ATHABASCA UNIVERSITY

GENERIC EARLY WARNING SIGNALS FOR CRITICAL TRANSITIONS:

An assessment of the signals' utility as a predictive management tool through an application on the undergraduate distance student's program withdrawal problem

By

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A DOCTORAL DISSERTATION

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES IN PARTIAL FULLFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF BUSINESS ADMINISTRATION

FACULTY OF BUSINESS

ATHABASCA UNIVERSITY

JANUARY 2018

Approval of Dissertation

The undersigned certify that they have read the dissertation entitled

GENERIC EARLY WARNING SIGNALS FOR CRITICAL TRANSITIONS:

AN ASSESSMENT OF THE SIGNALS' UTILITY AS A PREDICTIVE MANAGEMENT TOOL THROUGH AN APPLICATION ON THE UNDERGRADUATE DISTANCE STUDENT'S PROGRAM WITHDRAWAL PROBLEM

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In partial fulfillment of the requirements for the degree of

Doctor of Business Administration

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DEDICATION

To my dear daughter, ***Maya April Houry***, who was born over the course of my doctoral studies.

May this dedication inspire you, spark in you the flames of curiosity, instill in you a persistent sense of wonder in the world we inhabit and plant in you the seeds of scholarship in at least as much as my parents, ***Amin Rashed Houry and Huda Ashi Abou Shousha-Houry***, have planted them in me.

ACKNOWLEDGEMENTS

I am deeply grateful to my supervisor, Dr. Tilly Jensen, Acting Associate Dean for Pedagogy and Student Experience and Assistant Professor of Accounting, for her tireless supervision and guidance. I am also grateful to the committee members, Dr. Merlyn Foo, Assistant Professor of Finance, and Dr. Fathi Elloumi, Associate Professor of Accounting, for their support and guidance along the research path I have chosen.

I am also grateful for the assistance I have received from:

Dr. Conor Vibert, the Acadia University external examiner during the dissertation defense, for his oral feedback and subsequent written comments;

Dr. Pamela Buckle-Henning, the Adelphi University external examiner during the proposal defense, for her feedback and for encouraging me to present at the 2018 International Society of Systems Sciences conference in Vienna, Austria;

Dr. Martin Connors, Professor of Space Science and Physics and co-discoverer of Earth's Trojan Asteroid, for drawing my attention to a Complexity course offered at the Santa Fe Institute; for his feedback on the early chapters of my dissertation; and for his assistance in my presentation of a paper at the 2014 Second Biennial Conference on Sustainable Business, Development and Energy in Asia, held in Hiroshima, Japan;

Dr. Burton Voorhees, Professor of Mathematics, for opening my eyes to science research on generic early warning signals for critical transitions and the possibilities for the importation of such scientific thinking into the realm of management. His input constituted the very core of my dissertation;

Dr. Mihail Cocosila, Assistant Professor of Management Science and e-Commerce, for his valuable feedback on the early chapters of my dissertation and for his assistance in obtaining ethics clearance;

Dr. Kay Devine, Doctoral of Business Administration Program Director and Organizational Analysis Professor, for her guidance during the course work and the dissertation work, and for her feedback on a document during my coursework which evolved into a chapter of my dissertation;

Dr. Janice Thomas, Professor of Project Management and Director of the Project Management Research Institute, for her guidance during course work and dissertation work, and for her assistance in my presentation of a paper at the 2011 Second International Conference on Complexity Science Management and Intelligent Information Systems in Beijing, China. The paper won a third place award and was referenced in a Master's thesis at the University of Amsterdam. The paper was also of interest to a doctoral student at the University of Isfahan; and

Dr. Bob Hinings***,*** Professor of Organizational Studies, for his invaluable input during my coursework on what ultimately constituted a chapter of my dissertation.

I am very thankful to the Santa Fe Institute in New Mexico and the opportunity to complete a course on Complexity under Dr. Melanie Mitchell, Professor of Computer Science at Portland State University and Author of "Complexity: A Guided Tour." Dr. Mitchell's course ultimately inspired the secondary research question.

My sincere appreciation goes to Mr. Nazrat Durand for assisting in data collection.

Finally, I could not have completed my doctoral program without the support of my wife Rima Madi Houry, my daughter Maya April Houry and all those who have accompanied me on my doctoral journey.

EPIGRAPH

"The only relevant test of the validity of a hypothesis is comparison of its predictions with experience."

Milton Friedman (1912-2006).
American Economist and Statistician.

ABSTRACT

Complex systems range from business entities, the human brain, to the climate. These systems have tipping points at which a small perturbation can trigger a critical transition leading to an emergence at an alternate stable state. Although there are differences in the nature of different complex systems, their behaviors exhibit universal characteristics as they near a tipping point. Among such characteristics are the common generic early warning signals that precede critical transitions. The signals include: critical slowing down in which the rate of recovery from perturbations decreases over time; an increase in the variance and skewness of the state variable; an increase in the autocorrelation of the state variable; flickering between different states; and an increase in spatial correlations. The presence of such signals has significant management implications, as the identification of signals prior to the tipping points could allow management to identify intervention points. A review of literature did not identify any applications for the signals in managing undergraduate program student withdrawal at distance universities, hence the research gap. This research assessed the signals through an intensive case study of undergraduate program student withdrawal at a Canadian Distance University by comparing the incidences of the signals among inactive students to the incidences of the signals among graduates. Findings showed support for the signal on the rise in flickering, represented in the increase in the student's non-pass rates prior to withdrawing from a program; moderate support for the signal of critical slowing down, reflected in the longer time a student spends in a course; and moderate support for the signals on increase in autocorrelation, skewness and variance in the grade variable. The research also extended knowledge by investigating whether the emergence of a program withdrawal status is self-similar at the program level and the course level. Findings moderately supported self-similarity as a potential signal. In conclusion, the research into the signals and self-similarity suggests that the signals could be potentially utilized as a predictive management tool. These findings represent the beginnings of future research into the creation of program withdrawal Complexity based models and the possible identification of intervention points.

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CHAPTER I: INTRODUCTION

Complexity research is multidisciplinary. It pertains to the study of complex systems in various fields. Such systems are characterized by the presence of multiple agents, the generation of emergent properties and the undertaking of self-organization through feedback loops (Morgan, 2006). Complex systems range from business organizations, society, the climate, the human brain to even flocks of birds. These systems have tipping points, whereby a small perturbation can trigger a critical transition leading to an emergence at an alternate stable state (Scheffer et al., 2009). Despite the variations in the nature of the complex systems, their behaviors exhibit universal aspects as they near their tipping point (Scheffer et al., 2009). Specifically, research shows that there are common generic early warning signals that precede critical transitions (Scheffer et al., 2009). The early warning signals include:

- The phenomenon of critical slowing down in which a system's recovery rate from perturbations decreases (e.g. Veraart et al., 2012; Van Nes & Scheffer, 2007; Scheffer et al., 2009; Tredicce et al., 2004; Matsumoto & Kunisawa, 1978);
- An increase in the variance of the state variable (e.g. Carpenter & Brock, 2006; Bates, 1991; Hsieh et al., 2006; McSharry, Smith, & Tarassenko, 2003);
- An increase in the skewness of the state variable (e.g. Guttal & Jayaprakash, 2008);

- An increase in the autocorrelation of the state variable as the state of the system increasingly resembles its former state (e.g. Ives, 1995; Lebaron, 1992; Dakos et al., 2008);

- Flickering which is the iterative transition between alternative states (e.g. Wang et al., 2012; Bakke et al., 2009; Litt et al., 2001); and

- Characteristic spatial patterns (e.g. Scheffer, Westley & Brock, 2003; Shroeder, 1991; Rietkerk, Dekker, de Ruiter, & van de Koppel, 2004; Venegas et al., 2005; Hong & Stein, 2003).

In the business realm the presence of early warning signals has significant management implications. The identification of the signals prior to the tipping point could potentially allow management to exploit opportunities and manage risks prior to the system's transition to a new state.

1.1 Statement of the Problem

Despite the application of the generic early warning signals for critical transitions in various fields, such as ecology (Carpenter & Brock, 2006; Ives, 1995; Guttal & Jayaprakash, 2008), climatology (Dakos et al., 2008), fisheries (Hsieh et al., 2006), and health and medicine (McSharry, Smith, & Tarassenko, 2003; Litt et al., 2001), their application in the area of management, with the exception of the field of finance, (e.g. Bates, 1991; Lebaron, 1992), remains limited. A review of literature in Chapter II identified a research gap due to the absence of any application for the signals in the area of managing undergraduate program student withdrawal at a Canadian Distance

University, an institution with a student population consisting largely of non-traditional adult learners given its system of asynchronous distance learning, whereby students can enrol in an undergraduate course at the beginning of any month. Program withdrawal is an important problem to address because according to Wojciechowski and Palmer (2005) and Kember (1995) the program withdrawal rate amongst distance university students is higher than the program withdrawal rate at face-to-face conventional universities. As such, the program withdrawal problem presents an existential crisis for distance universities especially since, in some jurisdictions, such as the United Kingdom, public funding is dependent on the volume of students who persist and complete their courses (Simpson, 2005). The withdrawal problem is also associated with financial costs to the student and the institution (McCubbin, 2003).

This research assessed the utility of the generic early warning signals as a predictive management tool of program student withdrawal at a Canadian Distance University because studies of student attrition place a heavy emphasis on demographics and student engagement, but fail to link research findings to institutional practice (Tinto, 2007) and institutional practice can benefit from utilizing such early warning signals in the way of creating intervention points. This is especially important since assumptions about the autonomous and self-directed adult distance learner have been challenged with calls made for early counseling, creation of learning communities with satisfactory interactions and providing opportunities for learning skills development (Rovai, 2003). Although the findings from literature on program withdrawals (e.g. Sandeen, 2008; Bean & Metzner, 1985; Drekmeier & Tilghman, 2010) may help inform university administration in their strategic planning, institutional positioning, advancement and marketing, program reviews and program offerings to manage the student program withdrawal problem, none, however, adopt a Complexity perspective by regarding the student population as a complex adaptive system that self-organizes through feedback loops. The examination of generic early warning signals for student transition from an active student status to a program withdrawal status by either self-withdrawal or program inactivity helps identify opportunities for intervention points that support student relationship management consistent with Murphy's (1996) advocating of soft interventions during chaos.

The generic early warning signals for critical transition are not without controversy. Boerlijst, Oudman and de Roos (2013) argued that the identification of variables to which the generic signals were applied can only be accomplished post hoc and that in some of the analyzed case studies the generic early warning signals remained absent despite the critical transitions. Even the proponents of the signals, such as Scheffer et al. (2009), suggested that there is always the risk of false positives, where the signals are identified despite the absence of a critical transition, and false negatives where the signals are absent despite the presence of a critical transition. Another controversial point is that studies based on controlled perturbation experiments and computer simulations do not tell the natural story and are therefore inconclusive.

1.2 Purpose of the Study

The objective of the research is to assess the existence of the generic early warning signals through an intensive case study of program student withdrawal management at a Canadian Distance Education University with mainly nontraditional adult learners. A review of the literature indicated that such a business case has not been previously explored through a Complexity perspective. The assessment of the generic early warning signals was undertaken through the comparison of the incidences of the signals among students who either turned inactive or withdrew from their program of study (true positives) to the incidences of the generic early warning signals among graduates (false positives). The research also sought to extend knowledge by investigating whether the early warning signals exhibit self-similarity at the program level and the course level, i.e. whether the signals are self-similar at multiple levels, by investigating student data at the course level and the program level. To this end, the following is the primary research question:

1.3 Primary Research Question

How valid are the generic early warning signals for critical transitions as a predictive management tool when assessed within the context of program withdrawal management among undergraduate distance students?

In addition to the primary question, the research addressed a secondary research question:

1.4 Secondary Research Question

Does the emergence of a program withdrawal status among undergraduate distance students exhibit a self-similarity at the program level and the course level?

1.5 Significance of the Study

The research is significant due to four factors:

First, the methodology section of this document addressed the primary research question and the secondary question through the mathematical analysis of generic early warning signals for critical transitions among undergraduate university students who have failed at least two courses. This was achieved by utilizing the grade, course completion status, and course duration data readily available in the student database at a Canadian Distance University. The same analysis was undertaken on a control group, i.e. graduates, to test for statistically significant differences between the two groups. The significance testing allowed for comparing the true positives of the incidences of the generic early warning signals amongst the program student withdrawal group with the false positive incidences of the signals amongst the graduate group.

Second, the research investigated whether the emergence of a program withdrawal status exhibits self-similarity at the program level and the course level. This was accomplished by analyzing withdrawal data at the course level and at the entire program of enrollment level. This tested whether the self-similarity, present at the program level and the course level, is an early warning signal in its own right. Student withdrawal observed to be statistically significant at the course level could be an early warning signal of the student's potential withdrawal at the program level.

Third, literature reviewed on generic early warning signals spans multiple disciplines, e.g. climate studies (Dakos et al., 2008), finance (Bates, 1991), epileptic seizures (McSharry, Smith, & Tarassenko, 2003) and others, but none were identified in the areas of program withdrawal management. This field will benefit from the application of generic early warning signals for critical transitions as the validated signals could identify crisis points early enough to allow administrators to take action and address a student's potential program withdrawal threat prior to its occurrence.

Fourth, most of the reviewed literature (e.g. Veraart et al., 2012; Tredicce et al., 2004; Matsumoto & Kunisawa, 1978; Carpenter & Brock, 2006; Bates, 1991; McSharry, Smith, & Tarassenko, 2003) report on an intensive case study of a specific phenomenon, such as climate, ecology and others, in which one or two early warning signals are identified, such as increase in volatility prior to the 1987 stock market crash (Bates, 1991). This study comprehensively investigated all the generic early warning signals together in a single case study at a Canadian Distance University.

Fifth, the assessment of the generic early warning signals prior to critical transitions from an active student status to an inactive status, and the investigation into whether the emergence of a program withdrawal status was self-similar at the course level, was undertaken through data analysis on this natural complex system, the student. This approach offered a different perspective from that of other Complexity researchers who ran artificial simulations that do not always reflect the natural world.

Sixth, the validation of the generic early warning signals was undertaken through an application on the distance student's program withdrawal problem at the Canadian Distance University. Given that the Canadian Distance University has an environment comparable to that at other distance universities, the generic early warning signals could be potentially incorporated into a predictive management tool of relevance to a wider set of distance education universities.

Based on the research findings, the following are the theoretical and applied contributions of the research:

1.5.1 Contributions to Theory

- *Assessing the validity of the generic early warning signals by comparing incidences of the signals among an experimental group and a control group.*

The calculation of the generic early warning signals utilized the grade, course completion status, and course duration variables of inactive students and a control group of graduates to assess the validity of the signals amongst the program withdrawal students and whether their incidences are statistically higher than those present among the graduate group. The findings supported the signal on the rise in flickering prior to a student withdrawing from the program of study (78% for the program withdrawal group vs. 44% for the graduate group with a statistically significant difference), and moderately supported the signals on critical slowing (87% for the program withdrawal group vs. 66% for the graduate group with a statistically significant difference), rise in variance (64% for the program withdrawal group vs. 55% for the graduate group with a statistically significant difference), the rise in skewness (67% for the program withdrawal group vs. 52% for the graduate group with a statistically significant difference, and rise in autocorrelation (65% for the program withdrawal group vs. 53% for the graduate group with a statistically significant difference).

- *Identifying whether the emergence of a program withdrawal status is self-similar at the program level and the course level.*

Identifying whether the emergence of a program withdrawal status is self-similar was accomplished by examining the withdrawal data at the course level amongst the program withdrawal students and the graduates. This tested whether self-similarity is an early warning signal in its own right. The research findings showed that the incidence of 'course withdrawal and fails with zero grade' amongst program withdrawal students (39% mean) is high and statistically significant compared to the incidence of 'course withdrawal and fails with zero grade' amongst graduates (21% mean). The findings moderately supported self-similarity as a potential early warning signal.

- *Identifying whether all generic early warning signals could be present together in a single case study.*

Much of the literature on generic early warning signals refers to intensive case studies of a specific phenomenon, e.g. climate studies (Dakos et al., 2008), finance (Bates, 1991), epileptic seizures (McSharry, Smith, & Tarassenko, 2003) and others, in which one or two early warning signals are identified, such as increase in skewness. This research comprehensively investigated the presence or absence of all generic early warning signals, with the exception of spatial correlation, in a single case study.

1.5.2 Contributions to Practice

- *Assessing the utility of the generic early warning signals as a predictive management tool, as well as the utility of self-similarities as an additional signal*

The research has the potential to fill a gap in academic literature. Although literature on generic early warning signals spans multiple disciplines (e.g. Carpenter & Brock, 2006; Ives, 1995; Guttal & Jayaprakash, 2008), none were identified in the area of program student withdrawal management. Also, none explored whether the emergence of a program withdrawal status is self-similar at multiple levels of observation, such as the program level and the course level. The application on program withdrawals could identify intervention points so that administrators can take action in addressing the program student withdrawal problem. This could be primarily achieved by utilizing the signals supported by the research findings. Specifically, critical slowing down, autocorrelation, variance, skewness, flickering and self-similarity, either directly or through their incorporation in future regression models.

1.6 Limitations of the Study

There are several limitations to the research:

1.6.1 Limitations in the Foundational Theory: Complexity Theory

Thietart and Forgues (1995) adapted Complexity theory from the natural sciences and applied it to organizational studies. They proposed that organizations are potentially capable of moving from one dynamic state to another. They also suggested that organizations may have fractal form configurations. Complexity theory is discussed in detail in the literature review of Chapter 2. Complexity is not without its limitations.

First, organizations, as constructs of their rational and irrational human constituents, are obviously not physical systems and their violation of the law of entropy, which suggests that order must always decrease, is not surprising. To this end, some academics, such as Levy (1994) and Cohen (1999) question the transferability of the theory from the natural sciences to organizational studies. Levy (1994) argues that the application of the theory to social sciences is at the infancy stage and that further research is required before a final verdict is made.

Second, Cohen (1999) criticized the lack of coherent definitions and misuse of the theory’s terminology as the conflicting academic rhetoric tends to distort the theory’s practical applications. Cohen (1999) also argues that the theory is best regarded as a metaphor or framework rather than a theory. The mere use of the organismic metaphor, in his view, points to the theory's explanatory limitation. Moreover, the lack of distinction between chaos theory and complexity theory is not without consequences. Complexity draws upon chaos theory among other approaches to study complex systems (Smith & Humphries, 2004). However, it is noted that chaos theory discusses the rise of complexity from simple order, whereas complexity theory discusses the rise of simple order from complexity (Smith & Humphries, 2004). Treating the two in unison, as Smith and Humphries (2004) did, when they are different, brings to light the challenges associated with importing theories from the natural sciences.

Third, Complexity, according to Levy (1994) suffers from overstated expectations. For example, Lynch and Kordis (1988) describe it as a management panacea and that practitioners who implement it should be seen at the same level as Newton. Fitzgerald and Van Eijnatten (2002) optimistically describe the theory as a metapraxis, a theory of theories with broad practical applications. Nevertheless, despite the optimism, a major limitation of the theory is the gap between understanding the theory and its practical implementation (Smith & Humphries, 2004). Levy (1994) suggests that it is often difficult to tell whether a system is indeed chaotic, moving towards the spontaneous emergence of a new order, or simply subject to temporary chaotic influences. It is difficult for researchers and management practitioners to make that distinction because systems could bounce between a chaotic and non-chaotic state (Cohen, 1999). It is therefore unclear whether practitioners could realistically change their decisions just in time from maintaining the original order to welcoming the emergent order (MacIntosh & MacLean, 1999). Despite the attractiveness of the theory’s propositions, it is uneasy for some practitioners to make the decision for moving an organization to the edge of chaos, especially when the edge is unknown, (MacIntosh & MacLean, 1999). In this case no action might be the safer option hence weakening the case for adopting the theory as a practical management tool.

Fourth, the theory places heavy emphasis on quantitative analysis although it is unclear whether complex organizations could be meaningfully modeled mathematically. Since most organizational behaviour researchers and practitioners lack quantitative skills, this renders organizational research within the scope of the theory rather limited (“Chaos under a cloud”, 1996; Smith & Humphries, 2004).

Fifth, sensitive dependence on initial conditions states that the effect of fluctuations and observational errors grows exponentially over time leading to the loss of all information on the initial conditions. This suggests that long term forecasting is not possible (Aihara & Katayama, 1995). For some, the inability to make long term forecasts is a major weakness in the practical use of the theory.

Sixth, Morgan (2006) suggests that Complexity as applied to organizational studies is not a new concept. Ideas on employee engagement and empowerment have been the product of the Total Quality Movement since the 1980s. Similarly, Goldberg and Markoczy (2000) indicate that economists have investigated for some time how simple rules lead to complex outcomes resulting in emergent phenomena. Cohen (1999) indicates that many of chaos theory principles were already assumed in systems theory.

Seventh, McIntosh and MacLean (1999) regard the notions of self-organization and moving to the edge of chaos as a contradiction. This is because of the difficulty in reconciling natural self-organization with the need for management intervention to guide an organization to the edge of chaos.

1.6.2 Limitations in the Generic Early Warning Signals for Critical Transitions

The generic early warning signals for critical transitions are discussed in detail in the literature review of Chapter II. The signals are not without their limitations.

First, Scheffer et al. (2009) recognize the challenges associated with identifying early warning signals in natural complex systems, which incorporate noise and other unpredictable factors. Furthermore, even controlled perturbation experiments, such as Matsumoto and Kunisawa’s 1978 neuron study and Tredicce’s et al. (2004) laser study, discussed in the literature review section to illustrate critical slowing down, might not reveal the complete and natural picture. Other systems such as the financial markets are difficult to model because they are buffeted by unpredictable political, ecological and social perturbations.

Second, the utility of the early warning signals is also questionable. For example, while Bates (1991) argues that increased trade volatility precedes some financial events, the author also argues that volatility calm is sometimes observed. It is therefore unclear whether an eye should be kept on increased volatility or its calm. Since research by Lebaron (1992) showed that first degree autocorrelation was related to trade volatility, then it is logical to question the utility of autocorrelation as an early warning signal. Furthermore, despite the numerous examples citing spatial patterns as an early warning signal, Scheffer et al. (2009) state that there is no one size fits all spatial pattern that precedes critical transitions. This calls into question whether the patterns discussed in various cases were a matter of conveniently fitting the patterns into the theory.

Third, the threat of false positives and false negatives in identifying the signals is of concern. False negatives are situations where transitions are observed without being preceded by an early warning signal (Scheffer et al., 2009). For example, Scheffer et al. (2012) acknowledge that critical slowing down might not always point to a tipping point. They argue that critical slowing down should be complimented by additional information. Similarly, false positives could occur. The identification of early warning signals when the system is in fact not approaching a bifurcation could be due to mere chance (Scheffer et al., 2009).

Fourth, prediction of critical transitions remains elusive as systems may show little change prior to the tipping point (Scheffer et al., 2009). Modeling of complex systems may not be accurate enough to predict the tipping points. Boerlijst, Oudman and de Roos (2013) showed that early warning signals for the catastrophic collapse in simple ecological models were not present. They argued that a detailed mathematical understanding of the approaching bifurcation might only be recognized in retrospect.

1.6.3 Limitations in the Research Methodology

The research methodology was conducted by undertaking calculations on the incidences of the generic early warning signals for critical transitions amongst an experimental group, the program student withdrawal group, and a control group, the graduate group, through an intensive case study that utilizes the grade, course completion status and course duration variables of the students at a Canadian Distance

University. The methodology is discussed in Chapter III. It too is not without its limitations.

First, generalizability is an issue since the analysis is only applicable to the case study at hand. While the results of the data analysis are statistically generalizable to the Canadian Distance University, they are not representative of other universities. Nevertheless, many studies on generic early warning signals focus on specific cases, such as the 1987 market crash (Bates, 1991). Despite the mathematical analysis of the signals the approach is one more qualitative contribution to the literature. It should be noted, however, that the Canadian Distance University shares an environment comparable to that at other distance universities. Therefore, even though the research findings are not generalizable in the strict statistical sense, they are nevertheless of relevance to other distance institutions who might choose to look to this case study research for replicability.

Second, based on the reviewed literature, if one generic early warning signal is observed in one case study the other signals are not necessarily present, although they could be present in other cases. Therefore, the absence of a signal in the Canadian Distance University case study does not necessarily invalidate it.

Third, the mathematical analysis of the student database at the Canadian Distance University is limited to students who have failed at least two courses. This condition was set by the researcher so as to utilize the grade, course completion status and course duration variables in calculating the generic early warning signals. Focusing the analysis on these variables excludes other variables that might have contributed to a student’s decision to withdraw from a program.

Fourth, the generic early warning signal for spatial correlations cannot be measured in the case study because most courses at the Canadian Distance University have rolling enrolments. That is to say that the courses start on the first of every month on an individualized basis and not on a student cohort basis. As such, it is not possible to spatially correlate student grades to identify how students influence one another.

Fifth, based on the case studies discussed in the literature review section, calculations of generic early warning signals usually rely on long time series data, such as long term climate data (Dakos et al., 2008). In the proposed intensive case study data is limited to the number of courses a student took, which is a minimum of ten courses. A consequence of this condition is that the study excluded students who withdrew from the program after completing less than ten courses.

Sixth, although there is admittedly no clear bifurcation diagram reflecting the students' different stable states and tipping points for the various environmental conditions they might face, Scheffer et al. (2009) suggest that most early warning signals could apply to different types of thresholds be it catastrophic or non-catastrophic bifurcations, in addition to cyclic and chaotic systems. Of course, some of the program withdrawal behavior might follow that of a linearly responding system which has neither a catastrophic nor a non-catastrophic bifurcation and for which the generic early warning signals do not always apply. This remains a limitation of the research.

Seventh, in calculating critical slowing down 28 cases in the program withdrawal group and 13 cases in the graduate group were excluded from the analysis. These students either took group study courses only, challenge for credit courses only or just took one individualized study course with all the other group study courses that they took. This rendered the data insufficient for undertaking critical slowing down calculations.

Eighth, the signals for autocorrelation and skewness rely on the grade variable's standard deviation. There were 36 program withdrawal cases with undefined skewness because the standard deviation was zero. There were also 44 program withdrawal cases with undefined autocorrelation. The difference between the two numbers has to do with how autocorrelation data was selected. Although these cases were excluded from the analysis, they did not impact the margin of error of the sample significantly.

Ninth, the researcher was an employee at the Canadian Distance University which could have led to bias during data analysis and interpretation. The researcher was cognizant of the need for reflexivity by examining oneself and the research relationship. Although the researcher's conceptual baggage of preconceptions and assumptions could have influenced research analysis, interpretation of findings and word choice during reporting, the presence of a supervisory committee, external examiners and a work supervisor facilitated the minimization of any such bias.

1.7 Organization of the Dissertation

The dissertation first presents an overview of chaos theory, which is later referred to as Complexity, as a practical management tool by illustrating some examples, discussing the theory's strengths and limitations and then providing an overall assessment in relation to management practice.

The dissertation then presents the phenomenon of emergence and the concept of fractals or self-similarity as applied to organizations. Since emergence is an outcome of transitions, the discussion moves into describing the different types of transitions including critical transitions.

A literature review is then presented on the various generic early warning signals for critical transitions, along with some examples from multiple disciplines. Opposing literature critiquing the validity and even the presence of the generic early warning signals is also presented. Literature on program student withdrawal is then presented, along with an argument for adopting a Complexity perspective by regarding students, during their time in their respective programs of study, as complex adaptive systems that self-organize through feedback loops. Students as complex systems face perturbations leading to the students' critical transition to different states: a persistent student state, which is in line with Complexity's fixed point attractor, an inactive student state which is another fixed point attractor, or even a stop-out state as in exiting a program but returning at a later date, which is a periodic attractor.

Having discussed the relevant background literature, the methodology section of the dissertation proposes an intensive case study approach employing an analysis of the student database. This is intended to investigate the generic early warning signals and whether the emergence of a program withdrawal status exhibits any self-similarities at the program level and the course level based on an assessment of the utility of the signals as a management tool in predicting student program withdrawal at a Canadian Distance University. The methodology is followed by a presentation of research findings and a discussion on each generic early warning signal. Conclusions are then drawn along with the implications to theory and management practice, and finally closing with a discussion on possible future research directions and a self-reflection on the research journey.

1.8 List of Terms and Definitions

The following definitions are relevant to the dissertation's content. Some are gleaned from the Early Warning Signals Toolbox website, (http://www.early-warning-signals.org), which provides a guide for detecting critical transitions in spatial and time series data. The site is sponsored by the Synergy Program for Analyzing Resilience and Critical Transitions.

Table I-1: List of Terms and Definitions

TERM	DEFINITION
Alternative stable states	Different (multiple) states (equilibria) of a system under the same external conditions. The state to which a system converges is path-dependent.
Attractor	The dynamic regime to which a system converges after some time. Examples of attractors: point, cyclic (periodic), quasiperiodic, and chaotic
Basin of attraction	Set of initial conditions that lead to a particular state (equilibrium).
Bifurcation	A critical threshold in conditions at which the qualitative behavior of a system changes.
Catastrophic bifurcation	Bifurcation where the current state of a system disappears and the system is forced to move to an alternative state.
Catastrophic shift	An abrupt shift in the state of a system induced by a small perturbation that pushes the system across the border of the basin of attraction.
Critical transition	Abrupt shift in the behavior of a system when certain parameters reach a threshold. Most pronounced example is a catastrophic bifurcation.
Eigenvalue (dominant)	Maximum factor that expresses how much linearized deviations from equilibrium diverge in time. It approximates the recovery rate back to equilibrium after a perturbation.
Equilibrium	The condition at which competing processes are balanced. At a stable equilibrium, a system returns to it upon a small perturbation. At an unstable equilibrium, a system moves away from it upon a small perturbation.
Findings support the signal	When the signal is exhibited by over 50% of the program withdrawal test group and less than 50% of the graduate control group, and the difference in the proportions is statistically significant.

Table I-1: List of Terms and Definitions (Continued)

Findings moderately support the signal	When the signal is exhibited by over 50% of the program withdrawal test group and over 50% of the graduate control group, and the difference in the proportions is statistically significant, OR when the signal is exhibited by less than 50% of the program withdrawal test group and less than 50% of the graduate control group, and the difference in the proportions is statistically significant.
Fold bifurcation	The threshold (in a parameter) at which a stable and an unstable equilibrium collide. It marks the disappearance of both equilibria.
Grade variable	Final grade at course completion date representing the student system state.
Hysteresis	As conditions are changing in a bistable system, the system remains on the same state until a catastrophic bifurcation is reached at which point it shifts to the alternative state. If conditions are changed in the opposite direction, the system jumps back to the original state only until it meets another catastrophic bifurcation. The distance (in parameter space) between the two catastrophic bifurcations defines the size of the hysteresis. The bigger the size, the more difficult for a catastrophic shift to be reversed.
Positive feedback	A process through which something has a positive effect on itself.
Resilience (ecological)	The magnitude of disturbance a system can tolerate before it shifts into a different state.
Self-organized patterns	Patterns in space that emerge from the interaction between many units.
System state (as applied to the case study)	In the case study and depending on the signal analyzed, the system state is either the grade variable or the course completion status (fail, pass or withdraw). For the signal of critical slowing down, system state was not utilized in the analysis. Instead, the time from course start date to course completion date was calculated.
Transition	Discontinuous (first-order): Abrupt change in the qualitative behavior of a system.
	Continuous (second-order): Smooth change in the qualitative behavior of a system.
	Noise-induced: Change in the qualitative behavior of a system in the presence of high noise intensity.
Threshold	A point where the system is very sensitive to changing conditions.
Tipping point	A point where the system may flip to another state.

CHAPTER II: REVIEW OF LITERATURE

To inform the research questions and support the proposed research design, this section undertakes a comprehensive review of relevant literature. It is divided into three subsections. The first subsection provides an overview of chaos theory and Complexity, a foundational theory for the research, and assesses its application as a predictive management tool by introducing the theory, and identifying its strengths and weaknesses, followed by an overall assessment. The second subsection is more focused. It introduces the phenomenon of emergence and the concept of fractals and then proceeds to discuss in detail the generic early warning signals for critical transitions that lead to emergence. The discussion on the generic early warning signals includes definitions, some examples as well as criticisms and limitations. The third subsection examines the student program withdrawal problem, reviews literature on reasons behind program withdrawal and then examines the student program withdrawal problem through the Complexity lens.

2.1 Chaos Theory as a Practical Management Tool

2.1.1 An Overview

One approach for unravelling the mystery of how a multinational corporation evolves from a garage-based private venture is to be a beneficiary of innovations developed in the natural sciences. Some organizational and economic theorists, such as Radzicki (1990) and Butler (1990), have done just that in their research by importing chaos theory, which originated from Lorenz's 1963 research on fluid dynamics, and applying it as an alternative means to traditional theories to enhance their understanding of organizations. These theorists were driven by the belief that economic, social as well as ecological systems are complex systems characterized by the chaos of dynamic interactions and nonlinear relations that evolve over time.

According to Vibert (2004) chaos theory falls in the lower right quadrant of Burrell and Morgan's 1979 work. This quadrant is home to functional theories that are managerial in their orientation and focus on relationships based on which generalizations could be made. Functional organization theories focus on organizations, measure organizational effectiveness using not only bottom line metrics but survival tendencies and legitimacy, and examine organizational structures and relationships between subunits (Vibert, 2004). For its part, chaos theory does much of this in its own unusual way.

2.1.2 Chaos Theory

At a time when environmental uncertainty, diversity and adaptability are much more pronounced than hierarchical rigidity, there has been a shift in academic thinking from the classical Newtonian view for making sense of organizations to a post Newtonian view of understanding, not in the language of classical physics but in what Toulmin (1990) refers to as the ecosystemic vocabulary. Chaos theory, which falls under Complexity research, is very much part of this vocabulary as its language encompasses numerous technical terms. One of these terms is the edge of chaos, which is the horizon at which an organization is subjected to forces of stability and instability (Vibert, 2004). According to Vibert (2004) the theory suggests that while at the edge, when an organization reaches irreversible disequilibrium which is the point at which the tendency towards equilibrium is overcome, then the organization, if managed properly, reaches bifurcation which is a period of disequilibrium signalling a break from the past. Organizations therefore could disconnect themselves from old processes and allow for the spontaneous emergence of a self-organizing system. At the discrete bifurcation point this emergence moves an organization from one state to another in an abrupt and sudden manner. The emergence of a new organizational order could ensure the organization's adaptation and ultimate survival post the stage of chaos until it meets the next environmental challenge (Smith & Humphries, 2004). This process of chaos and order is iterative although the outcomes are unpredictable at each iteration (Browning, Beyer, & Shetler, 1995). At the same time, this new order could result in fractals which refers to the generation of comparable structures and processes at different organizational levels such as organizational, unit and individual levels (Vibert, 2004). The driver behind these fractals could be the attractor which attracts an organization to a recognizable structure or process (Vibert, 2004). There are in fact three types of attractors that could be recognized. According to Butler (1990) these are the fixed point attractor, the periodic attractor and the strange attractor. Butler (1990) argues that a system state, such as an organizational state, could ultimately reach stable equilibrium at a fixed point attractor or even a periodic attractor where the system state oscillates between two or more stable equilibria at each time iteration. Butler (1990) also states that a system could be influenced by a strange attractor where the system can reach different states within a bound set of values and therefore will never reach equilibrium in the traditional sense, but is not necessarily unstable because it lives in a bound region. Here it should be stressed that this is the essence of a chaotic time path, i.e. with the system attaining different states in a bound region, as opposed to a random time path. While at the edge of chaos organizations are characterized with sensitive dependence on initial conditions which argues that small changes could multiply and amplify to lead to large consequences which also implies that long term forecasting, much like the weather, is not possible whereas short term forecasting is (Vibert, 2004). Finally, organizations at the edge of chaos are also characterized by the irreversibility of action which argues that if an action is taken twice in the same organization, or a comparable organization, it is unlikely to lead to the same effect as history does not repeat itself (Thietart & Forgues, 1995; Morgan, 2006; Vibert, 2004).

Chaos theory, although unusual with its technical terms and theoretical suggestions, helps explain multi-firm alliances, the operations of high risk organizations, and self-organizing systems from which cultural patterns and complex structures emerge (Vibert, 2004). Chaos theory also argues that organization and direct management are an illusion as order cannot be directly created. It suggests that a practitioner can only manage the conditions to allow for the emergence of order (Thietart & Forgues, 1995). The theory is therefore based on a biological metaphor, with an organization viewed as an open nonlinear dynamic system exposed to the environment, capable of organismic evolution and self-determination, rather than a classical mechanical metaphor where management is deterministic (Caulkin, 1995). It should be clarified that complex systems may consist of multiple agents. While the agents themselves might follow the mechanical metaphor the complex system as a whole follows the biological metaphor. An illustration of this is Tsoukas's (1998) example which refers to the traffic in the streets of London. While each car driver engages in mechanistic decision making the emergent traffic pattern as a whole follows the biological metaphor due to the absence of a traffic officer.

Chaos theory cannot be discussed to the exclusion of complexity. Although complexity makes use of chaos theory (Fitzgerald, 2001), Smith and Humphries (2004) see chaos theory and complexity as complimentary. They suggest that chaos theory applies when chaotic behaviour originates from simple systems. Conversely, complexity applies when simple behaviour arises from complex systems. The two therefore represent opposite ends of the same spectrum. Smith and Humphries (2004) further argue that directionality when applied in an organizational setting is ambiguous at best as it is unclear whether organizations should be viewed as composed of simple human units that through interaction lead to complexity, or whether organizations should be viewed as intrinsically complex systems that lead to orderly patterns. They argue that perhaps simple human resources can lead to complex systems which in turn lead to simple organizational order. In addition, they also argue that it is debatable whether humans should be considered as simple units or complex ones as they tend to exhibit rational and irrational behaviour. Therefore, chaos theory and complexity, although not interchangeable, when considered from an organizational perspective are certainly complimentary. Based on this line of argument, Smith and Humphries (2004) refer to chaos and complexity in unison as a single chaos and complexity theory to refer to the collection of approaches used to study complex systems. Nevertheless, this paper will follow in the tradition of numerous researchers (e.g. Cohen, 1999; Keene, 2000; Alaa, 2004) who refer collectively to such approaches simply as “Complexity”.

2.1.3 Organizational Propositions Based on Complexity

Although Complexity was developed in the realm of physical sciences, many scholars (e.g. Radzicki, 1990; Butler, 1990) realized its potential for a wider application as it became increasingly evident that social and economic systems tend to exhibit nonlinear and complex interactions. To this end, many scholars have contributed to the importation of Complexity to organizational studies. Notably, Thietart and Forgues (1995) imported aspects of Complexity and adapted them to the field of organizational studies in the form of a series of propositions. The propositions essentially summarize the characteristics of Complexity as applied to organizations by viewing organizations as complex adaptive systems that self-organize through feedback loops. Some of these propositions are referred to over the course of the research discussion. The following is a listing of the propositions:

"**Proposition 1**: Organizations are potentially chaotic.

- **Proposition 1a**: *The greater the number of counteracting forces in an organization, the higher the likelihood of encountering chaos.*
- **Proposition 1b**: *The larger the number of forces with different periodic patterns, the higher the likelihood of encountering chaos.*

Proposition 2: Organizations move from one dynamic state to the other through a discrete bifurcation process.

- **Proposition 2a**: *An organization will always be in one of the following states: stable equilibrium, periodic equilibrium or chaos.*
- **Proposition 2b**: *A progressive and continuous change of the relationships between two or more organizational variables leads an organization, in a discrete manner, from a stable to a chaotic state via an intermediary periodic behaviour.*

Proposition 3: Forecasting is impossible, especially at a global scale and in the long term.

- **Proposition 3a**: *When in a chaotic state, ceteris paribus, the impact of a change has an unpredictable long term effect.*
- **Proposition 3b**: *When in a chaotic state, ceteris paribus, the impact of an incremental change can be predicted in the very short term.*

Proposition 4: When in a chaotic state, organizations are attracted to an identifiable configuration.

- **Proposition 4a**: *When in a chaotic state, organizations are more likely to adopt a specific configuration than a deterministically random pattern.*
- **Proposition 4b**: *The greater the openness of an organization to its environment, the more likely is the attraction by the organization to a given configuration.*

Proposition 5: When in a chaotic state, organizations, generally, have a fractal form.

- **Proposition 5a**: *When in a chaotic state, similar structure patterns are found at the organizational, unit, group and individual levels.*
- **Proposition 5b**: *When in a chaotic state, similar process patterns are found at the organizational, unit, group and individual levels.*

Proposition 6: Similar actions taken by organizations in a chaotic state will never lead to the same result.

- **Proposition 6a**: *When in a chaotic state, two identical actions taken by a same organization always lead to two different results.*
- **Proposition 6b**: *When in a chaotic state, the same action taken by two organizations never leads to the same results"* (pp 19-31).

Having introduced Complexity as applied to management the research now refers to different case studies on its application as a practical management tool to identify its strengths and limitations.

2.1.4 Successful Applications of Complexity to Organizations

Literature has numerous examples on the successful applications of Complexity as a practical management tool. In their paper, Browning, Beyer and Shetler (1995) describe how the initial disorder of competition and chaos due to collective market loss to Japanese dominance compelled fourteen US semiconductor companies to break with the past and form the SEMATECH consortium. As a consortium, individual actions of the member companies multiplied in magnitude keeping foreign competition at bay, while each consortium member actively engaged in internal competition with one another.

In a different example by Caulkin (1995), the managing director of Knowledge Based Development Ltd. increased the productivity of an offshore oil platform construction site by simplifying the project to four key principles, in consultation with a cross-functional team, thereby producing a complex adaptive intelligent identity from simple key principles. This was in the same manner a flock of birds, known as boids, formed based on following a few simple rules pertaining to bird speed, distance and direction. Every problem the company faced was addressed starting with the four principles until a solution, in the form of creative complexity, emerged.

There are many other examples on the successful applications of Complexity in the academic literature, such as Deer & Co. who selected the right manufacturing technology by understanding the interactions between the components of complex systems, and Coopers & Lybrand which provided consulting on fast changing strategies using business simulation games (Caulkin, 1995). Axerod (1999) describes how Capital One Services realized, using Complexity, that naturally evolved structures performed better than designed structures where different units of the organization are allowed to evolve independently from an overarching executive decision maker, leading to the emergence of a new company-wide structure. In other words, emergent effectiveness outshined engineered effectiveness. Coleman (1999) describes how Acer Group, Technical and Computer Graphics and Sun Microsystems recognized that their survival relied on tolerating disequilibrium thereby managing empowerment and control to influence creativity and self-organization among their employees. Phelan (1995), in reference to Complexity, describes how firms seek competitive advantages over their competitors. Ditto and Munakata (1995) describe short term economic predictions using Complexity. Aihara and Katayama (1995) discuss the application of deterministic chaos in the realm of engineering, specifically kerosene fan heaters and dishwashers, referring to their approach as chaos engineering.

2.1.5 Evidence Based Strengths

Academic literature is therefore rich with an abundance of successful applications for Complexity and its utilization as a practical management tool. Based on some of the cited case studies, and other literature, the research now discusses in detail the theory's overall strengths.

Although strategic management theories and programs on entrepreneurial studies offer insights into organizational change and life cycles, Complexity offers an alternative perspective by explaining the coupling of the paradoxical forces of change and stability and ultimately their impact on organizations (Vibert, 2004). In fact, a central tenet of Complexity is that "dysfunctional systems and apparent disarray and displacement are a normal aspect of adaptation to high-stress conditions" (Piotrowski, 2006, p. 10). The forces of stability and instability could push an organization to what Pascale (1999) refers to as the edge of chaos. Instability, if left unchecked, could push an organization over the edge into chaotic behavior, and stability might make an organization incapable of environmental interaction sending it into extinction. However, careful management could lead to the emergence of a new order, a self-organization, while at the edge of chaos to ensure an organization's survival (Pascale, 1999). Although unusual in its proposition, as it suggests, while maintaining standard policies and procedures in place, a hands-off approach in change management, this is nevertheless the prime benefit for the application of Complexity in an organizational context. Classical models emphasize rational planning and slow change, while Complexity explains processes that both accelerate and amplify emergent change (Salem, 2002). The managerial implication is that while setting up a strategic objective and moving an organization towards it might be viable for day to day operations, it is bound to break down over the long term. Hence the relevance of Complexity as an alternative model where self-organization, in the form of nonlinear evolutionary change, emerges as monolithic top management strategies are tested by a diversity of opinions and views of other personnel in the organization (Caulkin, 1995).

Another strength for Complexity is its reference to sensitive dependence on initial conditions. It suggests that when an organization is in a state of chaos small changes can lead to large consequences as the small changes could multiply over time, much like a butterfly flapping its wings in China could create a hurricane in the Caribbean (Aihara & Katayama, 1995). This implies that there is significant leverage to small actions taken while at the edge of chaos (Aihara & Katayama, 1995). Caulkin (1995) gives the example of the DOS (disk operating system) which made significant profits not necessarily because of its technical superiority over that of competitors, but because of the exponential growth in its early market share gains.

Complexity also suggests that adaptive equilibrium with the environment could imply organizational death. Pascale (1999) sees equilibrium as a precursor to organizational failure. This is because environments adapt to organizations as much as organizations adapt to them. For example, the invention of the iPhone forced the entire telecommunication environment to adapt to its standard. In a sense, organizational death cannot be exclusively blamed on the environment. Therefore, Complexity stresses the free will of organizations, a strength that most practitioners do not realize they actually have. Practitioners need to be cognizant of the free will asset to capitalize on it, especially as they embrace change and manoeuvre their organizations through chaos (Caulkin, 1995; Brown & Eisenhardt, 1998).

Finally, Tetenbaum (1998), Kelly (1994, 1998) and Cohen (1999) argue that the rise of radical technology, global economic restructuring, and changes at the social, political and cultural levels created many environmental uncertainties. In fact, there were numerous calls stressing the need to think differently to manage instability (e.g. Blainey, 2000; Roberts, 1995). In a similar vein, Keene (2000) suggests that the principles of scientific management and the machine metaphor are inadequate to enable practitioners to deal with changing environments. In response, Kaufmann (1994,

1995) focuses his attention on the adaptation of organisms and uses it as a metaphor for open systems living near the edge of chaos. This was the beginning for the proposition of new paradigms to make sense of all the change. As such, environmental uncertainty provided fertile ground for the development of new theories, such as chaos theory and Complexity, to fill a psychological, decision making and managerial need among practitioners for understanding complexity that change has brought upon their organizations. In conclusion, the theory's raison d'etre, as an answer to environmental change and uncertainty, is in fact its main strength.

2.1.6 Unsuccessful Applications of Complexity to Organizations

Just as literature shows an abundance of successful applications for Complexity as a practical management tool, there is also literature that shows the theory's unsuccessful or limited applications to practice.

In Piotrowski's (2006) Hurricane Katrina example although the author shows optimism that in the aftermath of the hurricane the disorganization at the political, organizational, social and personal levels was likely part of a process for creating a new order from chaos, just as it did after the San Francisco 1906 earthquake, the 1871 Chicago great fire, and the rebuilding of Europe through the Marshall Plan after the Second World War, it could be argued that this has yet to materialize. Only time will tell whether Hurricane Katrina pushed the city of New Orleans only to the edge of chaos, where the emergence of self-organization could possibly take place, or whether the hurricane pushed the city into chaos itself. The long time horizon for realizing the outcome is a limitation of the theory in this particular example.

The large number of variables that influence financial processes make it difficult to prove the existence of deterministic chaos (“Chaos under a cloud”, 1996). Also, some technology markets, such as computer software, hardware and telecommunications, are too young to provide sizable longitudinal data to successfully model chaotic systems (“Chaos under a cloud”, 1996). As a result, in such examples, the theory either fails or just falls short of being a practical management tool.

2.1.7 Evidence Based Limitations

Based on some of the unsuccessful applications cited, and other literature, it is evident that Complexity is not without its limitations.

When in a chaotic state the emergence of order requires the creation of energy out of nothing which contradicts the laws of physics (Smith & Humphries, 2004). Organizations, as constructs of their rational and irrational human constituents, are obviously not physical systems and their violation of the law of entropy, which suggests that order must always decrease, is therefore not surprising. As such, some academics (e.g. Levy, 1994; Cohen, 1999) question the theory’s transferability from the natural sciences to organizational studies, especially when the transfer is not quite accurate. Levy (1994) argues that the application of the theory to social sciences is still at the infancy stage. Further research is required over longer time horizons and more cases should be studied before a final verdict on the validity of the theory’s transferability is made. However, by then a new innovation in the sciences might make its way into organizational studies and herein lies an inherent limitation.

Cohen (1999) criticizes the lack of coherent definition and the widespread misuse of the theory’s terminology as the conflicting academic rhetoric tends to distort the theory's practical applications, particularly the property of emergence. Cohen (1999) also argues that the theory is best regarded as a metaphor or framework rather than a theory. Cohen (1999) reasons that if the theory's explanation of emergence was clear enough then there would not be a need for the utilization of metaphors in the explanation. The mere use of the organismic metaphor, in his view, points to the theory's explanatory limitation. Moreover, the lack of distinction between chaos theory and complexity theory is not without consequences. Complexity draws upon chaos theory among other approaches to study complex systems (Smith & Humphries, 2004). However, it is noted that chaos theory discusses the rise of complexity from simple order, whereas complexity theory discusses the rise of simple order from complexity (Smith & Humphries, 2004). Treating the two in unison, as Smith and Humphries (2004) did, in the theory's application to organizational studies, especially when they are different to some extent, also brings to light the challenges associated with importing and applying theories from the natural sciences.

In addition, Complexity seems to suffer from overstated expectations (Levy, 1994). For example, Lynch and Kordis (1988) describe it as earth shattering science, a management panacea, a radical business development paradigm and that practitioners who implement it wisely should be seen at the same level as Newton. Fitzgerald and Van Eijnatten (2002) optimistically describe the theory as a metapraxis, a theory of theories with broad practical applications. Nevertheless, as Smith and Humphries (2004) suggest, despite the optimism, a major limitation of the theory is the gap between understanding the theory and its practical implementation. In fact, Levy (1994) argues that sometimes it is difficult to tell whether a system is indeed chaotic, yearning for the emergence of order, or simply subject to temporary chaotic influences, perturbations, which imply that the current order should be allowed to persist. It is rather difficult for researchers and management practitioners to make that distinction (Cohen, 1999). Systems could potentially bounce between a chaotic and non-chaotic state. Consequently, it is unclear whether practitioners could realistically bounce their decisions just in time between maintaining the original order and welcoming the emergent order (MacIntosh & MacLean, 1999). Also, despite the attractiveness of the theory's propositions, it is uneasy for some practitioners to make the decision for moving an organization to the edge of chaos, especially when the edge is unknown, rendering the risk of falling over rather significant (MacIntosh & MacLean, 1999). For some practitioners in this case no action might be the safer option rather than taking the risky action of charting a course to the unknown edge, hence weakening the case for adopting the theory as a practical management tool.

The theory places heavy emphasis on quantitative analysis although it is unclear whether complex organizations could be meaningfully modeled through mathematical algorithms as is the case with fund management firms. Most organizational behaviour researchers and practitioners lack the required quantitative skills which makes the breadth and depth of organizational research within the scope of the theory rather limited ("Chaos under a cloud", 1996; Smith & Humphries, 2004).

Sensitive dependence on initial conditions, a characteristic of the theory, argues that the effect of inevitable fluctuations and observational errors grows exponentially with the arrow of time leading to the loss of all information on the initial conditions. This implies that long term forecasting is not possible (Aihara & Katayama, 1995). For some practitioners the inability to make long term forecasts is a fundamental weakness in the theory.

Interestingly, Morgan (2006) argues that Complexity as applied to organizations is not necessarily a new concept. Since the 1980s ideas on employee engagement and empowerment have been the product of the Total Quality Movement. Similarly, Goldberg and Markoczy (2000) indicate that economists, specifically game theorists, have investigated for some time how simple rules lead to complex outcomes resulting in emergent phenomena. Cohen (1999) indicates that many of chaos theory's principles were already assumed in systems theory. Complexity therefore could be regarded as just another device for cultivating an environment that fosters ideas on employee engagement and empowerment potentially leading to naturally occurring self-organization, ideas that are not unique to Complexity.

Finally, McIntosh and MacLean (1999) view the notions of self-organization and going to the edge of chaos as a contradiction, as it is difficult to reconcile natural self-organization with the implied need for management intervention to bring an organization to the edge of chaos. If self-organization is truly spontaneous and natural it should not require such intervention. This contradiction points to the practical limitations of the theory and the imperative need for further research to clarify the implications of its contradictory assumptions.

2.1.8 An Overall Assessment for Management Practice

Given Complexity's strengths and limitations the following is an overall assessment for its application as a practical management tool.

Some of Complexity's cited strengths, e.g. its transferability from the natural sciences, are also its weaknesses, e.g. questioning its transferability, which points to the importance for managing the theory's proper implementation within the respective environmental context. To this end, there should be a consensus among organizational theorists on the theory's technical terms to bring some order to the chaotic academic debate and by extension some order to its application as a practical management tool (Cohen, 1999).

Despite the quest for order, Vibert (2004) notes that order should not be an end in itself as its inertia resists the entropy of change. Practitioners at times should accept the brutality of their business and natural environment and act, or allow others to act rather than react, by facilitating the emergence of a company-wide self-organization through the individual actions of the various agents, employees, units or departments thereby tempering the brutality of nature from time to time and enhancing their understanding of it. After all, perpetual order only serves to instigate resistance to change which could drive an organization into perpetual chaos (Thietart & Forgues, 1995). The theory therefore is more about recognizing the edge of chaos and allowing for organizational emergence at different times for the purpose of organizational survival. It is recognized, however, that this is easier said than done as it is difficult to take an organization to the unknown edge of chaos as opposed to chaos itself which might be an undesired final state for the organization (MacIntosh & MacLean, 1999). The problem is compounded by the fact that crisis management is neither central to management training nor is it a major component of business school curricula (Richardson, 1993). Therefore, the instincts of a practitioner play an important role in managing the process, although the outcome remains uncertain. However, Levy (1994) suggests that managerial instincts could be informed by recognizing five strategic uses of the theory: short term planning is more viable than long term planning, long term forecasts are not viable, the recognition of instability, the acceptance of dramatic changes as part of organizational life cycles, and the recognition of the importance of instituting guidelines to deal with uncertainty and facilitate the emergence of order.

It is often difficult to observe self-organization by mistaking it for a trend of chaos within chaos thereby hindering its development. Practitioners at times need to patiently allow self-organization the time to develop before making the judgment call on whether the process is leading to chaos or to order. Again, while this is easier said than done, a practitioner's instinct plays an important role in facilitating this process (Brown & Eisenhardt, 1998).

Complexity might be taxing on technical and analytical skills. This in turn stresses the need for hiring quantitative experts to devise quantitative formulae and facilitate proper implementation of the theory to enhance the understanding of organizational management. This is also in line with Ashby's (1958) requisite variety argument for matching complex systems with complex minds to cope with meaningful interpretations to inform actionable applications.

While at the edge of chaos, business practitioners need to be cognizant of the irreversibility of action which argues that history does not repeat itself. In other words, an action that brings order to an organization while at the edge of chaos may not bring the same order the next time the organization finds itself at the edge. History does not repeat itself (Vibert, 2004). Practitioners should therefore avoid the temptation of codifying emergent order as an organizational policy or design to be applied in future chaotic iterations so as not to drive their organizations to extinction.

Finally, while Complexity revolves about nonlinearity stressing the limitations of a cause and effect approach in understanding organizational behaviour, it should be emphasized that not all organizational behaviour is without antecedents. If practitioners have some information on the initial state of the system then they might be able to predict some later stages (Goldberg & Markoczy, 2000). As such, deterministic thinking should be utilized to understand the intra-organizational relationships prior to resorting to what Smith and Humphries (2004) refer to as the blackbox of chaos theory, a place that houses the manifestation of acausal events thus removing the need for understanding the inner workings of an organization. In short, practitioners need to reach out to the traditional tools prior to resorting to Complexity thinking.

In conclusion, Complexity has its promoters (e.g. Morgan, 2006; Lynch & Kordis, 1988; Fitzgerald & Van Eijnatten, 2002) who praise it as a radical new paradigm for business management, and critics (e.g. Merry, 1995; Smith & Humphries, 2004) who suggest that few examples exist on the theory's practical applications. Therefore, on the one hand there is a valid argument for the application of Complexity thinking especially when dealing with complex environments. After all, matching complex organizations with Complexity thinking is in line with Ashby's (1958) requisite variety argument which suggests that the complexity and variety of an organizational system is best interpreted by a theory or a combination of theories, in this case Complexity, that have equal or even more variety and complexity to cope with the interpretation of the system. Nevertheless, as cited in some studies (e.g. Merry, 1995; Smith & Humphries, 2004), it is acknowledged that the effectiveness of Complexity as a practical management tool is still debatable and dependent on further research.

Complexity is capable of explaining the unusual in unusual ways, such as a struggling firm that nevertheless remains successful. During each struggle the firm approaches the edge of chaos then the emergence of reorganization brings a new order until the firm faces a new struggle and the cycle ever continues, albeit successfully provided that uncertainty is managed properly (Browning, Beyer, & Shetler, 1995). By extension, Complexity theory might just explain and reinforce its unusual self through its own autopoietic feedback loop characterized by the raging academic debate on the strengths and weaknesses of applying the theory to understanding organizations. Complexity as such faces its own forces of stability and instability. Perhaps as the theory nears its own edge of chaos in each iteration of academic debates there will be a self-organization of sorts with the emergence of a new and more robust order for the theory, allowing for its utility as a practical management tool to be forever refined. The growing academic debate and the passage of time will tell.

This research for one is positioned as yet another contribution to the raging academic debate through its proposed examination of a specific aspect of Complexity as a practical management tool and that is the generic early warning signals that precede critical transitions leading to emergence, generic signals that are common across various complex systems.

2.2 Generic Early Warning Signals for Critical Transitions

Having provided an overview of the research’s foundational theory, Complexity as a practical management tool, its propositions relative to management studies, discussed its strengths and limitations, this section of the literature review now focuses on generic early warning signals for critical transitions.

Despite Levy's (1994) argument on the invalidity of long term forecasting more recent literature is nevertheless rich with discussion on generic early warning signals for critical transitions that permeate various complex systems, and since emergence is an outcome of a critical transition this potentially points to the near predictability of emergence and in turn the potential opportunity to ultimately influence it (Scheffer et al., 2009).

The theoretical basis of research on early warning signals for critical transitions in simple systems and the preliminary work from more complex systems suggest that similar generic early warning signals in both simple and highly complex systems may arise (Scheffer et al., 2009). The value of research in this area lies in its practical management application since the detection of early warning signals, if achieved early enough, could prepare management to take action against the transition or simply ready itself for one through soft interventions during chaos (Murphy, 1996). This subsection first discusses the phenomenon of emergence and the possibility of influencing it. It then provides an overview of critical transitions leading to emergence and discusses each of the generic early warning signals for critical transitions illustrating examples of their successful applications in real systems across various disciplines. Counter arguments in the form of limitations and criticism of the generic early warning literature are also presented.

2.2.1 The Phenomenon of Emergence

Based on the numerous examples cited in discussing the strengths and weaknesses of Complexity theory it is evident that the phenomenon of organizational emergence is central to the theory.

Tsoukas (1998) argued that if the traffic in the City of London were left unregulated it is very likely to eventually self-regulate, just as the traffic in Rome or Cairo does, ultimately leading to the emergence of traffic patterns, although they are not necessarily efficient. The same holds true when examining high crime areas of Los Angeles which nevertheless have their own kind of emergent order, the type of order managed by the underworld (Tsoukas,1998). Therefore, within disorder lies emergent organizational order. Such self-organized emergence is very much part of organizational reality.

The process of organizational emergence is best described through Thietart and Forgues's (1995) proposition 2, cited in section 2.1.3 of this document, which states that organizations shift between different dynamic states through a discrete bifurcation process:

"**Proposition 2**: Organizations move from one dynamic state to the other through a discrete bifurcation process.

- **Proposition 2a**: *An organization will always be in one of the following states: stable equilibrium, periodic equilibrium or chaos.*
- **Proposition 2b**: *A progressive and continuous change of the relationships between two or more organizational variables leads an organization, in a discrete manner, from a stable to a chaotic*

state via an intermediary periodic behaviour." (pp 25-26).

Going through the discrete bifurcation process in a qualitative fashion ultimately leads to the emergence of a new order. Additionally, Chiles, Meyer and Hench (2004) stressed that emergence is not only comprised of creation but of continuous recreation over a period of time affecting both forms and populations. Chiles, Meyer and Hench (2004) referred to creation as origin and recreation as transformation, and concluded that emergence and transformation are interrelated. Along this line of argument, Leifer (1989) described emergence as a transformative process and transformation as an emergent process.

2.2.2 Emergence and Fractals

Another property for organizational emergence is its potential fractal-like form, i.e. self-similarity in patterns at multiple levels of observation. The patterns are termed fractals or fractal-like as per Mandelbrot (1983) who coined the original term and developed a mathematical theory of roughness to describe the natural world known as fractal geometry. After all, according to Mandelbrot, clouds are not perfect spheres and mountains are not perfect cones. He suggested that fractal geometry is a better model for the natural world than conventional geometric notions that assume smoothness of the shapes under study. In the business world, Thietart and Forgues's (1995) proposition 5, cited in section 2.1.3 of this document, suggested that similar organizational structure patterns as well as process patterns could be identified at different organizational levels, such as the organizational, unit, group and individual levels:

“**Proposition 5**: When in a chaotic state, organizations, generally, have a fractal form.

- **Proposition 5a**: *When in a chaotic state, similar structure patterns are found at the organizational, unit, group and individual levels.*
- **Proposition 5b**: *When in a chaotic state, similar process patterns are found at the organizational, unit, group and individual levels.”* (p. 27).

Such process and structure patterns are therefore scale invariant, fractal-like. To illustrate, Levy (1994) suggested that stock prices exhibit similar patterns whether they are observed over one year span, daily or minute by minute. Levy (1994) also suggested that self-similar patterns of behavior could also be expected whether one is analyzing competition between different nations, between different firms, between different departments or between different individuals. Organizational emergence could therefore be as fractal-like as the fractals observed in mother nature, such as the patterns on ice crystals, coastlines, galaxy clusters or even broccoli which are self-similar when subjected to different levels of magnifications and scrutiny.

2.2.3 Influencing Emergence

There are clues to influencing organizational emergence in Thietart and Forgues’s (1995) proposition 3b, cited in section 2.1.3 of this document, which suggested that the impact of an incremental change could be predicted in the short term:

“**Proposition 3b**: *When in a chaotic state, ceteris paribus, the impact of an incremental change can be predicted in the very short term.”* (p. 26).

This implies a certain level of predictability despite the chaos and a way to potentially influence or temper chaos. It is therefore possible to influence change towards a desired short term outcome by identifying, creating and supporting factors that ultimately lead to organizational emergence while suppressing those that inhibit it (Alaa, 2009).

Literature shows that many scholars supported the approach for creating enabling conditions for the development of new organizational forms to facilitate organizational survival in ever-changing environments (e.g. Mitleton-Kelly, 2003; Alaa & Fitzgerald, 2004). Specifically, Murphy (1996) advocated soft intervention during chaos by stating that change has to first evolve within the organization; it should not be imposed from the outside although seeds could be laid to introduce change. The laying of such seeds leads to the stimulation of enabling conditions for emergence. Murphy (1996) also suggested that an ideal intervention should take place at the crisis point when an organization is overtaken by instability. To this end, Murphy (1996) advised that business practitioners should act quickly prior to reaching the bifurcation point so as to block events uncongenial to the organization from taking shape. Therefore, a meaningful intervention first requires the identification, creation and support of factors influencing organizational emergence.

The literature is rich with case studies pointing to the existence of such factors. To illustrate a few, Tetenbaum (1998) gave the example of the credit card company Visa. Although the company existed on the grounds of principle and purpose, it was nevertheless designed in an unconventional way which condoned experimentation for as long as a clear set of principles revolving around the company's desire to be profitable were adhered to. This allowed for the company's organic development as it grew. Tetenbaum (1998) also pointed out that some units at Sony were empowered to manage creativity and experimentation, to balance control and efficiency and the tensions associated with creativity and competition. Further, Tetenbaum (1998) also described how a Motorola executive stimulated unintentional emergent change by providing his management team with a broad vision void of any detailed planning thereby laying the seeds for brainstorming and self-organization. This is in line with Coleman's (1999) recommendation in which he stressed the importance of advocating "... organizational arrangements that do not inhibit evolutionary change and that accept discontinuous change in an environment as an entrepreneurial opportunity" (p. 38).

Therefore, influential factors such as trust, empowerment, balance, innovation and creativity, to name just a few, either exist or could be created and supported influencing organizational emergence. Alaa (2009) suggested that it is paramount to identify or derive such factors leading to organizational emergence in order to incorporate them in a framework for stimulating dynamics which encourage and improve organizational properties instead of relegating them to pure chance. However, prior to influencing emergence it first needs to be predicted or at least near predicted as the system approaches the bifurcation point. This brings the discussion to the generic early warning signals for critical transitions, transitions the outcome of which is emergence.

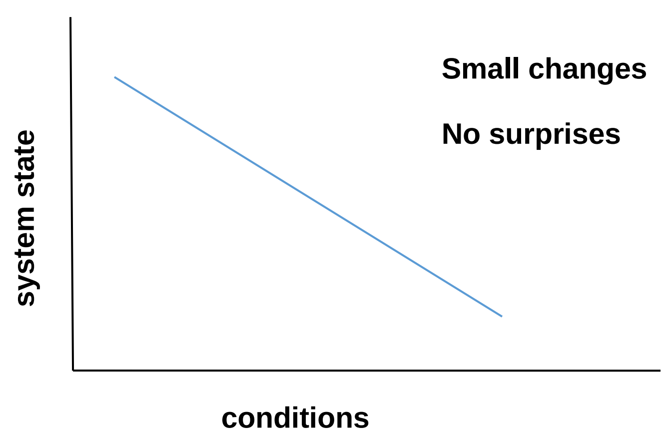
2.2.4 Critical Transitions Leading to Emergence

Emergence, be it organizational or natural, could be understood as the outcome of a critical transition in the system's state. Therefore, it is important to first define and discuss critical transitions.

According to the definitions in Table I-1 a critical transition is an “abrupt shift in the behavior of a system when certain parameters reach a threshold. Most pronounced example is a catastrophic bifurcation” (“Early Warning Signals Toolbox”, n.d.). The abrupt shift occurs at critical thresholds or so called tipping points (Scheffer et al., 2009). This definition is consistent with Thietart and Forgues’s (1995) proposition 2 as applied to organizations which states that organizations go through a discrete bifurcation process as they move from one dynamic state to another which leads to emergence. Current examples of critical transitions include government meltdowns as is the case with the 2010 Arab spring and stock market crashes as is the case with the 2008 economic downturn.

To illustrate, refer to Figure II-1 where small changes in conditions lead to unsurprising small changes in the system’s state. According to Scheffer et al. (2009) the changes are gradual, continuous and reversible. This is a linearly responding system and the transition here in the state variable cannot be described as critical as it is unsurprising, very much expected.

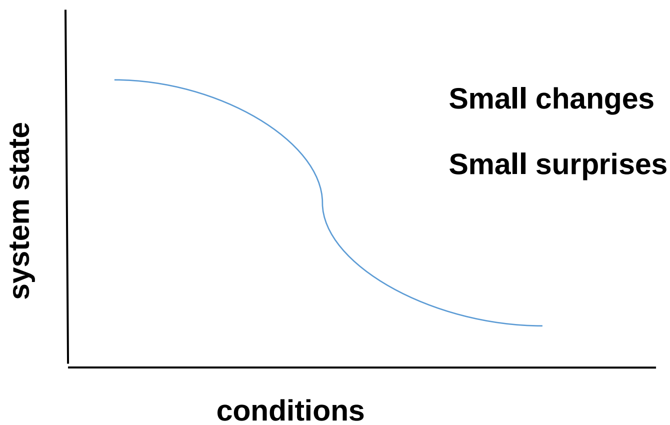
Figure II-1: Small Changes No Surprises



Source: Early Warning Signals Toolbox Website (http://www.early-warning-signals.org)

Figure II-2 is an example of a non-catastrophic bifurcation. It illustrates how small changes in the system lead to small surprises with disproportionally strong changes in the state of the system (Scheffer et al., 2009). It is suggested that when the old conditions are restored the system tips back to its original state. Therefore, the state of the system is continuous and reversible.

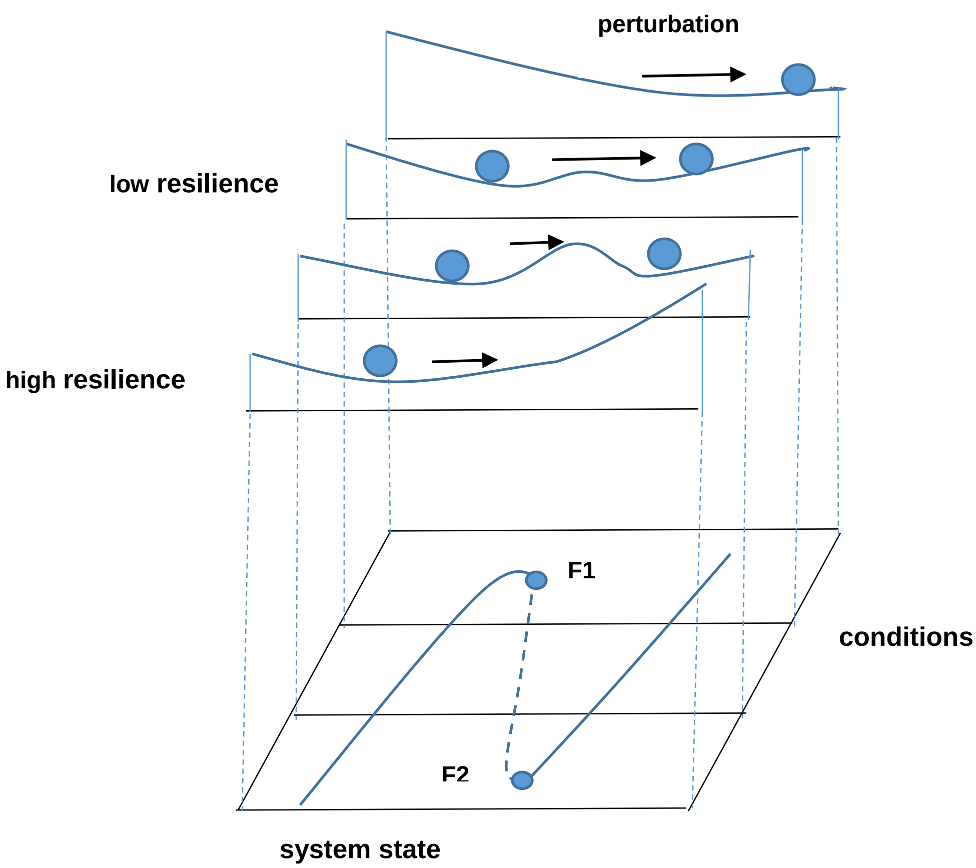
Figure II-2: Small Changes Small Surprises



Source: Early Warning Signals Toolbox Website (http://www.early-warning-signals.org)

According to Scheffer et al. (2009), Figure II-3 is an example of a critical transition in a catastrophic bifurcation. It illustrates that some system states have alternate stable states or alternate basins of attraction for any one condition. There could be in fact three equilibria for any one condition. These are represented in the two continuous branches in the graph and the dotted branch in the middle. If the system is not on the equilibria curves it will eventually move towards them, except for the middle dotted branch where the system will continue to move away from it until it reaches the continuous branches. The two continuous branches therefore represent stable basins of attraction, also known as the folded equilibrium curves, and the dotted curve in the middle represents the unstable border between them. This example is often referred to as fold catastrophe (Scheffer et al., 2009). Upon perturbing the system, the system state can therefore tip over from one stable state to another under the same conditions. The system's response to the perturbation is discontinuous and not easily reversible. This is the essence of critical transitions which correspond to catastrophic bifurcations where, according to the definitions in Table I-1, "the current state of a system disappears and the system is forced to move to an alternative state" ("Early Warning Signals Toolbox", n.d.). This occurs at certain thresholds in external conditions, specifically points F1 and F2, also known as bifurcation points. For example, if small perturbations move the conditions to the right of threshold F1 or to the left of threshold F2 positive feedback will trigger a catastrophic bifurcation to the one remaining alternate stable state. If conditions move to the left of threshold F1 or to the right of threshold F2 there could be a transition across the border of the basin of attraction to the alternate stable state. It should also be noted that if a system is highly stochastic then the strong perturbations could shift it across alternate stable states far from the vicinity of the bifurcation points F1 and F2 (Scheffer et al., 2012).

Figure II-3: Small Changes Big Surprises



Source: Early Warning Signals Toolbox Website (http://www.early-warning-signals.org)

Finally, although literature does not state this explicitly, it is worth clarifying, by tying this discussion to chaos theory and Complexity, that nearing the bifurcation point is consistent with the discussion on being at the edge of chaos after which the system bifurcates qualitatively to a new state(s). Similarly, perturbations affecting system state could be thought of as the resultant vector from the counter acting forces of stability and instability which could ultimately lead organizations to the edge of chaos. Therefore, the discussion on generic early warning signals for critical transitions is an attempt at mathematizing the edge of chaos.

It should also be noted that according to Scheffer et. al (2009) most generic early warning signals tend to arise when systems approach catastrophic (Figure II-3) or non-catastrophic thresholds (Figure II-2). The research now describes the generic early warning signals spanning various complex systems and illustrates examples on each.

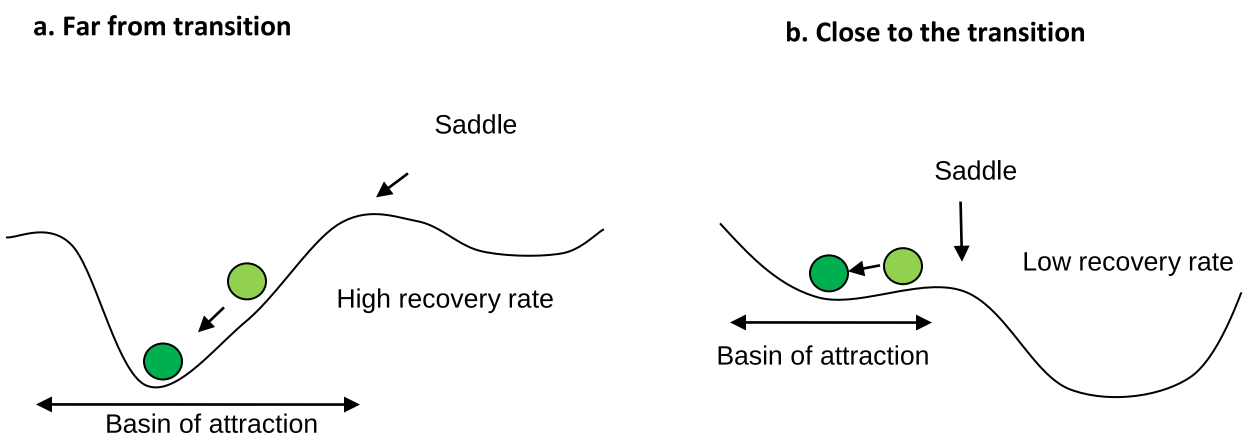
2.2.5 The Generic Early Warning Signals

Reviewed literature identifies three broad generic early warning signal categories, two temporal based and one spatial based. The first category incorporates critical slowing down and its symptoms, in the way of increased variance and increased autocorrelations. The second category incorporates signals associated with asymmetries in the stability landscape and the back and forth jumps across alternate basins of attraction. This includes skewness and flickering. The third category refers to spatial patterns as early warning signals. Despite the distinction of the signals into these three categories, it should be noted that the temporal based signals share many symptoms especially in terms of autocorrelations, skewness and variance in the time series of the state variable.

2.2.5.1 Critical Slowing Down and its Symptoms (increased variance and Autocorrelation)

Critical slowing down occurs when recovery rates from perturbations decrease as the system approaches a bifurcation (Scheffer et al., 2009). In Figure II-4(a) the ball, representing the state variable, in the basin of attraction has a high recovery rate when perturbed due to the steepness of the sides. This is a high resilience system. When the basin of attraction is more flattened as in Figure II-4(b), the ball has a lower recovery rate and is at higher risk of tipping over the saddle into the adjacent basin of attraction. This is a low resilience system. According to Veraart et al. (2012) the recovery rates reflect distance to a tipping point. Slowing down could be observed far from the bifurcation point with the recovery rate slowly decreasing to zero as critical transition is approached (Van Nes & Scheffer, 2007). It should be noted that, according to the definitions in the "Early Warning Signals Toolbox", the dominant eigenvalue approximates the recovery rate to equilibrium when the system is perturbed; the dominant eigenvalue is the "maximum factor that expresses how much linearized deviations from equilibrium diverge in time". This dominant eigenvalue becomes zero at the bifurcation point.

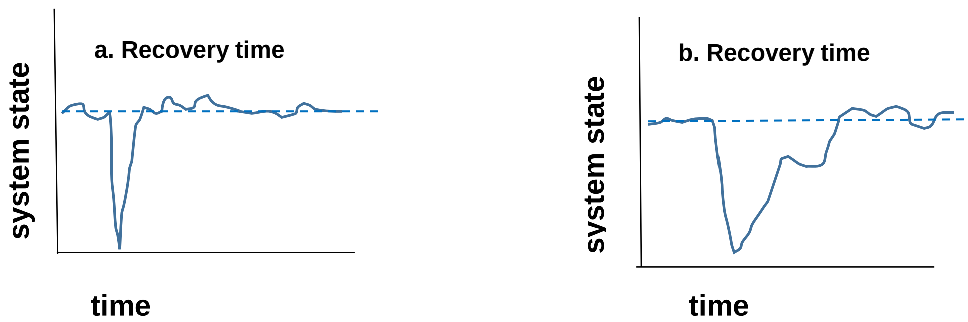
Figure II-4: Illustration of Critical Slowing Down



Source: Early Warning Signals Toolbox Website (http://www.early-warning-signals.org)

Figure II-5 illustrates critical slowing down by examining the recovery time from perturbations. Figure II-5(b) shows a longer recovery time than Figure II-5(a).

Figure II-5: Changes in Recovery Time from Perturbations



Source: Early Warning Signals Toolbox Website (http://www.early-warning-signals.org)

Critical slowing down has been identified in numerous controlled experiments. For example, a 1978 experimental study by Matsumoto and Kunisawa involved the observation of membrane potential changes, which is the difference in electric potential between the interior and the exterior of a biological cell. The changes were induced by current pulses in squid giant axons, nerve fibers which control part of the water jet propulsion system in squids. This allowed for the observation of transition in membrane potential from resting, where the potential is held at stable value, to time ordered states, in which the potential depends on time. At the transition point, specifically in the relaxation behavior, critical slowing down was observed. The authors also noted that the transition was discontinuous.

In a different controlled experiment by Tredicce et al. (2004), using semiconductor laser, it was shown that critical slowing down observed at the point of bifurcation leads to a dynamical hysteresis, i.e. the lagging of an effect behind its cause, which cannot be overcome by slowly adjusting control parameters through the bifurcation point.

It should be noted that critical slowing down is often accompanied with two symptoms and these are increased autocorrelation and increased variance in the state variable (Scheffer et al., 2009). These are discussed next.

2.2.5.1.1 Increase in Autocorrelation

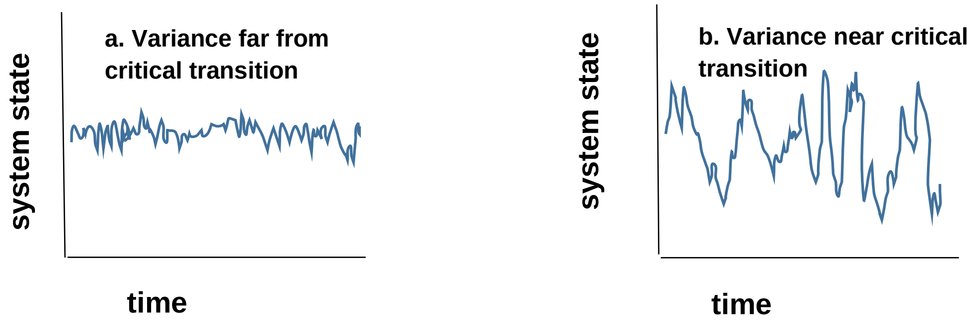
During critical slowing down, as a system nears transitions, the state of the system becomes increasingly similar to its past state (Scheffer et al., 2009). This increase in the memory of the system is quantified as an increase in lag-1 autocorrelation (Ives, 1995).

In a paper by Dakos et al. (2008) pertaining to climate research, it was shown that autocorrelation in the state variable increased prior to eight abrupt changes in past climate conditions. In business research, Lebaron (1992), upon examining different stock return series, showed that first degree autocorrelation was related to stock return volatility and since increased volatility was shown to be an early warning signal for the onset of a financial crash, as per Bates (1991), this renders autocorrelation an early warning signal in itself.

2.2.5.1.2 Increase in Variance

Prior to critical transition the variance of the state variable increases due to the accumulating impact of non-decaying shocks as the eigenvalue approaches zero (Carpenter & Brock, 2006). Figure II-6 illustrates the increase in variance over time as the system nears transition. In Figure II-6(b) the system is more volatile over time than in Figure II-6(a).

Figure II-6: Increase in Variance of the State Variable



Source: Early Warning Signals Toolbox Website (http://www.early-warning-signals.org)

Literature is rich with examples of increased variance preceding critical transitions. Hsieh et al. (2006) used 50 year-long larval fish surveys from the California Cooperative Oceanic Fisheries Investigations and compared the variability of exploited and unexploited fish stocks. Evidence was then provided to show that the temporal variability of exploited fish stocks was higher than that of the unexploited stocks. This increased variability amongst the exploited stocks was attributed to a truncation in the age structure which compromised the stocks' ability to mitigate environmental effects. A precautionary fisheries management approach was then suggested, one that not only focuses on viable biomass but also avoids age structure truncation so as to avoid catastrophic collapse in the stocks.

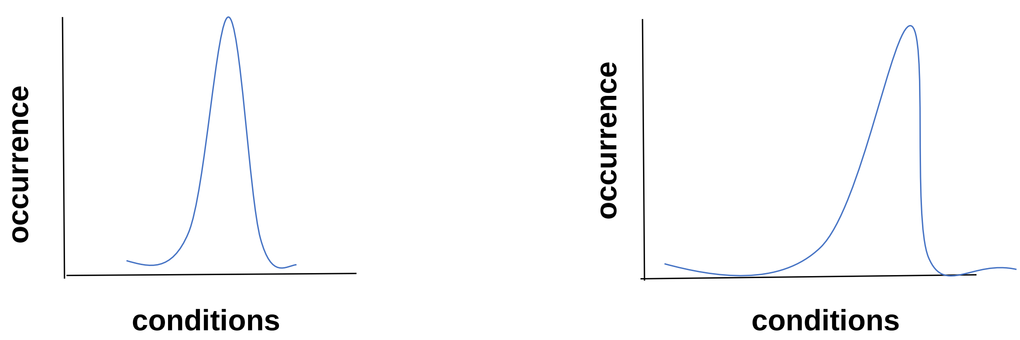
In their study of epileptic seizures, McSharry, Smith, and Tarassenko (2003) discovered that minutes prior to a seizure electrical signals recorded by an electroencephalography showed an increase in variance.

In the business world, specifically finance, it was shown that the spread between the value of call options and put options was a measure of volatility, the increase in which preceded the onset of financial events such as the 1987 crash (Bates, 1991).

2.2.5.2 Increase in Skewness and Flickering

Due to the asymmetry in the stability landscape as illustrated in Figure II-4(a) and II-4(b) the recovery rate is low, resulting in the system spending more time near the saddle which is the hump between the two basins of attraction representing the border between the two alternative states (Guttal & Jayaprakash, 2008). This results in skewing the distribution of the state variable as illustrated in Figure II-7. The figure shows a normal distribution (left graph) that skews to the left over time (right graph), as evident from the longer tail to the left.

Figure II-7: Increase in Skewness of the State Variable



Source: Early Warning Signals Toolbox (http://www.early-warning-signals.org)

According to Scheffer et al. (2009) flickering is another early warning signal that can be observed within the vicinity of catastrophic bifurcation. Flickering is the back and forth shift, triggered by stochastic forcing, between the basins of attractions, a bistable region just before a catastrophic bifurcation. Flickering is measured as increased variance and skewness in the distribution of the state variable, in addition to bimodality (i.e. a distribution with two modes) or even multimodality reflecting the alternative states (Scheffer et al., 2009). Sometimes a decrease in autocorrelation is also observed (Wang et al., 2012). The transient excursions to the vicinity of the alternative state ultimately shift the system to that stable state if the system perturbations persist.

There are many examples for flickering and skewness. In a study by Bakke et al. (2009) on rapid oceanic and atmospheric changes during the Younger Dryas cold period flickering, as in rapid alterations between cold and warm modes, was suggested to precede the abrupt end of the said period ultimately shifting to the warm mode. It was also suggested that the early part of the cold episode was relatively stable. The later part, closer to the bifurcation point, was characterized by flickering.

In medicine, based on data collected on five patients, Litt et al. (2001) observed that symptomless seizures were followed by energy bursts in the brain hours before clinical onset, a pattern that resembles flickering.

Finally, in a recent ecology paper by Wang et al. (2012) long term data was analyzed to show that flickering occurred 20 years prior to the critical transition of a Chinese lake to a dead eutrophic state deprived of oxygen due to algae growth.

2.2.5.3 Spatial Patterns as Early Warning Signals

Research into spatial patterns as early warning signals is based on the premise that systems may consist of coupled units that influence one another (Scheffer et al., 2009). This is true in the world of finance where performance in one stock can affect performance in another, or even in people's attitudes which could be affected by the attitudes of peers (Scheffer, Westley & Brock, 2003). This could lead to the rise of spatial patterns prior to a critical transition in the form of spatial coherence measured as increased cross-correlation (Shroeder, 1991). For example, in their study of ecosystems, Rietkerk, Dekker, de Ruiter, and van de Koppel (2004) identified self-organized spatial vegetation patterns (or patchiness) as early warning signals for approaching the vicinity of a catastrophic bifurcation in which all vegetation is lost. Interestingly, in their study of asthma attacks, Venegas et al. (2005) argued that bronchoconstriction results in patchiness in lung ventilation, one that is similar to spatial pattern formation preceding collapsing desert vegetation. Through the analysis of experimental data and undertaking computational models it was shown that such patchiness is a prelude to respiratory failure. Hence the existence of comparable self-organized spatial patterns as early warning signals in various complex systems.

In finance, Hong and Stein (2003) identified patterns in option prices and increased correlations across the returns of various stocks as spatial pattern indicators of falling markets.

2.2.6 Limitations of the Generic Early Warning Signals

Research undertaken in identifying and validating early warning signals for critical transitions is not without its limitations and criticism. Scheffer et al. (2009) recognize the challenges associated with identifying early warning signals in natural complex systems, which incorporate much noise and external unpredictable factors. This complicates the analysis of natural systems. That said, even controlled perturbation experiments or simple models, such as Matsumoto and Kunisawa’s 1978 neuron study and Tredicce’s et al. (2004) laser study, discussed earlier in illustrating critical slowing down, might not reveal the complete and natural picture rendering research findings questionable. Real systems such as the financial markets are notoriously difficult to model as they are buffeted by unpredictable political and social perturbations, even ecological perturbations as in the argument that the weather is chaotic, crop yield is therefore unpredictable, consequently crop prices and the markets as a whole are unpredictable and cannot be modeled accurately.

The utility of the early warning signals is also in question. For example, while Bates (1991) argues that measures of increased trade volatility precede some financial events, the author also argues that volatility calm is sometimes observed prior to abrupt changes. Therefore, it is unclear, from a management practice viewpoint, whether a watchful eye should be kept on increased volatility or its calm opposite. Since first degree autocorrelation was shown to be related to trade volatility, as per Lebaron (1992), then the same criticism holds true in questioning the utility of autocorrelation as an early warning signal. Moreover, Scheffer et al. (2009) argue that sometimes lead and lag relationships in financial data tend to be erratic which further compromises the calculation of autocorrelations and impairs their viability as a warning signal. In addition, despite the numerous examples cited earlier on spatial patterns as early warning signals, Scheffer et al. (2009) state that there is no one size fits all spatial pattern in foreseeing the critical transitions, which raises the question whether the patterns discussed in the various cases were a matter of conveniently fitting selective observed patterns into the theory.

The threat of false positives and false negatives in identifying the signals is also of concern. False negatives are situations where transitions are observed without being preceded by an early warning signal, possibly due to the lack of a gradual approach to a threshold or when a fast or extreme change in external conditions occurs or even perhaps due to the unavailability of long time series data (Scheffer et al., 2009). For example, Scheffer et al. (2012) acknowledge that critical slowing down might not always point to a tipping point, as in the example of declining temperature in winter only to rise again in the summer. They argue that critical slowing down should be viewed as a broad spectrum indicator to be complimented by additional information on the fundamental changes in a system. Similarly, false positives could occur. The identification of early warning signals when the system is in fact not approaching a bifurcation could be due to mere chance, confounding trends within the system or the external environment (Scheffer et al., 2009).

Prediction of critical transitions remains elusive as systems may show very little change prior to the tipping point (Scheffer et al., 2009). Modeling of complex systems may not be accurate enough to predict the tipping points. Boerlijst, Oudman and de Roos (2013) showed that the early warning signals for the catastrophic collapse in simple ecological models were in fact silent. They argued that a detailed mathematical understanding of the approaching bifurcation is required to make the prediction and that such an understanding can only be recognized in retrospect. This is comparable to the argument made earlier on managing organizations at the edge of chaos. Managers might be reluctant to take their organizations to the edge of chaos when it remains unclear where the edge is until after the fact when it is too late for anything other than regret (MacIntosh & MacLean, 1999).

Despite the widespread application of generic early warning signals in various disciplines some gaps and some questions remain. For example, no applications were identified in the field of management as most business applications are finance related. There is also a deficiency in the thorough examination of any fractal-like characteristics for emergence. If emergence could be of a fractal-like nature, self-similar at multiple levels in terms of structural and process patterns, as per Levy (1994) and Thietart and Forgues (1995), then it is logical to test the hypothesis that this fractal-like characteristic of emergence is a generic early warning signal in and of itself. After all, if emergent patterns detected at lower dimensions are telling of what is to come at higher dimensions then this fractal-like characteristic of emergence could be viewed as an early warning signal.

2.2.7 The Generic Early Warning Signals: A Summary

In summary, as per Thietart and Forguies (1995) organizations could be viewed as complex adaptive systems capable of bifurcating to new states with fractal-like forms. This is the essence of emergence, the outcome of critical transitions for which generic early warning signals could exist (Scheffer et al., 2009). Table II-1 summarizes the generic early warning signals for critical transitions.

Table II-1: Generic Early Warning Signals for Critical Transitions: A summary

Signal	Description	References
Critical slowing down	Slow rate of recovery from perturbation.	(Scheffer et al., 2009; Veraart et al., 2012; Tredicce et al., 2004; Matsumoto & Kunisawa, 1978; Van Nes & Scheffer, 2007)
Flickering	The back and forth shift, triggered by stochastic forcing, between the basins of attractions, a bistable region just before a catastrophic bifurcation.	(Litt et al., 2001; Wang et al., 2012; Scheffer et al., 2009; Bakke et al., 2009)
Increase in variance	Prior to critical transition the variance of the state variable increases due to the accumulating impact of non-decaying shocks.	(Carpenter & Brock, 2006; Bates, 1991; Hsieh et al., 2006; McSharry, Smith, & Tarassenko, 2003)
Increase in skewness	Due to asymmetry in the stability landscape, recovery rate is low resulting in the system spending more time near the saddle which is the hump between the two basins of attraction representing the border between the two alternative states.	(Guttal & Jayaprakash, 2008).
Increase in autocorrelation	The state of the system increasingly resembles its previous state.	(Ives, 1995; Lebaron, 1992; Dakos et al., 2008)
Increase in spatial correlation	Systems may consist of coupled units that influence one another.	(Scheffer, Westley & Brock, 2003; Shroeder, 1991; Hong & Stein, 2003; Rietkerk, Dekker, de Ruiter, & van de Koppel, 2004; Venegas et al., 2005)

2.3 Program Student Withdrawal Problem

Having discussed Complexity in general and more specifically the generic early warning signals for critical transitions, this section first discusses the program student withdrawal problem and past research aimed at understanding program withdrawals. It then illustrates the gap in literature by showing that none of the past research have adopted a Complexity perspective, generally, or attempted to understand withdrawals by utilizing the generic early warning signals for critical transitions, specifically. Finally, the section proposes a Complexity perspective for the student program withdrawal problem at distance universities. It suggests that the problem provides an opportunity for applying and assessing the utility of the signals as a predictive management tool in a new business field, i.e. program withdrawal management, and that investigating the generic early warning signals prior to a student's withdrawal from a program could give a new perspective on the withdrawal problem, the Complexity perspective.

2.3.1 Program Withdrawal at Distance Universities

According to Wojciechowski and Palmer (2005) and Kember (1995), the program withdrawal rate amongst distance university students is higher than the program withdrawal rate at face-to-face conventional universities. This program withdrawal problem presents an existential crisis for distance universities especially since, in some jurisdictions, such as the United Kingdom, public funding is dependent on the volume of students who persist and complete their courses (Simpson, 2005). There are also significant financial costs associated with withdrawals, as universities would have already invested a substantial amount of money into their students' education through both the resources provided to them and the time spent on teaching them, money which could have been better spent on eventual program completers (McCubbin, 2003). Program withdrawal rates are also deemed as one indicator of teaching quality, (DEST, 2005), and the dropout problem therefore needs to be addressed. It should be noted that what is deemed to be one problem at one institution is not necessarily a problem for another. For example, a study conducted at the United Kingdom's Open University indicates that some students intentionally abandon their distance studies, thereby using the distance university as a stepping stone for admission into an academic program elsewhere (Ashby, 2004). Therefore, program withdrawal, while a problem for the distance university, is the type of a problem that cannot always be addressed since program withdrawal could be an asset to the student's long term objectives.

2.3.2 Understanding Program Student Withdrawal

Program withdrawal studies have been conducted at various distance universities such as Deakin University in Australia (Brown, 1996), the Open University in the United Kingdom (Ashby, 2004), Korea National Open University (Shin & Kin, 1999), and Athabasca University in Canada (Powell, 1991), where different factors and relationships amongst one another have been found to influence student completion and withdrawal rates. Additionally, according to Woodley (2004), the most important models used by distance researchers to predict student withdrawal and identify intervention points to reduce the withdrawal rate are Sweet's model (Sweet, 1983), and Kember's model (Kember, 1995). However, much earlier in 1975, Vincent Tinto developed what eventually became the most widely cited and influential model of program withdrawal studies used by distance researchers. This dominant model is known as the Vincent Tinto's Student Integration Model (SIM) of Attrition (Woodley, 2004).

According to his 1975 paper, Tinto's SIM is a longitudinal model that explains the various processes influencing a student's decision to withdraw and how the said processes interact to produce the attrition. Tinto identified the different types of leaving behavior which include academic failure, voluntary withdrawal, permanent dropout, temporary dropout and transfer. Building upon Durkheim's theory of suicide, which predicts the probability of committing suicide based on a person's integration into society, Tinto (1975) suggested that the willful withdrawal of one's existence from higher education is also due to the lack of a student's integration into university life. In other words, the students' withdrawal decision is dependent on their interaction with the social and academic environment of their institution, in addition to individual characteristics which include the student's commitment to degree attainment at the university, pre-college experience and family background. Tinto (1975) emphasized that program withdrawal is the consequence of longitudinal processes of interactions between the students and the universities they attend. Tinto (1975) also stressed the importance of a student's academic integration and suggested that students view that integration through a combination of grade performance and intellectual development. In fact, gaining knowledge and educational development seems to be of central importance to program persistors.

Within the context of distance learning and in reference to Tinto's model, Kember (1995) argued that more emphasis should be placed on the external environment, which includes family support and the student's career, than internal factors such as social integration into the institution's culture. Similarly, McGivney (2004) stated that distance students are typically adults with usually full time jobs and family responsibilities. For these students, the decision to withdraw from a program of study is dependent on such factors as time management, difficulty contacting faculty, unrealistic expectations and poor guidance and support from faculty (Ostman & Wagner, 1987).

According to Woodley (2004) a limitation of program withdrawal research and all the developed models, including Tinto's 1975 SIM, is that they either rely on survey data to identify the underlying reasons behind a student's withdrawal decision, which ultimately suffer from social desirability bias, or that they look at student progress in relation to key variables for dropping out to make predictions. A new perspective could add new value to the research. The next section proposes a Complexity perspective for managing program withdrawal through the identification of the generic early warning signals for critical transitions prior to a student's withdrawal from a program of study.

2.3.3 Student Program Withdrawal: A Complexity perspective

From a Complexity perspective, this section proposes that a student could be viewed as a self-organizing complex adaptive system, subject to perturbations, taking it to the edge of chaos, and leading to the emergence of a new state through a fixed point attractor or a periodic attractor.

2.3.3.1 Rationale for Complexity as a Foundational Theory

There are numerous theories of macro-organizational behavior (Vibert, 2004). As such, the distance student's program withdrawal problem could be investigated through different theoretical lenses. The institutional theory for example inverts the assumption that organizations are different and investigates why organizations are the same (Vibert, 2004). This leads to investigating the distance student's program withdrawal problem by identifying commonalities among distance education universities and the drivers behind conformity, such as social pressures, policies of professional associations, government regulations and social acceptance. In short, commonalities in structures, patterns and strategies that could be behind the common problem of student withdrawal.

Another possible theoretical lens is transaction cost theory. According to this theory the uncertainty in future outcomes makes it costly to enforce a contract because the actors in the contract tend to behave opportunistically (Vibert, 2004). This indeed describes the dynamics between students who withdraw from their programs of study and the institution they study at. This could warrant transaction cost theory as a theoretical lens for the distance student's program withdrawal problem.

Another perspective is resource-based theory. It suggests that organizations possess internal resources that allow them to succeed (Vibert, 2004). In the case of the Canadian Distance University studied in this research, the internal competitive advantage lies in its ability to allow students to start courses at the beginning of every month. It is unclear how this impacts its program withdrawal rate in relation to other institutions which could warrant an investigation through the resource-based lens.

The list of potential theoretical lenses therefore offers choice. Nevertheless, the primary thrust behind this research is the assessment of the generic early warning signals for critical transitions and presenting an original contribution by investigating whether self-similarity is a signal in its own right. The generic early warning signals are sourced from systems science which falls under the banner of Complexity. Therefore, Complexity remains the foundational theory in researching the distance student's program withdrawal problem as discussed in detail in Section 2.1.

2.3.3.2 Program Student Withdrawal Population as a Complex Adaptive System

Tsoukas (1998) referred to the traffic in the streets of London as a complex system. In the absence of a traffic officer each driver is an independent agent undertaking decision making based on interactions with other drivers and the external environment. Each driver takes into account personal objectives, such as reaching a destination, distance from other cars and speed of other cars. This traffic system ultimately self-regulates leading to the emergence of traffic patterns. Similarly, among the program student withdrawal population each student assesses, as an independent agent, his or her position in the program of study factoring in system perturbations such as the student's integration and interaction with the social and academic environment of the academic institution (Tinto, 1975). This could ultimately lead to the emergence of a new status for the student, with a program withdrawal status being one of the possible outcomes. Further discussion on the student as a self-organizing system, along with potential system perturbations and possible outcomes is presented in the next sections.

2.3.3.3 A Student as a Self-Organizing System

There is much literature that supports the proposition for viewing a student as a self-organizing system. This stems from the student's ability to make choices as an independent agent within the student population based on individual preferences and interactions with the environment. For example, in terms of applying to an academic institution, literature focused on non-traditional adult student populations suggests that the availability of an academic program matching an adult student's interest (Broekemier, 2002) and the conveniences in terms of time and place (Levine & Cureton, 1998) are the primary drivers behind a student's selection of an academic institution. More specifically, Sandeen (2008) suggested that the underlying reason behind that interest is the acquisition of skill sets for career development either in the way of career advancement or changing employers. Other cited factors included program quality (Levine & Cureton, 1998), the reputation of the institution, program cost and financing options (Broekemier, 2002), and program delivery mode (Sandeen, 2008). Finally, Digilio (1998, as cited in Broekmeier, 2002) indicated that adult students return to school to escape boredom and to network with others. Therefore, there are a variety of factors that a student entertains as he or she self-organizes a decision on applying to a program.

Upon applying to university, some students withdraw from their program of study through a non-start behavior of their own choice as well, i.e. never enrolling in a single course, thereby exhibiting the characteristic of a self-organizing system. For example, Drekmeier and Tilghman (2010) suggested that one in five non-starts who planned to attend a university ultimately chose a competitor. This was followed by those who questioned the suitability of the university to their particular needs in terms of location, course schedule and delivery format.

Moreover, among those students who start a course, Wylie (2004) suggested that attrition among non-traditional students is the end result of their re-evaluation of external factors that impact them, including responsibilities towards family, career matters and hours of employment. This re-evaluation is also a characteristic of self-organizing behavior.

2.3.3.4 Student as a System Subject to Perturbations

There is much evidence in literature that students are subject to the paradoxical forces of change and stability. Students withdraw from their program of study due to perturbations caused by external factors. For example, Drekmeier and Tilghman (2010) suggested that students withdraw from their program of study due to changes in external circumstances, such as changes in career or family situation, in addition to financial circumstances which could counteract the stabilizing forces of persistence. Interestingly, their findings confirmed Bean and Metzner's (1985) and Kember's (1995) research which showed that the non-traditional student population is influenced by external factors as opposed to variables pertaining to social integration which usually tend to affect attrition among traditional students. Kerka (1989) agreed, arguing that external factors diminish the quest for education into a mere secondary activity among non-traditional students. The perturbations have an implication on the outcome in the form of the student's final status in the program of study. This is consistent with the Complexity perspective discussed in Section 2.1 and Section 2.2 which suggested that, upon perturbing a system, the system state can tip over from one stable state to another (Scheffer et al., 2009).

2.3.3.5 The Student's Final State

Having provided supporting literature on self-organization and perturbations as applied to student withdrawal, it could be proposed, from a Complexity perspective, that a student is essentially an organization of one person and, as per Thietart and Forgues's 1995 propositions, could be regarded as a complex adaptive system that self-organizes through feedback loops. This one student organization is subject to external and internal perturbations of all sorts, such as financial challenges, personal challenges, academic challenges and others (Wylie, 2004; Garland, 1993; Parker, 1999), that bring it to the edge of chaos and eventually through a critical transition the outcome of which could be the emergence of one of three possible final states (Serge, 2005):

- An inactive student status or program withdrawal status;
- A persistent active student status; and
- A stop-out status, i.e. temporarily exiting and then re-enrolling in the respective program of study.

2.3.3.6 Final Student Status Attractor Types

By matching the student's final status with attractor types as discussed in Complexity (e.g. Butler, 1990), it is possible to arrive at the following conclusions:

- The emergence of an inactive student status (program withdrawal status) could be regarded as a fixed point attractor according to Complexity. After all, program withdrawal is an alternate stable state.
- The persistent active student status, another fixed point attractor, is another stable state reflecting the student's continued determination to persist in his or her program of study despite facing perturbations.
- Students who graduate transition from the student state to the alternate graduate stable state, which is another fixed point attractor.
- Other students might stop-out, i.e. temporarily exit a program only to re-enrol at a later date. These students are described in Tinto's 1975 paper as temporary dropouts. Their behavior reflects a periodic attractor, as described in Complexity, as they alternate between an inactive student state and an active student state.

Adopting such a Complexity perspective is consistent with Thietart and Forgues's (1995) proposition 2a which indicates that an organization will always be in a stable equilibrium, periodic equilibrium or in a chaotic state. Table II-2 summarizes the various student statuses and attractor types as proposed for this dissertation.

Table II-2: Student Status and Attractor Type

Student Status	Definition	Final State	Attractor Type
Persistent Active Student	Student who persists in a program of study	Persistent student state	Fixed point attractor
Inactive student (program withdrawal)	Student who exits a program of study	Dropout state	Fixed point attractor
Graduate	Student who transitions from student status to graduate status upon completing a program of study	Graduate state	Fixed point attractor
Stop-out	Student who dropouts and re-enrols at a later date	Oscillating between a dropout state and a student state	Periodic attractor

2.3.4 Program Student Withdrawal: A summary and concluding remarks

The program student withdrawal problem is of concern to distance universities given its financial costs (McCubbin, 2003) and impact on funding (Simpson, 2005). All of the program withdrawal studies undertaken at other distance universities (e.g. Brown 1996; Ashby, 2004; Shin & Kin, 1999, Powell, 1991) rely on survey research or the tracking of student progress in relation to key variables. None have adopted a Complexity perspective or have attempted to investigate any of the generic early warning signals prior to the student's transition to a dropout status. There is an opportunity to regard a student as a self-organizing complex adaptive system (e.g. Broekemier, 2002; Sandeen, 2008; Levine & Cureton, 1998; Wylie, 2004), subject to perturbations (e.g. Kerka, 1989; Drekmeier & Tilghman, 2010), taking it to the edge of chaos, and leading to the emergence of a new state through a fixed point attractor or a periodic attractor, a perspective consistent with Complexity (Butler, 1990). This is particularly important because within the cited research it has already been acknowledged that individual choices to withdraw from a program are many and varied, but often participants in follow-up studies identify personal characteristics or life circumstances rather than institutional factors that university administration can act on (Garland, 1993; Parker, 1999). Moreover, studies of attrition for on-campus programming place a heavy emphasis on demographics and student engagement but fail to link research findings to institutional practice (Tinto, 2007). Assumptions about the autonomous self-directed adult distance learner have been challenged with calls made for early counseling, creation of learning communities with satisfactory interactions and the creation of opportunities for learning skills development (Rovai, 2003). Although findings from literature may help inform university administration in their strategic planning to manage the program student withdrawal problem, none of the reviewed literature, however, adopts the proposed Complexity perspective.

Having supported the proposition of students as complex adaptive systems that self-organize, face perturbations, and emerge in new states consistent with fixed point attractors and periodic attractors, the examination of generic early warning signals for student transition from an active student status to an inactive status, through a Complexity lens, could therefore be a valid and an original approach to identifying management opportunities. Specifically, the identification of intervention points that support student relationship management consistent with Murphy's (1996) advocating of soft interventions during chaos.

CHAPTER III: METHODOLOGY

Scheffer at al. (2009) submit that the application of generic early warning signals for critical transitions is still in its infancy. They state, “more work is needed to find out how robust these signals are in situations of which spatial complexity, chaos and stochastic perturbations govern the dynamics” (p. 57). This methodology section with its intensive case study research approach heeded the call by assessing the utility of generic early warning signals for critical transitions as a predictive management tool, specifically in the management of undergraduate program student withdrawal. This was accomplished through the investigation of generic early warning signals for critical transitions from an active student status to an inactive student status, i.e. program withdrawal, at a Canadian Distance University. This Complexity perspective could help inform university administrators in managing the program student’s withdrawal problem and in identifying intervention points.

3.1 Intensive Case Study Rationale

The form and nature of research questions often drive the choice of a research strategy. To this end, Yin (2009) tabulated the relevant situations for various research strategies and argued that the “how and why” research questions are best addressed through experiment, history and case study. The shortfall of experiment, he stated, is that it requires controls of behavioral events as evident in some of the simulation and computer modelling approaches mentioned in Chapter II when discussing some of the examples for the generic early warning signals. Moreover, Yin (2009) suggested that case studies rely on the same techniques as history, however, they have advantages not typically present in the historian’s repertoire and these are direct observation and systematic interviewing. Flyvbjerg (2001) argued that small sample qualitative research is often at the forefront of theoretical development and case studies, as small sample size research may serve as a source of both theory building and testing. Flyvbjerg (2001) also stated that case studies are useful for testing the scope of hypotheses, as a single case has the potential to refute or further confirm a hypothesis, such as the discovery of a black swan which refutes the hypothesis that all swans are white. Indeed, theory testing and theory building or extension was the intention in addressing the proposed primary and secondary research questions. Therefore, the research approach followed in the tradition of the intensive case study research where a case was studied holistically and intensively in its proper context to produce a thick description of the workings and unique nature of the case (Eriksson & Kovalainen, 2008). This was a path already undertaken by many researchers of early warning signals in multidisciplinary fields discussed in the review of relevant literature. It was the objective of this research to assess the generic early warning signals by intensively examining a case study to determine "how" and "why" a state variable transitions from one state to another and whether the findings were reliable by having the analysis incorporate a control group. This was consistent with Flyvbjerg's (2001) testing rationale. If the responses to the "how" and "why" were consistent with the presence or absence of generic early warning signals then this served as a confirmation or a critique of existing literature. Assessing whether the emergence of a program withdrawal status was self-similar at the program level and the course level also extends knowledge by identifying or refuting any self-similarities as an additional early warning signal. This was also consistent with Flyvbjerg's (2001) theoretical development and extension of theory through hypothesis testing. It should be noted that the research used the term ‘self-similar’ instead of ‘fractal-like’. This is because the research was focused on investigating the emergence of a student withdrawal status only at two levels of observation, the program level and the course level, as opposed to a larger or even an infinite number of levels for which the term fractal-like is more suited.

3.2 The Proposed Intensive Case Study

According to Eriksson and Kovalainen (2008), intensive case study research focuses on a unique case and examines it from a classical qualitative and interpretive perspective. While it is true that case studies have different definitions, one definition compiled from various sources (e.g. Stone, 1978; Benbasat, 1984; Bonoma, 1985 and Kaplan, 1985) in Benbasat et al. (1987, p.370), stands out. It states:

“*A case study examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities (people, groups or organizations). The boundaries of the phenomenon are not clearly evident at the outset of the research and no experimental control or manipulation is used.”*

The assessment of generic early warning signals for critical transitions as a practical management tool and whether the emergence of a program withdrawal status was of a self-similar nature could benefit from the case study approach and the understanding of phenomenon in its natural setting as opposed to undertaking experiments through artificial simulations. The phenomenon referred to here is that of program student withdrawal behavior at a unique non-traditional distance education Canadian institution with a substantial population of adult learners and where, according to its website, undergraduate students can enrol in undergraduate individualized study courses at the beginning of any month and complete them at their own pace.

Eriksson and Kovalainen (2008) submit that in the methodological point of view case studies are traditionally identified with the qualitative research tradition, such as focus groups and key informant interviews, which are different from the quantitative traditions, such as fielding surveys and undertaking quantitative data analysis, which aim to produce generalizable results. However, despite the qualitative spirit of case study research they suggest that quantitative data, generated through surveys or extracted from databases, could also be used to construct the case. In other words, they suggest that case study research should be understood as a research approach or strategy rather than a method. In the spirit of Eriksson and Kovalainen's (2008) argument the case study research included a mathematical analysis of the student database at a Canadian Distance University by undertaking calculations on the grade, course completion status and course duration variables of students who faced perturbations or program challenges, failed two courses and withdrew from their study programs to test whether they exhibited the generic early warning signals prior to transitioning to the program withdrawal status. The incidences of the signals were compared against those present among a control group of graduates, students who faced challenges by failing two courses as well but ultimately persisted and graduated.

An investigation into the presence, or lack thereof, of the generic early warning signals prior to the critical transitions at the student's program level, and identifying whether the emergence of a program withdrawal status was self-similar at the course level, was accomplished through the undertaking of data analysis on this natural complex system, the student. This approach offered a different perspective from other viable approaches undertaken by other Complexity researchers in their case studies, such as undertaking artificial simulations which do not always reflect the natural world. Similarly, undertaking a controlled perturbation experiment was not viable as it was both unrealistic and unethical to subject students to perturbations that could drive them to the edge of chaos, and possibly compel them to withdraw from their program of study.

With the research's emphasis on a quantitative methodology within the larger context of an intensive case study research approach, the philosophical underpinning of the study incorporated an epistemology of positivism which assumed that reality constituted of observable material (Eriksson & Kovalainen, 2008). In other words, the study assumed that the generic early warning signals were observable within the student database, and mathematics was the method for identifying the incidences of the signals. Another philosophical underpinning was the ontology of objectivism as the existence of the generic early warning signals was analyzed within the objective reality of hard core data present in the student database. The study's mathematically calculated findings were therefore based on the positivist interpretation of the objective reality of the student database. It should be noted, however, that the positivist approach was limited as it excluded the unquantifiable factors that might have led to the student's program withdrawal, such as emotional factors or health factors, which are better understood through a qualitative interpretivist perspective. Furthermore, the researcher was an employee of the institution under study. The objective reality of the student database and the interpretation of the quantitative data could have been compromised through the researcher's own subjective experience at the institution.

Finally, it should be clarified that, according to Eriksson and Kovalainen (2008), despite the qualitative spirit of a case study, quantitative data, as in the proposed mathematical analysis of the student database, can be undertaken because a case study is a research approach, or a strategy, and not a method. To this end, while quantitative results could be generalized to the case, the case remained a case of one whose results were not necessarily generalizable to other cases, hence the qualitative spirit despite the quantitative heart.

3.3 Description of Research Site: Canadian Distance University

According to its website, the Canadian Distance University offers 55 undergraduate and graduate programs through online and distance courses to students in Canada and across the world. The University also offers some traditional face-to-face courses onsite or at the site of partner institutions and allows students to challenge courses for credit. Most of the University's programs are open-ended giving students as much time as they need to complete their studies. This is largely due to its offering of online individualized study courses which allow students up to six months to complete a three-credit course and up to twelve months to complete a six-credit course through self-paced learning. Students are also given the option to purchase up to three two-month extensions if required. Students register and pay fees by the tenth of the month to start courses on the first of the following month. Course load at any one time is at the discretion of the student. The University developed program plans to help students track the courses completed and those that are still to come. In support of their online independent studies, students have access to a tutor also known as an academic expert, counselling services, an online library for information and guidance, E-Lab for tools and resources, a write site to assist in developing writing skills, and math site to build quantitative skills. Students have access to various financial support options. They also have access to a transfer credit office that evaluates transfer credits for individual courses, blocks of courses, as is the case with the block transfer of diplomas or certificates earned at other colleges, in addition to the assessment and recognition of experiential learning.

The Canadian Distance University is part of the Canadian Virtual University consortium which is a Canadian network of online and distance education universities. According to its website as at 2018, the Canadian Virtual University includes the University of New Brunswick, Royal Roads University, Athabasca University, University of Manitoba, Laurentian University, Thompson Rivers University, Carleton University, Mount Royal University, Memorial University of Newfoundland, Royal Military College of Canada and Universite TELUQ. All of these institutions are public, accredited, degree granting universities and given their specialty in online and distance education, their environments are comparable to that of the Canadian Distance University. Therefore, even though the research focuses on the Canadian Distance University the findings would be of relevance to other institutions in the Canadian Virtual University consortium, as well as other non-member distance universities who share an environment comparable to that of the Canadian Distance University.

3.4 Limitations of the Proposed Intensive Case Study

Although there was admittedly no clear bifurcation diagram reflecting the students' different stable states and tipping points for the various environmental conditions they might face, Scheffer et al. (2009) suggest that most early warning signals could apply to different types of thresholds be it catastrophic or non-catastrophic bifurcations, in addition to cyclic and chaotic systems. The signals are argued to be "indicators of proximity to a broad class of thresholds, where small forces can cause major changes in the state of a complex system" (Scheffer et al., 2009, p.58). Hence the validity of the investigation into the generic early warning signals leading to the inactive student status.

A limitation of the study, however, was that the spatial correlation generic early warning signal was not measurable because most courses at the Canadian Distance University are of a rolling individualized study nature. In other words, the courses start on the first of every month on an individualized basis and not on a student cohort basis. Therefore, it was not possible to spatially correlate student grades and identify how students influence one another due to the absence of a student cohort. Such limitations were acknowledged in the discussion section. Nevertheless, it is worth noting that Dr. Marten Scheffer of Wageningen University, an authority on generic early warning signals, expressed support for undertaking research in the proposed case study (personal communication, October 22, 2012).

As with any case study the findings were limited to the one case, i.e. the Canadian Distance University. While the results of data analysis were generalizable to the University in the statistical sense, they were not, however, necessarily representative of other universities. This case study therefore should be considered, despite the mathematical analysis, as a qualitative contribution to the academic debate on generic early warning signals.

Finally, the researcher was an employee at the Canadian Distance University which could have in turn led to bias during the data interpretation phase, such as a psychological need to show that the generic early warning signals were of practical utility to the employer by inadvertently overanalyzing the data or placing a positive spin on data findings. The researcher was cognizant of the need for reflexivity and has gone through the process of reflection on the research by examining oneself and the research relationship. The researcher's conceptual baggage of preconceptions and assumptions based on his personal experiences at the University could have influenced research analysis, interpretation of findings and word choice during reporting. This remained a limitation of the research. Nevertheless, the minimization of any bias was facilitated by the presence of a supervisory committee and external examiners, in addition to a Research Ethics Board that required all research involving human subjects to go through a detailed ethics application. Not to mention the researcher's own work supervisor who expected objectivity in the analysis if the findings were ever to be of practical use to the University.

3.5 Methodology for the Mathematical Analysis of the Student Database

3.5.1 A Description of the Student Database

The Canadian Distance Education University had a student database. Data on the program withdrawal students was collected from the database once approval was obtained from the Research Ethics Board. The variables available in the database included:

- Course start date which was the date the students started a course;
- Course complete date which was the date the students completed the course;

- Course completion status, such as withdrawals, passes, fails and in progress;
- Delivery mode of the course which identified whether the course was a self-paced individualized study course, a group study course or a challenge for credit;
- Course final grade as a percentage or as a letter;
- Assignments submitted, denoted by a yes or no flag;
- Admission date which delimited when the student was accepted or admitted to the University. This was useful in focusing the research on the most recent inactive students and graduates from the past five years;
- Program of enrollment;
- Program status denoted as current, inactive, expelled, graduated, or pending graduation; and
- Death status with a yes or no flag. This identified whether a student turned inactive due to death.

3.5.2 Sampling Frame

The data extract source for the study's sampling frame was the University's student database. The data extract was obtained by filing a request with the University's Information Technology Services. The sampling frame included program withdrawal undergraduate students (experimental group) and graduates (control group).

3.5.2.1 Sampling Frame for Program Withdrawal Students: The experimental group

For program withdrawal students the following criteria were met:

- Must have faced an academic challenge, which represented a perturbation, over the course of their program of study by failing at least two courses. This rendered the grade variable, course duration variable and the completion status variable as the relevant variables for quantitative analysis;

- Enrolled in an undergraduate bachelor degree program of study, i.e. other than nonprogram/open studies, to focus the research on long term undergraduate program students;
- Passed or failed a minimum of ten University courses. This generated a minimum of ten data points per student to undertake a meaningful analysis;
- The final program status at the University was that the students ultimately dropped out of their last University undergraduate program of study in the past five years (i.e. inactive); and
- Not expelled from the University.

For each program withdrawal student the following variables were requested from the student database so as to facilitate data analysis:

- All final course grades;
- All course start dates;
- All course completion dates;
- All course completion statuses i.e. fail, pass, early withdraw, withdraw, late withdraw, and system withdraw;
- Credits contracted in each course;
- Credits awarded in each course;
- Course IDs;
- F_Grad, i.e. whether the course was an undergraduate or graduate one;

- Delivery mode of the course taken, i.e. individualized study, group study or challenge exam;
- Location ID/cooperative institution name if the course was group study;
- F_Start which was whether a student submitted an assignment in the course;
- All the dropout's courses with a completion status of pass, fail, withdrawal, late withdrawal, system withdrawal or early withdrawal;
- Admission date;
- Their undergraduate programs of study, including previous certificates and diplomas;
- Enrolment dates in their undergraduate programs of study, including previous certificates and diplomas;
- Program status for each enrolment date;
- Dropout date; and
- If the student started in a certificate, diploma or a different bachelor program then laddered into a bachelor program from which s/he dropped, a request was made to include all courses from the certificate diploma or the other program the student was in prior to laddering.

3.5.2.2 Sampling Frame for Graduates: The control group

For the graduate group the following criteria were met:

- Must have faced an academic challenge, which represented a perturbation, over the course of their program of study by failing at least two courses. This rendered the grade variable, course duration variable and the completion status variable as the relevant variables for quantitative analysis;

- Enrolled in an undergraduate bachelor degree program of study, i.e. other than nonprogram/open studies, to focus the study on long term undergraduate program students;
- Passed or failed a minimum of ten University courses. This generated a minimum of ten data points per graduate to undertake a meaningful analysis; and
- The final program status at the University was that the students ultimately graduated from their last University undergraduate program of study in the past five years (or are pending graduation).

For each graduate the following variables were requested from the student database so as to facilitate data analysis:

- All final course grades;
- All course start dates;
- All course completion dates;
- All course completion statuses i.e. fail, pass, early withdraw, withdraw, late withdraw, and system withdraw;
- Credits contracted in each course;
- Credits awarded in each course;
- Course IDs;
- F_Grad, i.e. whether the course was undergraduate or graduate;
- Delivery mode of the course taken i.e. individualized study, group study or challenge exam;
- Location ID/cooperative institution name if the course was group study;
- F_Start which was whether a student submitted an assignment in the course;

- All the graduate's courses with a completion status of pass, fail, withdrawal, late withdrawal, system withdrawal or early withdrawal;
- Admission date;
- Their undergraduate programs of study including previous certificates and diplomas;
- Enrolment dates in their undergraduate programs of study, including previous certificates and diplomas;
- Program status for each enrolment date;
- Graduation date; and
- If the student started in a certificate, diploma or a different bachelor program then laddered into a bachelor program from which s/he graduated, a request was made to include all courses from the certificate diploma or the other program the student was in prior to laddering.

3.5.3 Sampling Plan

The main information source for the study was the student database. The data was requested from Information Technology Services at the Canadian Distance University. This was accomplished through a formal request by the researcher upon obtaining ethics clearance and institutional permission. The structured querying language for the data extract is available in Appendix C for the program withdrawal group and in Appendix D for the graduate group. The sampling approach was probability random sampling to remove any bias due to sample selection. More specifically, the targeted sample size was 400 students who failed two courses and eventually became inactive (program withdrawals), in addition to a control group of 400 students who failed two courses and eventually graduated. This allowed for group comparisons via significance testing.

Table III-1 illustrates the population size, sample size required and the margin of error for the study at the 95% confidence level. Sample size was driven by the data analysis methods to be used, i.e. z test between the program withdrawal group and the graduate group, degree of accuracy and the confidence levels. A sample size of 400 program withdrawal students and 400 graduates was adequate yielding the margin of error of ±4.2% for the program withdrawal group and 3.6% for the graduate group at the 95% confidence level. A larger sample size would not have reduced the margin of error significantly. For a total population of 1,430 program withdrawal students the margin of error for a sample of 600 is ±3% whereas the margin of error for a sample of 400 is ±4%. The difference is only 1%. Note that the margin of error is calculated as:

B=2*SQRT[(N-n)/N*0.25/n]

where N is population size and n is sample size (Cooper & Schindler, 2011).

Table III-1: Sampling Plan

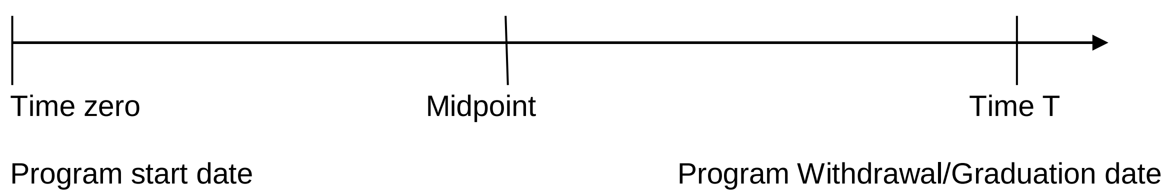
Student Type	Population Size	Sample Size	Margin of Error
Program Withdrawal Students	1,430	400	±4.2%
Graduates	862	400	±3.6%
Total	2,292	800	±2.8%

Note: Population size is based on preliminary data provided by the University Information Technology Services of students who dropped out or graduated from December 2009 to December 2014.

3.5.4 Data Analysis

While there could have been various reasons for student transition from an active status to a program withdrawal status, the research was limited by the availability of variables in the student database. Since the research objective was to assess the generic early warning signals, the focus was on the students with at least two failed courses who transitioned to an inactive status. This emphasized the relevance of the available grade variable, course completion status and course duration. Therefore, 400 cases of program students were extracted from the database. These were students who have completed at least 10 courses or more, to capture students who have pursued their studies for quite some time, and with at least two not necessarily consecutive fails. Based on the course completion dates, the incidences of each early warning signal among students in the sample were calculated before and after the midpoint of the time series data. This is illustrated in Figure III-1.

Figure III-1: Timeline



The following is the approach for measuring the presence of each early warning signal:

- **Critical slowing down**: Measured as the time difference between the course start date and course completion date which effectively showed whether or not it was taking a student longer to complete a course. Group study courses were excluded from this analysis because they ran on a fixed timeframe. Challenge for credit courses were also excluded as they afforded a student a different course experience from individualized study courses which include assignments and different exams. There were 28 excluded cases for the program withdrawal group and 13 excluded cases for the graduate group. Therefore, only self-paced individualized study courses were used to calculate critical slowing down.

- **Increase in variance and skewness:** Variance and skewness in the grade variable were examined on a case by case basis by sorting the course grades in ascending order of course completion dates, taking the midpoint of the ten or more courses, and comparing variance and skewness before and after the midpoint. In the absence of a midpoint as the case was if the number of courses taken was odd, the grade of the median course was applied to the first half of course grades and to the second half of course grades so that its impact was accounted for in both phases.
- **Lag-1 autocorrelations**: Autocorrelations were calculated by autocorrelating each course grade with the grade of the course completed just before it (i.e. a lag by one course completion date). This was done before and after the midpoint of the 10 or more courses the student took to identify any increases or decreases in autocorrelation pre and post the midpoint.
- **Flickering**: Flickering was determined by identifying a pattern of passes and non-passes (i.e. fails or withdrawals) in the courses.
- **Spatial patterns:** The investigation into spatial patterns was compromised by the lack of identifiable coupled units for each program withdrawal student or graduate. This is a consequence of the fact that most courses at the Canadian Distance University were undergraduate individualized study, self-paced and

distance based with no specific student cohort. Therefore, this signal was not investigated.

The 400 cases and the percentage incidences of each of the generic early warning signals were representative of the program withdrawal student population within a margin of error of $\pm$4.2% at the 95% confidence level. The margin of error was calculated as B=2*SQRT[(N-n)/N*0.25/n] where N was population size and n was sample size (Cooper & Schindler, 2011). Data for a control group of 400 graduates with at least two fails who persisted in their program of study and eventually graduated, was also extracted from the database. They were representative of the graduate population within a margin of error of $\pm$3.6% at the 95% confidence level. The incidences of false early warning signals in those cases were examined on a case by case basis. After examining each case, the incidences of each of the generic early warning signals were then calculated among the graduates. It was then possible to test for statistically significant differences at the 95% confidence level between the true positive incidences of early warning signals among the program student withdrawal group and the false positive incidences of early warning signals among the graduate group. Where the difference was indeed statistically significant then this further supported the viability of the generic early warning signals. Where there were no statistically significant differences then the support for the generic signals, at least for the Canadian Distance University, could neither be claimed nor refuted.

To address the secondary research question on whether the emergence of a program withdrawal status was self-similar, the incidence of course withdrawals and fails with zero final grades, which is a form of course abandonment, was calculated among the program withdrawal group to determine the percentage of program withdrawal students who also exhibited withdrawal behavior at the course level. In addition, the percentage of course withdrawals among the control group of graduates was calculated representing the false positives. Significance testing was undertaken between the program withdrawal experimental group and the graduate control group to determine if the incidence of course withdrawal among the program withdrawal group was statistically higher than the graduate group. This helped further validate whether program withdrawal was self-similar through course withdrawal. After all, if the emergence of a program withdrawal status was self-similar at the program level and the course level then course withdrawal behavior could be telling of an impending program withdrawal behavior. This potentially rendered self-similarity as an early warning signal. A potential consequence of this analysis was the identification of intervention points for managing at-risk students.

3.5.5 Sample Data Analysis

Table III-2 illustrates the data analysis based on the record of one student who enrolled in the Bachelor of Management program and then withdrew from the program of study in 2011. The program data for this student was sorted by course end date which was the date the student’s completion status was attained. Completion status represents the “state” of the student at that date:

Table III-2: Program Data for an Inactive Student

Course ID	Course Start Date	Course End Date	Duration in Months	Delivery Mode	Grade	Completion Status
PHIL152	2000-Feb-01	2000-Jul-31	6.0	HOM	55	Pass
ADMN232	2000-Aug-01	2001-Jan-31	6.1	HOM	60	Pass
LGST369	2001-Jul-01	2001-Dec-31	6.1	HOM	50	Pass
ORGB386	2001-Jul-01	2001-Dec-31	6.1	HOM	60	Pass
ACCT253	2001-Jul-01	2002-Feb-28	8.1	HOM	50	Pass
ECON475	2001-Nov-01	2002-Jun-30	8.0	HOM	85	Pass
ACCT250	2002-Oct-01	2003-Mar-21	5.7	HOM	50	Pass
ADMN233	2002-Oct-01	2003-Mar-31	6.0	HOM	85	Pass
SOCI321	2002-Oct-01	2003-Mar-31	6.0	HOM	60	Pass
COMP200	2002-Oct-01	2003-May-31	8.1	HOM	60	Pass
MKTG396	2002-Oct-01	2003-May-31	8.1	HOM	55	Pass
COMM329	2002-Oct-01	2003-Jul-31	10.1	HOM	60	Pass
Midpoint of the timeline based on course completion dates						
IDRL308	2004-Apr-01	2004-Sep-30	6.1	HOM	60	Pass
IDRL312	2004-Apr-01	2004-Nov-30	8.1	HOM	60	Pass
HRMT387	2004-Apr-01	2005-Mar-31	12.1	HOM	85	Pass
ORGB319	2004-Apr-01	2005-Mar-31	12.1	HOM	85	Pass
FNCE234	2005-Mar-01	2006-Feb-28	12.1	HOM	55	Pass
CMIS351	2006-Apr-01	2006-Sep-30	6.1	HOM	60	Pass
ECOM320	2006-Apr-01	2006-Sep-30	6.1	HOM	85	Pass
PHIL333	2006-Nov-01	2007-Apr-30	6.0	HOM	60	Pass
PHIL252	2006-Nov-01	2007-Oct-31	12.1	HOM	85	Pass
PSYC300	2008-Mar-01	2008-Nov-20	8.8	HOM	0	Withdraw/ Fail
ECON401	2009-Jul-01	2010-Jun-07	11.4	HOM	0	Withdraw/ Fail
HRMT301	2009-Jul-01	2010-Jun-07	11.4	HOM	0	Withdraw/ Fail

Based on the program data, the student had a healthy start in the first half of the Bachelor of Management program. The student did not fail any courses. In the second half of the program the student also had a healthy start passing all the courses. In 2008 and 2010, however, the student attempted three courses all of which were abandoned resulting in a withdraw-fail status. This means that the student did not formally withdraw from the courses after abandoning them. The student therefore received a zero final grade in these courses. The analysis now moves into calculating the signals pre and post the midpoint of the student's timeline. The signal analysis results are tabulated in Table III-3:

Table III-3: Calculation of Early Warning Signals

Signal	Definition	Pre-Midpoint	Post-Midpoint	Directionality	Conclusion
Variance	Variance in the grades	144.697	1156.629	Rise in Variance	Signal is present
Skewness	Skewness in the grades	1.505	-0.862	Drop in Skewness	Signal is not present
Autocorrelation	Correlates each course grade with the previous course grade	-0.486	0.543	Rise in Autocorrelation	Signal is present
Flickering	% non-pass status / Total	0%	25%	Rise in Flickering	Signal is present
Critical slowing down	Average of course start date to course end date	7.0	9.4	Longer average time to course completion	Signal is present

The variance in the grade variable was calculated pre-midpoint and post midpoint. The variance rose from 145 to 1157. This is consistent with Complexity's suggestion on the rise in variance prior to a critical transition, which here is the transition from an active student status in the Bachelor of Management program to an inactive student status.

Skewness decreased from 1.5 to -0.9. The signal on the rise in skewness in the state variable is therefore not present in this example.

Autocorrelation was calculated pre-midpoint by correlating the grade data series, starting from the first course to the 11th course, against the grade data series starting with the second course to the 12th course. This represents lag-1 autocorrelation. The same approach was undertaken with the post midpoint data. The result was a rise in autocorrelation from -0.5 to +0.5, which is consistent with theory.

Flickering is the percentage of non-pass states over total states. Flickering rose from 0% pre-midpoint to 25% post midpoint. Finally, the signal of critical slowing down, which is the time it takes a student to complete a course, rose from 7.0 months pre-midpoint to 9.4 months post midpoint, also consistent with theory.

This illustrated sample analysis was undertaken on all 400 cases of program withdrawal students to calculate an overall percentage for the presence of each signal. The analysis was also undertaken among the graduate control group where the presence of the signals represented false positives. Significance testing was then undertaken to determine if the incidences of the signals amongst the experimental program withdrawal group was statistically higher than the graduate control group.

In terms of addressing the secondary research question on whether the emergence of a program withdrawal status was self-similar at the program level and the course level, the case of the Bachelor of Management student showed that the student exhibited some self-similarity by abandoning 3/24 courses for which a withdraw-fail was received. The same observation was undertaken among all program withdrawal students to determine the overall percentage of course withdrawals. This percentage was then tested against that of a graduate control group to determine whether the difference was statistically significant, and whether the results supported the proposition that the self-similarity of a program withdrawal status is a potential early warning signal.

3.5.6 Data Analysis Limitations

a. Database Integrity

The quality of the research was heavily dependent on the quality of the student database. Specifically, the data entry accuracy of the student's course information in the student database was dependent on the work quality and performance of the data entry personnel at the Canadian Distance Education University.

b. Catastrophic vs. Non-Catastrophic Bifurcation

The program student withdrawal behavior might not have followed that of a catastrophic or non-catastrophic bifurcation. The extracted data set did not guarantee a focus on either. An example would be the linearly responding system discussed in Figure II-1 for which generic early warning signals did not necessarily exist. However, these cases were also expected to exist in the control group as well, thereby not impacting the inter-group comparisons significantly. It should also be noted that the requirement for each student to have completed at least ten courses prior to withdrawing potentially filtered the data to a catastrophic bifurcation that resulted in a critical transition from an active status to an inactive status. This is because a non-catastrophic bifurcation, as in a linearly responding system, would be expected to show a semi-steady decline in the grade variable over at least ten courses prior to student withdrawal. This is too many courses and most students whose grades are on a consistently downward path are expected to withdraw from their program of study prior to completing ten courses or more.

c. The Signal of Spatial Correlations

This case study examined student program withdrawal at a Canadian Distance University offering individualized study courses. These are courses that students can enrol in at the beginning of every month. Therefore, the students are not part of a cohort as is the case in a traditional classroom. The implication of this is that students are not part of a coupled system as they do not have study peers in a defined classroom. This created challenges for calculated spatial correlations that require a coupled system. Therefore, the individualized study course delivery at the Canadian Distance University and the lack of a coupled system of students prevented the investigation into the generic early warning signal of spatial correlations.

d. Limitations in Critical Slowing Down Calculations

When undertaking critical slowing down calculations group study courses were excluded from the analysis. This is because group study courses are of a fixed duration. Challenge for credit courses were also excluded as they afforded a student a different course experience from individualized study courses. A challenge for credit requires just one examination, whereas an individualized study course requires assignments and various exams. There were 28 excluded cases for the program withdrawal group and 13 excluded cases for the graduate group. This, however, did not reduce the sample size in a significant way so as to increase the margin of error.

e. Limitations in Autocorrelation and Skewness Calculations

The signals for autocorrelations and skewness were calculated using the standard deviation in the grade variable. There were 36 program withdrawal cases with undefined skewness due to the standard deviation being zero. There were also 44 program withdrawal cases with undefined autocorrelation due to the standard deviation being zero. The difference in the number of cases with zero standard deviation between the skewness and autocorrelation calculations has to do with how the autocorrelation cases were selected pre and post midpoint. All these cases were therefore excluded from the analysis but they did not decrease the sample size significantly so as to increase the margin of error.

3.6 Filing a Full Application with the Research Ethics Board

Prior to engaging in research activities a full application, along with all supporting documentation, was submitted to the AU Research Ethics Board. The submission was made to obtain clearance for undertaking research involving human subjects. In this case the distance education university students and graduates (“Research Centre”, 2014). The submission was made through the research portal under the supervision of the doctoral supervisory committee. Certification of Ethics Approval was obtained from the Research Ethics Board on October 22nd 2014 (Appendix A). Subsequently, institutional permission from the Vice President Academic was obtained on November 4th 2014 for accessing university systems and data (Appendix B). Both approvals were used to file a data request with the Information Technology Services at the Canadian Distance University.

CHAPTER IV: RESEARCH FINDINGS

Building on the data analysis, this section presents research findings for each generic early warning signal. It also presents the investigation into self-similarity as a potential signal in its own right.

The following findings are presented to address the primary research question:

How valid are the generic early warning signals for critical transitions as a predictive management tool when assessed within the context of program withdrawal management among undergraduate distance students?

4.1 Findings for the Signal on Increase in Flickering in the State Variable

Flickering has been defined in this paper as any deviation from a pass state. Therefore, by examining the completion status variable on a student by student basis flickering is attributed to either a fail or withdrawal state. Flickering as a percentage is calculated as the sum of non-passes, i.e. fails plus withdrawals, divided by the total states.

4.1.1 Data File Preparation for Calculating Flickering

To calculate the signal for the rise in flickering in the state variable the student grade data was sorted in ascending order by course completion date. The midpoint of the course completion dates was identified and flickering was calculated prior to the midpoint and post the midpoint. The difference in pre and post the midpoint of flickering was then calculated to determine whether there was an increase or decrease in flickering. The analysis was undertaken for both the program withdrawal group and the graduate control group. The case-by-case details are available in Appendix E for the program withdrawal group and in Appendix F for the graduate group. Table IV-1 is an illustration of the analysis on a single record:

Table IV-1: Flickering Analysis on Single Record

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
1	15%	23%	8%	Rise in Flickering

4.1.2 Results for Flickering Calculations

Table IV-2 is a tabulation of the flickering results for the program withdrawal group and the graduate group. It shows that a higher proportion of students in the program withdrawal group (78%) exhibited an increase in flickering compared to the graduate control group (44%).

Table IV-2: Findings for Flickering

		Group				
		Graduates		Program Withdrawals		Difference
		Count	Column N %	Count	Column N %	%
Conclusion on the Flickering Signal	Decline in Flickering	160	40.0%	50	12.5%	27.5%
	No Change in Flickering	66	16.5%	38	9.5%	7.0%
	Rise in Flickering	174	43.5%	312	78.0%	-34.5%
	Total	400	100.0%	400	100.0%	0.0%

4.2 Findings for the Signal on Critical Slowing Down

Critical slowing down is based on the time a student spent in a self-directed individualized study course. The more time the student spent in a course compared to previous courses is considered evidence of critical slowing down.

4.2.1 Data File Preparation for Calculating Critical Slowing Down

In order to calculate the signal for critical slowing down the student data was sorted in ascending order by course completion date. The time spent in a course was calculated by subtracting the course start date from the course completion date on a course by course basis. The midpoint of the course completion dates was identified and the average time spent in a course was calculated prior to the midpoint and post the midpoint. Then the difference in pre and post midpoint average time was calculated to determine whether the student spent more time or less time in the course post midpoint. The analysis was undertaken for both the program withdrawal group and the graduate control group. The detailed analysis is available in Appendix G for the program withdrawal group and in Appendix H for the graduate group. It should be noted that there were 28 program withdrawal cases and 13 graduate cases for which the time spent in a course could not be calculated. This is because all the courses these students took were either group study or challenges or majority group study with just one individualized study course. Group study were excluded from the analysis because they are of a fixed duration and do not impact critical slowing down compared to individualized study courses which are self-paced. Challenge for credit were excluded from the analysis because individualized study courses afford the student the full course experience in the way of various assignments and exams. This is different from simply challenging a course for credit. Table IV-3 is an illustration of the analysis on a single record.

Table IV-3: Critical Slowing Down Analysis on Single Record

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
255	185.0	111.0	-74.0	Less time spent in course

4.2.2 Results for Critical Slowing Down Calculations

The results tabulated in Table IV-4 show that a higher proportion of students in the program withdrawal group (87%), compared to the graduate group (66%), exhibited the signal for critical slowing down. This is because they spent more time on average in their courses post the midpoint of the course completion date.

Table IV-4: Findings for Critical Slowing Down

		Group				
		Graduate		Program Withdrawals		Difference
		Count	Column N %	Count	Column N %	%
Conclusion on Critical Slowing Down	Equal time spent in course	1	0.3%	3	0.8%	-0.5%
	Less time spent in course	130	33.6%	45	12.1%	21.5%
	More time spent in course	256	66.1%	324	87.1%	-21.0%
	Total	387	100.0%	372	100.0%	0.0%

4.3 Findings for the Signal on Increase in Autocorrelation in the State Variable

Lag-1 autocorrelation is calculated by correlating the grade in each course with the one before it, hence the lag. An increase in autocorrelation from pre to post the midpoint of course completion is evidence for the signal.

4.3.1 Data File Preparation for Calculating Autocorrelation

To calculate the signal for the rise in autocorrelation in the state variable the student grade data was sorted in ascending order by course completion date. Courses with a withdrawal completion status had no final grades and were therefore excluded from the analysis. The midpoint of the course completion dates was identified and autocorrelation was calculated prior to the midpoint and post the midpoint. The difference in pre and post midpoint autocorrelations was then calculated to determine whether there was an increase or decrease. The analysis was undertaken for both the program withdrawal group and the graduate control group. The detailed analysis is in Appendix I for the program withdrawal group and in Appendix J for the graduate group. There were 44 program withdrawal cases with undefined autocorrelation due to the standard deviation being zero. These cases were excluded from the analysis. Table IV-5 illustrates the analysis on a single record:

Table IV-5: Autocorrelation Analysis on Single Record

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
1	-0.052298714	0.75955248	0.8118512	Increase in Autocorrelation

4.3.2 Results for Autocorrelation Calculations

The results in Table IV-6 showed that the majority of students in both the program withdrawal group (65%) and the graduate group (53%) exhibited the signal for the increase in autocorrelation in the state variable. However, a higher proportion of students in the program withdrawal group (65%) exhibited an increase in autocorrelation of the grade variable compared to the graduate control group (53%).

Table IV-6: Findings for Autocorrelations

		Group				
		Graduates		Program Withdrawals		Difference
		Count	Column N %	Count	Column N %	%
Conclusion on Autocorrelation	Decrease in Autocorrelation	189	47.3%	125	35.1%	12.2%
	Increase in Autocorrelation	211	52.8%	231	64.9%	-12.1%
	Total	400	100.0%	356	100.0%	0.0%

4.4 Findings for the Signal on Increase in Variance in the State Variable

Variance is calculated using all grade variables pre and post the midpoint of course completion. An increase in variance, from pre to post the midpoint of course completion, is evidence for the signal.

4.4.1 Data File Preparation for Calculating Variance

In order to calculate the signal for the rise in variance in the state variable the student grade data was sorted in ascending order by course completion date. Courses with a withdrawal completion status had no final grades and were therefore excluded from the analysis. The midpoint of the course completion dates was identified and variances were calculated prior to the midpoint and post the midpoint. The difference in pre and post midpoint variances was then calculated to determine whether there was an increase or decrease in the variance. The analysis was undertaken for both the program withdrawal group and the graduate control group. The detailed analysis is in Appendix K for the program withdrawal group and in Appendix L for the graduate group. Table IV-7 illustrates the analysis on a single record:

Table IV-7: Variance Analysis on Single Record

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
50	2311.8	1264.8	-1047	Decrease in Variance

4.4.2 Results for Variance Calculations

Table IV-8 shows that the majority of students in both the program withdrawal group (64%) and the graduate group (55%) exhibited the signal for the rise in variance in the state variable. However, a higher proportion of students in the program withdrawal group (64%) exhibited an increase in the variance of the grade variable compared to the graduate control group (55%).

Table IV-8: Findings for Variance

		Group				
		Graduates		Program Withdrawals		Difference
		Count	Column N %	Count	Column N %	%
Conclusion on Variance	Decrease in Variance	179	44.8%	145	36.3%	8.5%
	Increase in Variance	221	55.3%	255	63.8%	-8.5%
	Total	400	100.0%	400	100.0%	0.0%

4.5 Findings for the Signal on Increase in Skewness in the State Variable

Skewness is calculated using all grade variables pre and post the midpoint of course completion. An increase in skewness, from pre to post the midpoint of course completion, is evidence for the signal.

4.5.1 Data File Preparation for Calculating Skewness

In order to calculate the signal for the rise in skewness in the state variable the student grade data was sorted in ascending order by course completion date. Courses with a withdrawal completion status had no final grades and were therefore excluded from the analysis. The midpoint of the course completion dates was identified and the skewness was calculated prior to the midpoint and post the midpoint. The difference in pre and post midpoint skewness was calculated to determine whether there was an increase or decrease. The analysis was undertaken for both the program withdrawal group and the graduate control group. The detailed analysis is in Appendix M for the program withdrawal group and in Appendix N for the graduate group. There were 36 program withdrawal cases with undefined skewness due to the standard deviation being zero. These cases were excluded from the analysis. Table IV-9 illustrates the analysis on a single record:

Table IV-9: Skewness Analysis on Single Record

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
150	2.800568358	0.009972721	-2.7905956	Decrease in Skewness

4.5.2 Results for Skewness Calculations

Table IV-10 shows that the majority of students in both the program withdrawal group (67%) and the graduate group (52%) exhibited the signal for the rise in skewness in the state variable. However, a higher proportion of students in the program withdrawal group (67%) exhibited an increase in skewness compared to the graduate control group (52%).

Table IV-10: Findings for Skewness

		Group				
		Graduates		Program Withdrawals		Difference
		Count	Column N %	Count	Column N %	%
Conclusion on Skewness	Decrease in Skewness	194	48.5%	121	33.2%	15.3%
	Increase in Skewness	206	51.5%	243	66.8%	-15.3%
	Total	400	100.0%	364	100.0%	0.0%

4.6 Findings for Self-Similarity as a Potential Early Warning Signal

The analysis then moved into investigating self-similarity as a proposed potential early warning signal. Specifically, the findings presented in this section addressed the secondary research question:

Does the emergence of a program withdrawal status among undergraduate distance students exhibit a self-similarity at the program level and the course level?

The term ‘self-similarity’ was used as opposed to ‘fractal-like’ characteristic because the data warranted only two layers of investigation: The program level data and the course level data. The investigation specifically examined whether students who withdrew at the program level also exhibited withdrawal behaviour at the course level. In other words, whether program withdrawal was a behavior self-similar to course withdrawal. The data was also compared against that of the graduates as a control.

4.6.1 Data File Preparation for Calculating Self-Similarity

In examining self-similarity two approaches were adopted. The first calculated the course withdrawal rate, which is the self-similarity rate on a student by student basis by dividing course withdrawals by the sum of passes, fails and withdrawals. Table IV-11 is an analysis for one student. The detailed analysis is in Appendix O for the program withdrawal group and in Appendix P for the graduate group.

Table IV-11: Withdrawal Rate Analysis on Single Record

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self - Similarity rate)
1	8	10	2	20	10%

The second approach divided the fails into two categories, regular fails with low grades and fails with a zero grade. This second approach treated fails for which a zero grade is recorded as course withdrawal. Although the student did not officially withdraw from the course, the fact that a zero grade is recorded on the transcript is an indication of course abandonment. For this approach the ‘withdrawal and fails with zero’ rate was calculated as (the sum of course withdrawals and fails for which a zero grade was received) divided by (the sum of passes, fails, withdrawals and fails for which a zero grade was received). Table IV-12 is an analysis for one student. The tables detailing all cases for the program withdrawal group and for the graduate group are available in Appendices Q and R, respectively. The ‘passes’ include courses that were previously failed and then retaken:

Table IV-12: 'Withdrawal and Fails with Zero' Rate Analysis on Single Record

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	Withdrawal & Fails with Zero rate
2	2	8	24	0	34	24%

4.6.2 Findings for The First Approach: Withdrawal Rate

Table IV-13 illustrates the descriptive statistics for the withdrawal rate among the program withdrawal group and the graduate group. There were no differences between the means of the two groups as they were equal at 2% each.

Table IV-13: Withdrawal Rate Descriptive Statistics

	Graduates	Program Withdrawals
	Withdrawal Rate	**Withdrawal Rate**
Mean	2%	2%
Median	0%	0%
Mode	0%	0%
Minimum	0%	0%
Maximum	33%	33%
Standard	5%	5%
Count	400	400

Table IV-14 illustrates an attempt at dividing the withdrawal rates into categories. The differences between the proportions were minor given the closeness of the column proportions between the two groups.

Table IV-14: Differences in Withdrawal Rate Categories

		Group				
		Graduates		Program Withdrawals		Difference
		Count	Column N %	Count	Column N %	%
Withdrawal Rate Range	No Withdrawals	310	77.5%	318	79.5%	-2.0%
	1% to 10% withdrawals	68	17.0%	54	13.5%	3.5%
	11% to 20% withdrawals	16	4.0%	21	5.3%	-1.3%
	21% to 33% withdrawals	6	1.5%	7	1.8%	-0.3%
	Total	400	100.0%	400	100.0%	0.0%

4.6.3 Findings for the Second Approach: ‘Withdrawals and Fails with Zero’ Rate

Upon adding fails with zero grades to the withdrawals the calculations showed a noticeable difference in the ‘withdrawal and fails with zero’ rate between the graduate group (21%) and the program withdrawal group (39%). Table IV-15 illustrates the descriptive statistics of the findings.

Table IV-15: ‘Withdrawal and Fails with Zero’ Rate Descriptive Statistics

	Graduates	Program Withdrawals
	‘Withdrawal & Fails with Zero’ Rate	‘Withdrawal & Fails with Zero’ Rate
Mean	21%	39%
Median	18%	36%
Mode	20%	36%
Minimum	0%	0%
Maximum	77%	92%
Standard Deviation	12%	19%
Count	400	400

The finding is further supported in Table IV-16 upon dividing the ‘withdrawal and fail with zero’ rate into distinct categories of ‘no withdrawals or fails with zero’, ‘under 50% withdrawals and fails with zero’, and ‘50% or over withdrawals and fails with zero’.

Table IV-16: Differences in ‘Withdrawal and Fails with Zero’ Rate Categories

		Group				
		Graduates		Program Withdrawals		Difference
		Count	Column N %	Count	Column N %	%
‘Withdrawal & Fails with Zero’ Rate Range	50% or Over Withdrawals & Fails with Zero	17	4.3%	122	30.5%	-26.3%
	Under 50% Withdrawals & Fails with Zero	381	95.3%	277	69.3%	26.0%
	No Withdrawals or Fails with Zero	2	0.5%	1	0.3%	0.3%
	Total	400	100.0%	400	100.0%	0.0%

4.7 Summary of Findings

For the signal on increase in flickering: A higher proportion of students in the program withdrawal group (78%) exhibited an increase in flickering compared to the graduate control group (44%). This represents a preliminary support for the viability of the signal.

For the signal of critical slowing down: A higher proportion of students in the program withdrawal group (87%), compared to the graduate group (66%), exhibited the signal for critical slowing down as they spent more time on average in their courses post the midpoint of the course completion dates. This represents a preliminary support for the viability of the signal.

For the signal on increase in autocorrelation: A higher proportion of students in the program withdrawal group (65%) exhibited an increase in autocorrelation of the grade variable compared to the graduate control group (53%). This represents a preliminary support for the viability of the signal.

For the signal on increase in variance: A higher proportion of students in the program withdrawal group (64%) exhibited an increase in the variance of the grade variable compared to the graduate control group (55.3%). This represents a preliminary support for the viability of the signal.

For the signal on increase in skewness: A higher proportion of students in the program withdrawal group (67%) exhibited an increase in the skewness of the grade variable compared to the graduate control group (52%). This represents a preliminary support for the viability of the signal.

For self-similarity: Upon strictly examining the withdrawal rate there were minor differences between the program withdrawal group and the graduate group. However, upon examining the 'withdrawals and fails with zero' rate there were differences between the two groups (39% mean for program withdrawal group vs. 21% mean for the graduate group). Therefore, the 'withdrawals and fails with zero' rate provides a preliminary support for the viability of the signal, which is an original contribution of this research.

CHAPTER V: DISCUSSION

This section builds on the research findings from the assessment of each generic early warning signal and from the investigation into self-similarity as a potential signal in its own right. This is accomplished by undertaking deeper statistical analyses on the reported findings and drawing generalizable conclusions.

The following is the discussion in relation to the primary research question: ***How valid are the generic early warning signals for critical transitions as a predictive management tool when assessed within the context of program withdrawal management among undergraduate distance students?***

When drawing conclusions from the research findings, the definitional references in Table V-1 were applied. These definitions were extracted from Table I-1 'List of Terms and Definitions':

Table V-1: Relevant Extract of Definitional References

Findings support the signal	When the signal is exhibited by over 50% of the program withdrawal test group and less than 50% of the graduate control group, and the difference in the proportions is statistically significant.
Findings moderately support the signal	When the signal is exhibited by over 50% of the program withdrawal test group and over 50% of the graduate control group, and the difference in the proportions is statistically significant, OR when the signal is exhibited by less than 50% of the program withdrawal test group and less than 50% of the graduate control group, and the difference in the proportions is statistically significant.

5.1 Assessing the Signal on Increase in Flickering in the State Variable

Flickering has been defined in this paper as the sum of non-passes, i.e. fails plus withdrawals, divided by the total states. Upon sorting the grade data for each student in ascending order by course completion date, the midpoint of the course completion dates was identified and flickering was calculated pre and post the midpoint. The difference between pre and post the midpoint of flickering was calculated to determine whether there was an increase, decrease or no change in flickering (Appendices E & F).

5.1.1 Significance Testing on the Flickering Signal

The flickering data was processed in SPSS (Statistical Package for Social Sciences). The data generated are summarized in Table V-2. The analysis showed that a higher proportion of students in the program withdrawal group (78%) exhibited an increase in flickering compared to the graduate group (44%).

Table V-2: SPSS Output for Flickering (restated)

		Group					
		Graduates		Program Withdrawals		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Conclusion on the Flickering Signal	Decline in Flickering	160	40.0%	50	12.5%	210	26.3%
	No Change in Flickering	66	16.5%	38	9.5%	104	13.0%
	Rise in Flickering	174	43.5%	312	78.0%	486	60.8%
	Total	400	100.0%	400	100.0%	800	100.0%

Upon undertaking significance testing, at the 95% confidence level, Table V-3 showed that a statistically significant higher proportion of students in the program withdrawal group (78%) exhibited an increase in flickering compared to the graduate control group (44%).

Table V-3: SPSS Significance Testing for Flickering

Comparisons of Column Proportions[a]			
		Group	
		Graduates	**Program Withdrawals**
		(A)	**(B)**
Conclusion on the Flickering Signal	**Decline in Flickering**	B	
	No Change in Flickering	B	
	Rise in Flickering		A

Results are based on two-sided tests. For each significant pair, the key of the category with the smaller column proportion appears in the category with the larger column proportion.
Significance level for upper case letters (A, B, C): .05

a. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.

5.1.2 Discussion on the Increase in Flickering Signal

The findings support the presence of the signal for an increase in flickering in the completion status variable prior to a critical transition (Scheffer et al., 2009). In fact, more than three-quarters of the students in the program withdrawal group exhibited flickering (true positives) while less than half of the students in the graduate group did (false positives). More importantly, the incidence of the increase among the program withdrawal test group (78%) was statistically higher than that of the graduate control group (44%).

These findings align with cited literature on the presence of flickering prior to a critical transition (Scheffer et al., 2009). For example, in medical research and upon collecting data on five patients, Litt et al. (2001) observed that hours before clinical onset symptomless seizures were followed by energy bursts in the brain, a pattern that resembles flickering. In ecology, Wang et al. (2012) analyzed long term data which showed that flickering occurred 20 years prior to the critical transition of a Chinese lake to a dead eutrophic state deprived of oxygen due to algae growth. Finally, in a study on rapid oceanic and atmospheric changes during the Younger Dryas cold period, Bakke et al. (2009) observed that flickering, in the form of rapid alterations between cold and warm modes, preceded the abrupt end of the period which ultimately shifted to the warm mode. In this study, an increase in flickering in the form of student non-passes, i.e. fails plus withdrawals, divided by the total states, preceded program withdrawal in 78% of the program withdrawal cases.

5.2 Assessing the Signal on Critical Slowing Down

Critical slowing down in this research is based on the time students spent in an individualized study course. If a student spent longer time in a course compared to previous courses then this would be an indication of critical slowing down. Critical slowing down was calculated by first subtracting the course start date from the course completion date on a course by course basis. Then, upon identifying the midpoint of the course completion dates, the average time spent in a course was calculated pre and post the midpoint to determine whether the student spent more time or less time in the course post midpoint (Appendices G & H). There were 28 program withdrawal cases and 13 graduate cases for which the time spent in a course could not be calculated.

This is because all the courses these students took were either group study of fixed duration or challenges for credit that afford the students a different course experience from individualized study courses.

5.2.1 Significance Testing on the Critical Slowing Down Signal

The critical slowing down data was processed in SPSS. The data generated are summarized Table V-4. The analysis showed that the majority of students (over 50%) in both the program withdrawal group (87%) and the graduate group (66%) exhibited the signal for critical slowing down, as they spent more time on average in their courses post the midpoint of the course completion date.

Table V-4: SPSS Output for Critical Slowing Down (restated)

		Group					
		Graduate		Program Withdrawals		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Conclusion on Critical Slowing Down	**Equal time spent in course**	1	0.3%	3	0.8%	4	0.5%
	Less time spent in course	130	33.6%	45	12.1%	175	23.1%
	More time spent in course	256	66.1%	324	87.1%	580	76.4%
	Total	387	100.0%	372	100.0%	759	100.0%

Table V-5 presents significance testing at the 95% confidence level. It showed that a statistically significant higher proportion of students in the program withdrawal group (87%) spent more time on average in their courses compared to the graduate control group (66%).

Table V-5: SPSS Significance Testing for Critical Slowing Down

<table>
<tr><th colspan="4">Comparisons of Column Proportions[a]</th></tr>
<tr><th colspan="2" rowspan="3"></th><th colspan="2">Group</th></tr>
<tr><th>Graduate</th><th>Program Withdrawals</th></tr>
<tr><th>(A)</th><th>(B)</th></tr>
<tr><td rowspan="3">Conclusion on Critical Slowing Down</td><td>Equal time spent in course</td><td></td><td></td></tr>
<tr><td>Less time spent in course</td><td>B</td><td></td></tr>
<tr><td>More time spent in course</td><td></td><td>A</td></tr>
<tr><td colspan="4">Results are based on two-sided tests. For each significant pair, the key of the category with the smaller column proportion appears in the category with the larger column proportion.
Significance level for upper case letters (A, B, C): .05</td></tr>
<tr><td colspan="4">a. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.</td></tr>
</table>

5.2.2 Discussion on the Critical Slowing Down Signal

Although the findings support the presence of the signal for critical slowing down prior to a critical transition and that the incidence of the increase among the program withdrawal test group (87%) is statistically higher than that of the graduate control group (66%), the findings, however, moderately support the theory. This is because the presence of the signal among 66% of graduates limits its viability as a tool for predicting student withdrawal.

The findings align to a certain extent with literature which suggests that critical slowing down occurs when recovery rates from perturbations decrease as the system approaches a bifurcation (Scheffer et al., 2009). For example, Tredicce et al. (2004) conducted a controlled experiment using semiconductor laser in which they observed critical slowing down at the point of bifurcation in the form of the lagging of an effect behind its cause. Matsumoto and Kunisawa observed critical slowing down in a 1978 experimental study that involved membrane potential changes, which is the difference in electric potential between the interior and the exterior of a biological cell. This research on program student withdrawal suggests the same as critical slowing down was exhibited by 87% of the program withdrawal cases.

The limitation stemming from the exclusion of 28 group study and challenge cases for the program withdrawal group and 13 cases for the graduate group was inconsequential. The exclusion did not reduce the sample size in a significant way so as to increase the margin of error.

5.3 Assessing the Signal on Increase in Autocorrelation in the State Variable

The lag-1 autocorrelation analysis was conducted by first sorting the student's grades in ascending order of course completion date. Then correlating the grade in each course with the one before it, hence the lag. This was undertaken pre and post the midpoint of course completion. Courses with a withdrawal completion status had no final grades and were therefore excluded from the analysis. The difference in pre and post midpoint autocorrelations was calculated to determine whether there was an increase or decrease (Appendices I & J). There were 44 program withdrawal cases with undefined autocorrelation due to the standard deviation being zero. These cases were excluded from the analysis.

5.3.1 Significance Testing on the Autocorrelations Signal

Upon analyzing the data in SPSS, Table V-6 shows that the majority of students (over 50%) in both the program withdrawal group (65%) and the graduate group (53%) exhibited the signal for the increase in autocorrelation in the state variable.

Table V-6: SPSS Output for Autocorrelations (restated)

		Group					
		Graduates		Program Withdrawals		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Conclusion on Autocorrelation	Decrease in Autocorrelation	189	47.3%	125	35.1%	314	41.5%
	Increase in Autocorrelation	211	52.8%	231	64.9%	442	58.5%
	Total	400	100.0%	356	100.0%	756	100.0%

Significance testing on the column percentages in SPSS was undertaken at the 95% confidence level. The analysis in Table V-7 showed that a statistically significant higher proportion of students in the program withdrawal group (65%) exhibited an increase in autocorrelation of the grade variable compared to the graduate control group (53%).

Table V-7: SPSS Significance Testing for Autocorrelations

Comparisons of Column Proportions[a]			
		Group	
		Graduates	**Program Withdrawals**
		(A)	**(B)**
Conclusion on Autocorrelation	**Decrease in Autocorrelation**	B	
	Increase in Autocorrelation		A
Results are based on two-sided tests. For each significant pair, the key of the category with the smaller column proportion appears in the category with the larger column proportion. Significance level for upper case letters (A, B, C): .05			
a. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.			

5.3.2 Discussion on the Increase in Autocorrelations Signal

Although the findings support the presence of the signal for an increase in autocorrelation in the state variable prior to a critical transition, and that the incidence of the increase among the program withdrawal test group (65%) is statistically higher than that of the graduate control group (53%), the findings moderately support the theory. This is because the presence of the signal among 53% of graduates limits its viability as a tool for predicting student withdrawal.

The findings align to a certain extent with literature which suggests that an increase in autocorrelation occurs as the system approaches a bifurcation (Scheffer et al., 2009). For example, Lebaron (1992) showed by examining stock return series, that first degree autocorrelation was related to stock return volatility and impending financial crashes. In climate studies, Dakos et al. (2008) showed that there was an increase in the autocorrelation of the state variable prior to eight abrupt changes in past climate conditions.

The limitation related to the exclusion of 44 program withdrawal cases with undefined autocorrelation, due to the standard deviation being zero, did not decrease the sample size significantly so as to increase the margin of error.

5.4 Assessing the Signal on Increase in Variance in the State Variable

The rise in variance in the state variable was calculated by first sorting the student grade data in ascending order of course completion dates. Then calculating variances pre and post the midpoint of course completion dates (Appendices K & L). Courses with a withdrawal completion status had no final grades and were excluded from the analysis. The difference in pre and post midpoint variances was calculated to determine whether there was an increase or decrease in the variance.

5.4.1 Significance Testing on the Variance Signal

Table V-8 is a tabulation of the data in SPSS. The analysis showed that the majority of students (over 50%) in both the program withdrawal group (64%) and the graduate group (55%) exhibited the signal for the rise in variance in the state variable.

Table V-8: SPSS Output for Variance (restated)

		Group					
		Graduates		Program Withdrawals		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Conclusion on Variance	Decrease in Variance	179	44.8%	145	36.3%	324	40.5%
	Increase in Variance	221	55.3%	255	63.8%	476	59.5%
	Total	400	100.0%	400	100.0%	800	100%

Table V-9, shows that, at the 95% confidence level, a statistically significant higher proportion of students in the program withdrawal group (64%) exhibited an increase in the variance of the grade variable compared to the graduate control group (55%).

Table V-9: SPSS Significance Testing for Variance

Comparisons of Column Proportions[a]			
		Group	
		Graduates	**Program Withdrawals**
		(A)	**(B)**
Conclusion on Variance	**Decrease in Variance**	B	
	Increase in Variance		A
Results are based on two-sided tests. For each significant pair, the key of the category with the smaller column proportion appears in the category with the larger column proportion. Significance level for upper case letters (A, B, C): .05			
a. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.			

5.4.2 Discussion on the Increase in Variance Signal

Although the findings supported the presence of the signal for an increase in variance in the state variable prior to a critical transition and that the incidence of the increase among the program withdrawal test group (64%) was statistically higher than that of the graduate control group (55%), the findings, nevertheless, moderately support the theory. This is because the presence of the signal among 55% of graduates limits its viability as a tool for predicting student withdrawal.

The findings align to a certain extent with literature which suggests that an increase in variance occurs as the system approaches a bifurcation (Scheffer et al., 2009; Carpenter & Brock, 2006). For example, in finance, the spread between the value of call options and put options was shown to be a measure of volatility. The increase in this volatility preceded the onset of the 1987 financial crash (Bates, 1991). Hsieh et al. (2006) compared the variability of exploited and unexploited fish stocks using 50 year-long larval fish surveys from the California Cooperative Oceanic Fisheries Investigations. Evidence showed that the temporal variability of exploited fish stocks was higher than that of the unexploited stocks. The increased variability was attributed to a truncation in the age structure which compromised the stocks' ability to mitigate environmental effects. Finally, McSharry, Smith, and Tarassenko (2003) showed in their studies of epileptic seizures that electrical signals recorded by an electroencephalography exhibited an increase in variance just minutes prior to a seizure.

5.5 Assessing the Signal on Increase in Skewness in the State Variable

The rise in skewness in the state variable was calculated by first sorting the student grade data in ascending order of course completion date. Then calculating skewness pre and post the midpoint of course completion. The difference in pre and post midpoint skewness was calculated to determine whether there was an increase or decrease in the skewness (Appendices M & N). There were 36 program withdrawal cases with undefined skewness due to the standard deviation being zero. These cases were excluded from the analysis.

5.5.1 Significance Testing on the Skewness Signal

Table V-10 is a tabulation of the data in SPSS. The table shows that the majority of students (over 50%) in both the program withdrawal group (67%) and the graduate group (52%) exhibited the signal for the rise in skewness in the state variable.

Table V-10: SPSS Output for Skewness (restated)

		Group					
		Graduates		Program Withdrawals		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Conclusion on Skewness	Decrease in Skewness	194	48.5%	121	33.2%	315	41.2%
	Increase in Skewness	206	51.5%	243	66.8%	449	58.8%
	Total	400	100.0%	364	100.0%	764	100.0%

Table V-11 shows the data from running significance testing on the column percentages in SPSS at the 95% confidence level. According to the table, a statistically significant higher proportion of students in the program withdrawal group (67%) exhibited an increase in the skewness of the grade variable compared to the graduate control group (52%).

Table V-11: SPSS Significance Testing for Skewness

Comparisons of Column Proportions[a]

		Group	
		Graduates	**Program Withdrawals**
		(A)	**(B)**
Conclusion on Skewness	**Decrease in Skewness**	B	
	Increase in Skewness		A

Results are based on two-sided tests. For each significant pair, the key of the category with the smaller column proportion appears in the category with the larger column proportion.
Significance level for upper case letters (A, B, C): .05

a. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.

5.5.2 Discussion on the Increase in Skewness Signal

Although the findings supported the presence of the signal for an increase in skewness in the state variable prior to a critical transition and that the incidence of the increase among the program withdrawal test group (67%) was statistically higher than that of the graduate control group (52%), the findings, nevertheless, moderately support the theory. This is because the presence of the signal among 52% of graduates limits its viability as a tool for predicting student withdrawal.

The findings align to a certain extent with literature which suggests that an increase in skewness occurs as the system approaches a bifurcation (Scheffer et al., 2009). For example, Guttal and Jayaprakash (2008) suggested that during critical slowing down, a system spends more time between the two basins of attraction representing the border between the two alternative states which is an indication of skewness.

In all 36 program withdrawal cases were excluded due to their undefined skewness with the standard deviation being zero. This limitation did not decrease the sample size significantly so as to increase the margin of error.

5.6 Investigating Self-Similarity as a Potential Early Warning Signal

Having addressed the primary research question by assessing the viability of the literature identified generic early warning signals when applied to the program student withdrawal problem, the analysis now moves to address the secondary research question:

Does the emergence of a program withdrawal status among undergraduate distance students exhibit a self-similarity at the program level and the course level?

The research therefore investigated self-similarity as a proposed potential early warning signal. The term 'self-similarity' was used as opposed to 'fractal-like' characteristic because there were only two layers to investigate: Program level data and course level data. The research investigated whether students who withdrew at the program level also exhibited withdrawal behaviour at the course level. The program withdrawal student data was also compared against the graduate control group.

Two approaches were adopted in examining self-similarity. The first approach calculated the course withdrawal rate, or the self-similarity rate, by dividing course withdrawals by the sum of passes, fails and withdrawals (Appendices O & P). The second approach divided the fails into regular fails with low grades and fails with a zero grade. This approach treated fails for which a zero grade is recorded as a course withdrawal. For this second approach the 'withdrawal and fails with zero' rate was calculated by dividing the sum of course withdrawals and fails, for which a zero grade was received, by the sum of passes, fails, withdrawals and fails for which a zero grade was received (Appendices Q & R).

5.6.1 Significance Testing for the First Approach: Withdrawal Rate

Table V-12 shows the descriptive statistics for the withdrawal rate among the program withdrawal group and the graduate group as generated in SPSS. Significance testing did not yield any significant differences between the means of the two groups as they were equal at 2% each.

Table V-12: Differences in the Withdrawal Rate Descriptive Statistics (restated)

	Graduates	Program Withdrawals	Difference
	Withdrawal Rate	Withdrawal Rate	
Mean	2%	2%	0%
Median	0%	0%	0%
Mode	0%	0%	0%
Minimum	0%	0%	0%
Maximum	33%	33%	0%
Standard	5%	5%	0%
Count	400	400	0

In Table V-13, the withdrawal rates were also divided into categories to conduct a test of statistical significance on the proportions. The test did not yield any statistically significant differences between the proportions given the closeness of the column proportions between the two groups.

Table V-13: Withdrawal Rate Categories (restated)

		Group					
		Graduates		Program Withdrawals		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Withdrawal Rate Range	**No Withdrawals**	310	78%	318	80%	628	79%
	1% to 10% withdrawals	68	17%	54	14%	122	15%
	11% to 20% withdrawals	16	4%	21	5%	37	5%
	21% to 33% withdrawals	6	2%	7	2%	13	2%
	Total	400	100%	400	100%	800	100%

* No statistically significant differences. Results are based on two-sided tests.

5.6.2 Significance Testing for the Second Approach: 'Withdrawals and Fails with Zero' Rate

In the second approach fails with zero grades were added to the withdrawals. The calculations in Table V-14 showed a noticeable difference in the 'withdrawal and fails with zero' rate between the graduate group (21%) and the program withdrawal group (39%).

Table V-14: Differences in the 'Withdrawal and Fails with Zero' Rate Descriptive Statistics (restated)

	Graduates	Program Withdrawals	Difference
	'Withdrawal & Fails with Zero' Rate	'Withdrawal & Fails with Zero' Rate	
Mean	21%	39%	-18%
Median	18%	36%	-18%
Mode	20%	36%[a]	-16%
Minimum	0%	0%	0.0%
Maximum	77%	92%	-15%
Standard Deviation	12%	19%	-7%
Count	400	400	0.0%

The SPSS output in Table V-15 confirmed that there was a statistically significant difference between the means of the two groups. Therefore, the mean 'withdrawal and fails with zero' rate among program withdrawals (39%) was statistically higher than the mean 'withdrawal and fails with zero' rate among graduates (21%). In other words, the mean of self-similarity among the program withdrawal students was statistically higher than that among the graduates. This lends moderate support to the proposition that students who withdraw at the program level tend to exhibit course withdrawal behavior that is on average higher than those students who ultimately graduate (the control group). The term 'moderate', as defined in this research, indicates that the mean was less than 50% for the two groups despite the statistically significant differences among them.

Table V-15: 'Withdrawal and Fails with Zero' Rate Significance Testing on Means

Comparisons of Column Means[a]		
	Group	
	Graduates	Program Withdrawals
	(A)	(B)
'Withdrawal & Fails with Zero' rate		A
Results are based on two-sided tests assuming equal variances. For each significant pair, the key of the smaller category appears in the category with the larger mean. Significance level for upper case letters (A, B, C): .05		
a. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.		

Table V-16 further supported the findings upon dividing the 'withdrawal and fails with zero' rate into distinct categories of "no withdrawals or fails with zero", "under 50% withdrawals and fails with zero", and "50% or over with withdrawals and fails with zeroes".

Table V-16: ‘Withdrawal and Fails with Zero’ Rate Categories (restated)

		Group					
		Graduates		Program Withdrawals		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
‘Withdrawal & Fails with Zero’ Rate Range	50% or Over with Withdrawals & Fails with Zero	17	4%	122	31%	139	17%
	Under 50% Withdrawals & Fails with Zero	381	95%	277	69%	658	82%
	No Withdrawals or Fails with Zero	2	1%	1	0%	3	0%
	Total	400	100%	400	100%	800	100%

More importantly, significance testing on column proportions in Table V-17 showed that the 31% proportion of program withdrawal students with a ‘withdrawal and fails with zero’ rate at 50% or over is statistically higher than that among the graduates (4%). This further supports the proposition that self-similarity is more pronounced among program withdrawal students compared to the control group of graduates.

Table V-17: ‘Withdrawal and Fails with Zero’ Rate Significance Testing on Categories

Comparisons of Column Proportions[a]

		Group	
		Graduates	**Program Withdrawals**
		(A)	**(B)**
‘Withdrawal & Fails with Zero’ Rate Range	**50% or Over with Withdrawals or Fails with Zero**		A
	Under 50% Withdrawals or Fails with Zero	B	
	No Withdrawals or Fails with Zero		

Results are based on two-sided tests. For each significant pair, the key of the category with the smaller column proportion appears in the category with the larger column proportion.
Significance level for upper case letters (A, B, C): .05[a]

a. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.

5.6.3 Discussion on Self-Similarity

In determining whether students who withdraw at the program level also exhibit withdrawal at the course level, the analysis showed that the self-similarity proposition was not supported when strictly considering withdrawal data. However, when fails with zero grades, which represent course abandonment, are added to the withdrawal data it was shown that program withdrawal students tend to exhibit self-similarity as their ‘withdrawal and fails with zero’ rates were statistically higher than that of the control group of graduates. The results therefore moderately support the proposition that self-similarity could be a potential early warning signal. This is an original contribution of the research.

The findings align to a certain extent with literature on fractal geometry as applied to the business world. More specifically, Thietart and Forgues's (1995) proposition 5, cited in section 2.1.3. Proposition 5 states that similar organizational structure and process patterns could be identified at different organizational levels, such as the organizational, unit, group and individual levels:

"**Proposition 5**: When in a chaotic state, organizations, generally, have a fractal form.

- **Proposition 5a**: *When in a chaotic state, similar structure patterns are found at the organizational, unit, group and individual levels.*
- **Proposition 5b**: *When in a chaotic state, similar process patterns are found at the organizational, unit, group and individual levels.*" (p. 27).

Similarly, Levy (1994) suggested that such process and structure patterns are scale invariant or fractal-like since stock prices observed over one month, daily or minute by minute exhibited similar patterns. Levy (1994) also suggested that self-similar patterns of behavior could be observed whether one is analyzing competitive behaviour between individuals, departments, firms or even nations. This research on program student withdrawal suggests the same, that self-similar patterns of behavior or withdrawal are exhibited at an average of 39%, by the program withdrawal students, at both the course level and the program level.

5.7 Summary of Discussion

Based on the data analysis, the research findings in this study, followed by the statistical analysis, supported to various degrees the presence of the five generic early warning signals cited by Scheffer et al. (2009). Specifically, the findings in this study supported the presence of the signal for increase in flickering which is consistent with research by Litt et al. (2001) in the medical field, research by Wang et al (2012) in ecology and research by Bakke et al. (2009) in oceanic and atmospheric studies. This research moderately supported the presence of the signal for critical slowing down which is consistent with research findings by Tredicce et al. (2004) on semiconductor lasers and research by Matsumoto and Kunisawa (1978) on biological cells. This research moderately supported the presence of the signal for increase in autocorrelations consistent with research in finance by Lebaron (1992) and climate studies research by Dakos et al. (2008). This research moderately supported the presence of the signal for increase in variance consistent with findings by Bates (1991) in the study of financial crashes and the study by McSharry, Smith, and Tarassenko (2003) on the onset of epileptic seizures. This research also moderately supported the presence of the signal for increase in skewness consistent with findings by Guttal and Jayaprakash (2008). Lastly, the findings in this study also moderately supported the proposed self-similarity as a potential early warning. This was true only when withdrawals and fails with zeroes were taken into account. This finding is consistent with Thietart and Forgues's (1995) proposition 5 which suggests that fractal geometry is applicable in the organizational world.

Finally, the data analysis limitations identified as part of this study resulted in the exclusion of 28 group study and challenge cases for the program withdrawal group and 13 cases for the graduate group in the calculation of critical slowing down; the exclusion of 44 program withdrawal cases with undefined autocorrelations due to the standard deviation being zero; and the exclusion of 36 program withdrawal cases due to their undefined skewness with the standard deviation being zero. These exclusions were inconsequential as they did not decrease the sample size significantly so as to increase the margin of error. One significant limitation stands out, however. The spatial correlation generic early warning signal was not measurable. This is because most courses at the Canadian Distance University are of a rolling individualized study nature. This means that the courses start on the first of every month on an individualized basis and not on a student cohort basis. Therefore, due to the absence of a student cohort it was not possible to spatially correlate student grades and identify how students influence one another.

CHAPTER VI: CONCLUSION

This section provides the concluding remarks based on the data analysis and the research findings. It also discusses the research implications to theory and management practice and charts potential future research directions. In making the concluding comments, it is important to revisit two key definitions adopted for this research:

- ***Findings support the signal:*** When the signal is exhibited by over 50% of the program withdrawal test group and less than 50% of the graduate control group, and the difference in the proportions is statistically significant.
- ***Findings moderately support the signal:*** When the signal is exhibited by over 50% of the program withdrawal test group and over 50% of the graduate control group, and the difference in the proportions is statistically significant, OR when the signal is exhibited by less than 50% of the program withdrawal test group and less than 50% of the graduate control group, and the difference in the proportions is statistically significant

6.1 Implications to Theory

The implications to theory could be identified in reference to the primary research question which was:

How valid are the generic early warning signals for critical transitions as a predictive management tool when assessed within the context of program withdrawal management among undergraduate distance students?

The findings of this study supported the theory on generic early warning signals for critical transitions. Specifically, upon examining the signals collectively as applied to the specific case study of program student withdrawal at a Canadian Distance University, the research data supported the signal on the rise in flickering, which is the back and forth shift, a bistable region prior to a student's critical transition from active status to inactive status. This finding was consistent with some of the reviewed literature such as the Litt et al. (2001) research in the medical field, the Wang et al. (2012) research in ecology; and the Bakke et al. (2009) in oceanic and atmospheric studies. All of these studies identified flickering that preceded critical transitions in their respective fields.

The findings of this study also provided moderate support for the signal of critical slowing down confirming other literature reviewed such as the Tredicce et al. (2004) research on semiconductor lasers and the Matsumoto and Kunisawa (1978) research on biological cells. These studies showed that a system exhibited a slow rate of recovery from perturbations prior to critical transition.

The increase in autocorrelation signal also received moderate support from this study's findings which is consistent with the Lebaron (1992) research in finance and the Dakos et al. (2008) research in climate studies. These latter studies showed that the state of the system increasingly resembled its previous state prior to a critical transition.

The increase in variance signal, resulting from the accumulating impact of non-decaying shocks, also received moderate support from this study in line with Bates (1991) who investigated increased volatility prior to financial crashes, and McSharry, Smith, and Tarassenko's (2003) research on increase in volatility prior to the onset of epileptic seizures.

The signal for increase in skewness was also moderately supported by this research and was therefore consistent with the findings of Guttal and Jayaprakash (2008) that skewness exists prior to a critical transition due to asymmetry in the stability landscape. Finally, the signal on increase in spatial correlation was not measurable due to the absence of a student cohort at the Canadian Distance University.

This research also investigated a secondary research question:

Does the emergence of a program withdrawal status among undergraduate distance students exhibit a self-similarity at the program level and the course level?

The proposed signal of self-similarity also received moderate support from the data. Therefore, the results provided some support for the application of fractal geometry on student attrition in a distance education setting. This is an original contribution of the research that is consistent with the Thietart and Forgues's (1995) proposition 5 on the applicability of fractal geometry in the organizational world.

Table VI-1 provides a summary of the research findings in this study and the respective conclusions:

Table VI-1: Summary of Research Findings

Signal	Descriptor	Program Withdrawal Group (Test Group)	Graduate Group (Control Group)	Significance Testing at 95% Confidence Level	Conclusion
Assessment of signals cited in literature					
Critical Slowing Down	More time spent in a course	87%	66%	Statistically Significant Difference	Moderate support
Increase in Autocorrelation	Rise in autocorrelation of grade variable	65%	53%	Statistically Significant Difference	Moderate support
Increase in Variance	Rise in Variance of grade variable	64%	55%	Statistically Significant Difference	Moderate support
Increase in Skewness	Rise in Skewness of grade variable	67%	52%	Statistically Significant Difference	Moderate support
Rise in Flickering	Incidences of non-pass states	78%	44%	Statistically Significant Difference	Support
Original contribution: Proposed generic early warning signal					
Self-Similarity (proposed signal)	'Withdrawal and Fails with Zero' Rate	39% mean	21% mean	Statistically Significant Difference	Moderate support

6.2 Implications to Management Practice

The literature review in Chapter II identified a research gap due to the absence of any applications for the generic early warning signals in the area of managing undergraduate program student withdrawal, specifically at institutions with a student population consisting largely of non-traditional adult learners. Program withdrawal is a problem. According to Wojciechowski and Palmer (2005) and Kember (1995), the program withdrawal rate amongst distance university students is higher than the program withdrawal rate at conventional universities. This has implications on the perceived success of distance universities. Furthermore, the program withdrawal problem presents a financial concern for distance universities because in the United Kingdom for example, public funding is dependent on the volume of students who complete their courses (Simpson, 2005). The withdrawal problem is therefore associated with financial costs to both the student and the institution (McCubbin, 2003). The successful validation of five generic early warning signals including variance, skewness, autocorrelation, flickering and critical slowing down, and the successful validation of the proposed sixth signal of self-similarity as applied to the program student withdrawal problem at the Canadian Distance University, lay the foundation for developing a predictive management tool. Student advisers could utilize this tool to create viable intervention points and reduce program withdrawals. The predictive management tool could be a dashboard consisting of the five-supported generic early warning signals, in addition to the proposed sixth signal of self-similarity. The dashboard could be programmed so that the signals are periodically calculated and updated as the students progress through their programs of study on a monthly or term basis. This is done by extracting the variables on the course final grades, course completion status, course start dates and course completion dates as recorded in the student database for each and every course the students register in and automatically calculating the signals. Students exhibiting any of the generic early warning signals, such as a rise in variance, skewness, autocorrelation, flickering and critical slowing down, including the additional signal of self-similarity, could be subject to an intervention by a student advisor. Given the resource limitations of student advising capacity at post-secondary institutions, specifically in terms of budgetary constraints, the number of personnel allocated to advising duties, along with technical capacity limitations and time management limitations, the interventions could be prioritized. First by either introducing an intervention(s) to those students who exhibit a signal in a significant way, thereby warranting a red alert. An intervention(s) could also be introduced to those who exhibit multiple signals in moderate ways or the same moderate signal on multiple occasions, thereby resulting in Multiple Advanced Yellow Alerts or MAYA. The specific nature, level or extent of the interventions is beyond the scope of this research. However, the interventions would have to be customized depending on the signals' severity levels and frequencies. For example, a severe signal might require an in-person meeting as opposed to a phone call, a letter or an email. It might also require an escalation of the intervention case from the portfolio of junior student advisors to the portfolio of senior student advisors or even program directors if warranted. Utilizing the generic early warning signals for critical transitions to develop a prioritization system for student intervention could be of practical use for improving student retention and program completion rates.

Even though the research focused on the Canadian Distance University the findings would be of relevance to other institutions in the Canadian Virtual University who share an environment comparable to that of the Canadian Distance University. The predictive management tool and the subsequent intervention programs could therefore be of relevance and of use to a wider audience of distance universities such as the University of New Brunswick, Royal Roads University, Athabasca University, University of Manitoba, Laurentian University, Thompson Rivers University, Carleton University, Mount Royal University, Memorial University of Newfoundland, Royal Military College of Canada and Universite TELUQ to name a few.

6.3 Potential Future Research Directions

Despite these research findings supporting much of the theory on generic early warning signals it should be stressed that the findings are only relevant to the specific case study of this research i.e. the Canadian Distance University with self-paced courses. Further validation is required through applications at other distance and traditional institutions to determine the generalizability of the findings of this study beyond the Canadian Distance University.

With the research finding's largely moderate support of the generic early warning signals as applied to the program student withdrawal problem, further research could be undertaken to incorporate these signals into predictive regression models. The result might be the development of refined intervention programs to mitigate the program student withdrawal problem.

Since program withdrawal is shown to be self-similar in the sense that it is preceded by course withdrawals, then it could be suggested that emergence is self-similar in this specific case study of program withdrawals. This renders the self-similarity characteristic of emergence as a generic early warning signal in and of itself. The finding could be used to investigate whether emergence is also self-similar at other distance and traditional universities. The finding could also be used to investigate whether emergence is self-similar in other fields, such as science or finance or economics. If the finding is validated in other fields then this builds confidence in that this proposed early warning signal could also be labeled as being generic.

Given the potential presence of accurate assignment databases at other institutions, the self-similarity analysis could be expanded to determine whether the generic early warning signals exhibited at the program level prior to program withdrawal and the course level prior to course withdrawal are also exhibited at the intra-course level through the analysis of assignment data. If such an analysis produces positive results then it has the potential to push the utility of the signal of self-similarity to an even earlier phase.

6.4 Reflections

This section provides personal thoughts on the author's research journey.

6.4.1 Research Success and Failure

While the generic early warning signals for critical transitions have both their promoters, such as Scheffer et al. (2009), Litt et al. (2001), Wang et al (2012), Tredicce et al. (2004), and Matsumoto and Kunisawa (1978) to name a few, they also have their detractors. In fact, Scheffer et al. (2009) recognize challenges associated with identifying early warning signals in natural complex systems, which incorporate much noise and external unpredictable factors. Bates (1991) who argued that measures of increased trade volatility precede some financial events, also sometimes observed volatility calm prior to abrupt changes. Boerlijst, Oudman and de Roos (2013) showed that the early warning signals for the catastrophic collapse in simple ecological models could be absent. They argued that a detailed mathematical understanding of the approaching bifurcation can only be recognized in retrospect.

Nevertheless, this research into generic early warning signals for critical transitions as applied to the program student withdrawal problem successfully aligns with the promoters camp. The research findings supported one generic early warning signal, flickering, and moderately supported the remaining four signals: variance, skewness, autocorrelation and critical slowing down. Although the research into the signal of spatial correlations could not be undertaken due to the lack of a student cohort, the proposed signal of self-similarity was moderately supported. This proposed signal extends knowledge by adding one more tool to the known toolbox of early warning signals, a toolbox that the research showed could be potentially utilized as a predictive management tool.

6.4.2 Personal Learning

The doctoral journey has been an immersive experience in systems' level thinking. It showed first hand that academic ideas in various unrelated fields, such as science and business, could successfully cross disciplines. Not only metaphorically, but also through direct applications. Therefore, staying abreast of advances in other disciplines could help advance one's own field of interest in innovative ways.

Coming to terms with research limitations is also an important lesson. While the researcher's objective was to prove the universality of the generic early warning signals, the signal of spatial correlation could not be tested. Furthermore, applying the signals successfully to one case study, the Canadian Distance University, limited their viability to the one case. Generalizability is always a challenge. At the personal level the researcher does not see that as a failure, but as an opportunity to investigate other case studies to further support or refute the literature on generic early warning signals.

Trust also plays a significant role in research. Since the analysis relied heavily on data stored in the Canadian Distance University's student database, the researcher had to trust that the student provided the correct data, that the data entry clerks entered the data correctly, that the database administrators ensured data integrity, and that the information technology professionals facilitated the extraction of the data within the requested parameters. The number of stakeholders entrusted with the research therefore goes beyond the researcher and his immediate supervisory committee. Trusting in the professionalism of the distant circle of stakeholders is essential for moving research forward.

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APPENDICES

Appendix A: Certification of Ethics Approval

Athabasca University
RESEARCH CENTRE

October 22, 2014

Mr. Sami Houry
Office of the Vice President, Academic\Institutional Studies
Athabasca University

File No: 21567

Expiry Date: October 21, 2015

Dear Mr. Sami Houry,

Thank you for your recent resubmission to the Faculty of Business Departmental Ethics Review Committee, addressing the clarifications and revisions as requested for your research entitled, 'Generic Early Warning Signals for Critical Transitions: An assessment and an investigation into fractal-like dimensions through a business lens.'.

Your application has been **Approved** and this memorandum constitutes a ***Certification of Ethics Approval***. You may begin the research immediately.
It is noted that you will require [redacted] Institutional Approval to access university systems, staff or students. This approval process has been initiated by the Office of Research Ethics on your behalf. You will be advised in writing as soon as this process is concluded.

This REB approval, dated October 22, 2014, is valid for one year less a day.

Throughout the duration of this REB approval, all requests for modifications, renewals and serious adverse event reports must be submitted via the Research Portal.

To continue your proposed research beyond October 21, 2015, you must submit a Renewal Form before September 15, 2015.

When your research is concluded, you must submit a Final Report Form to close out REB approval monitoring efforts.

At any time, you can login to the Research Portal to monitor the workflow status of your application.

If you encounter any issues when working in the Research Portal, please contact the system administrator at research_portal@athabascau.ca.

Sincerely,

Fathi Elloumi
Chair, Faculty of Business Departmental Ethics Review Committee
Research Ethics Board

Appendix B: Institutional Permission

MEMORANDUM

Office of the Vice President Academic

November 04, 2014

TO: Mr. Sami Houry
Office of the Vice President, Academic\Institutional Studies, Graduate Student
[redacted] University

COPY: Supervisor
Registrar, AU
Institutional Studies, AU
Office of the Vice President Academic

SUBJECT: Institutional Permission - REB File No. 21567

You have been approved to contact [redacted] University staff, students and systems for your research proposal 'Generic Early Warning Signals for Critical Transitions: An assessment and an investigation into fractal-like dimensions through a business lens.' subject to the following conditions:

1. Your research proposal has been approved by the Athabasca University Research Ethics Board (AUREB);
2. Staff and student information is used solely for the purpose outlined in the research proposal submitted to the AUREB;
3. Secondary uses of data or subsequent research proposal(s) will require additional approval of the AUREB, permission of the staff or former staff, students or former students and institutional permission if the individual is still an [redacted] University staff or student;
4. Staff and student participants will be provided with information about how information will be represented in documentation, reports and publications;
5. Staff and student information will not be shared with a third party;
6. The nature of communication with staff and students is that outlined in the research proposal submitted to the AUREB;
7. Staff and student demographic information will be used solely within the research project;
8. Documentation such as staff and student responses to questionnaires, interview responses (written or taped), observations of individual staff or student behaviors, etc. will not be used for any purpose other than that outlined in the research proposal submitted to the AUREB;
9. Staff and student information will be kept confidential until it is destroyed after a period not in excess of 10 years;

10. Use of personal information will be in compliance with the **Freedom of Information, Protection of Privacy (FOIP)** legislation of the province of Alberta, Canada.

I wish you every success with your research project.

Dr. Cindy Ives
Vice President, Academic (Interim)

Appendix C: Structured Querying Language for the Program Withdrawal Data Extract

```
CREATE INDEX idx_trix_hist_assignment
  ON trix.hist_assignment
     (stud_id, start_dt, crs_id);


DROP TABLE tmpn_all_ass CASCADE CONSTRAINTS;


CREATE TABLE tmpn_all_ass AS
(
SELECT au_util.s_to_p(TO_CHAR(stud_id))  stu_pidm,
       TO_CHAR(start_dt,'YYYYMM') start_term,
       SUBSTR(crs_id,1,4)        subj_code,
       SUBSTR(crs_id,5,3)        crse_numb,
       asg_no,
       mark,
       TRUNC(comp_dt)                  receive_date,
       TRUNC(mark_dt)                  mark_date,
       TRUNC(create_dt)                create_date
  FROM trix.hist_assignment a
  WHERE a.comp_dt = (SELECT MAX (b.comp_dt)
                     FROM trix.hist_assignment b
                     WHERE b.stud_id  = a.stud_id
                       AND b.start_dt = a.start_dt
                       AND b.crs_id   = a.crs_id )
UNION
```

```
SELECT stu_pidm,
       TO_CHAR(start_dt,'YYYYMM') start_term,
       subj_code,
       crse_numb,
       asg_no,
       mark,
       TRUNC(receive_dt)            receive_date,
       TRUNC(mark_dt)               mark_date,
       TRUNC(create_dt)             create_date
  FROM trix.assignment )
;

DROP INDEX idx_trix_hist_assignment;

CREATE INDEX idx_tmpn_all_ass
  ON tmpn_all_ass
    (stu_pidm, start_term, subj_code, crse_numb, asg_no);

DELETE
  FROM nazrat.tmpn_all_ass a
  WHERE 1 < ( SELECT COUNT(*)
              FROM nazrat.tmpn_all_ass b
              WHERE b.stu_pidm = a.stu_pidm
                AND b.start_term = a.start_term
                AND b.subj_code  = a.subj_code
                AND b.crse_numb  = a.crse_numb
                AND b.asg_no     = a.asg_no);
```

```
SELECT COUNT(*)
  FROM nazrat.tmpn_all_ass;

--On 2015-12021 17:34  time 07:56 mins
--Index created.
--Table dropped.
--Table created.
--Index dropped.
--Index created.
--66 rows deleted.

--  COUNT(*)
----------
--   3595004
--1 row selected.
--------------------------------------------------------------------------------

CREATE INDEX idx_trix_hist_trix_reg
  ON trix.hist_trix_reg
    (stud_id, start_dt, crs_id);

DROP TABLE tmpn_all_regs CASCADE CONSTRAINTS;

CREATE TABLE tmpn_all_regs AS
(
SELECT stu_pidm,
```

```
      TO_CHAR(start_dt,'YYYYMM') start_term,
      subj_code,
      crse_numb,
      crs_del,
      cm_revision,
      crs_scm,
      calc_grade
  FROM trix.newtreg a
  WHERE a.upd_dt = (SELECT MAX(b.upd_dt)
                    FROM trix.newtreg b
                    WHERE b.stu_pidm = a.stu_pidm
                      AND TO_CHAR(b.start_dt,'YYYYMM') =
TO_CHAR(a.start_dt,'YYYYMM')
                      AND b.subj_code = a.subj_code
                      AND b.crse_numb = a.crse_numb)
UNION
SELECT au_util.s_to_p(TO_CHAR(stud_id))  stu_pidm,
      TO_CHAR(start_dt,'YYYYMM') start_term,
      SUBSTR(crs_id,1,4)        subj_code,
      SUBSTR(crs_id,5,3)        crse_numb,
      crs_del,
      ' ',
      crs_scm,
      calc_grade
  FROM trix.hist_trix_reg a
  WHERE a.upd_dt = (SELECT MAX(b.upd_dt)
                    FROM trix.hist_trix_reg b
```

```
                 WHERE b.stud_id = a.stud_id
                  AND TO_CHAR(b.start_dt,'YYYYMM') =
TO_CHAR(a.start_dt,'YYYYMM')
                  AND b.crs_id = a.crs_id)
);

DROP INDEX idx_trix_hist_trix_reg;

CREATE INDEX idx_tmpn_all_regs
  ON tmpn_all_regs
    (stu_pidm, start_term, subj_code, crse_numb);


DELETE FROM tmpn_all_regs a     -- get rid of duplicates
  WHERE 1 < ( SELECT COUNT(*)
             FROM tmpn_all_regs b
             WHERE b.stu_pidm = a.stu_pidm
               AND b.start_term = a.start_term
               AND b.subj_code  = a.subj_code
               AND b.crse_numb  = a.crse_numb);

SELECT COUNT(*)
  FROM tmpn_all_regs;

--On 2015-12021 17:42  time 06:11 mins
--Index created.
--Table dropped.
```

```
--Table created.
--Index dropped.
--Index created.
--121 rows deleted.

--  COUNT(*)
----------
--   1426151
--1 row selected.
--------------------------------------------------------------------------------
--case  2411795
--         students became enrolled in 'INACTIVE' program, system generated
--         previous to becoming inactivated they were in a bachelor program.
--
-- 2015 11 25

SELECT spriden_id,
     spriden_last_name,
     spriden_first_name,
     spriden_mi,
     ' ',
     g.sgbstdn_program_1      first_program,                    --*
     g.sgbstdn_term_code_eff  first_term_code_eff,
     SUBSTR(g.sgbstdn_term_code_eff,1,4)
     || '-' || SUBSTR(g.sgbstdn_term_code_eff,5,2)
     || '-01'              first_date,
     ' ',
```

```
a.sgbstdn_program_1      current_program,
a.sgbstdn_term_code_eff  current_term_code_eff,
SUBSTR(a.sgbstdn_term_code_eff,1,4)
|| '-' || SUBSTR(a.sgbstdn_term_code_eff,5,2)
|| '-01'                 inactivation_date,
' ',
b.sgbstdn_term_code_eff  previous_term_code_eff,
b.sgbstdn_program_1      previous_program,
b.sgbstdn_majr_code_1    previous_majr_code_1,
b.sgbstdn_majr_code_1_2  previous_majr_code_1_2,
' ',
(SELECT SUM(shrtckg_credit_hours)
    FROM shrtckn, shrtckg e, shrtckl, shrgrde
    WHERE shrtckn_pidm          = spriden_pidm
      AND e.shrtckg_pidm        = shrtckn_pidm
      AND e.shrtckg_term_code   = shrtckn_term_code
      AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
      AND shrtckn_pidm          = shrtckl_pidm
      AND shrtckn_term_code     = shrtckl_term_code
      AND shrtckn_seq_no        = shrtckl_tckn_seq_no
      AND shrgrde_code          = shrtckg_grde_code_final
      AND shrgrde_levl_code     = shrtckl_levl_code
      AND shrgrde_passed_ind    = 'N'
      AND e.shrtckg_seq_no      = (
          SELECT MAX(f.shrtckg_seq_no)
            FROM shrtckg f
            WHERE f.shrtckg_pidm       = spriden_pidm
```

```
                AND f.shrtckg_term_code   = e.shrtckg_term_code
                AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) ) failed_credits,
   (SELECT SUM(shrtckg_credit_hours)
       FROM shrtckn, shrtckg e, shrtckl, shrgrde
       WHERE shrtckn_pidm          = spriden_pidm
        AND e.shrtckg_pidm        = shrtckn_pidm
        AND e.shrtckg_term_code   = shrtckn_term_code
        AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
        AND shrtckn_pidm          = shrtckl_pidm
        AND shrtckn_term_code     = shrtckl_term_code
        AND shrtckn_seq_no        = shrtckl_tckn_seq_no
        AND shrgrde_code          = shrtckg_grde_code_final
        AND shrgrde_levl_code     = shrtckl_levl_code
        AND shrgrde_passed_ind    = 'Y'
        AND e.shrtckg_seq_no      = (
           SELECT MAX(f.shrtckg_seq_no)
             FROM shrtckg f
             WHERE f.shrtckg_pidm        = spriden_pidm
                AND f.shrtckg_term_code   = e.shrtckg_term_code
                AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
passed_credits,
   (SELECT SUM(shrtckg_credit_hours)
       FROM shrtckn, shrtckg e, shrtckl, shrgrde
       WHERE shrtckn_pidm          = spriden_pidm
        AND e.shrtckg_pidm        = shrtckn_pidm
        AND e.shrtckg_term_code   = shrtckn_term_code
        AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
```

```
        AND shrtckn_pidm          = shrtckl_pidm
        AND shrtckn_term_code     = shrtckl_term_code
        AND shrtckn_seq_no        = shrtckl_tckn_seq_no
        AND shrgrde_code          = shrtckg_grde_code_final
        AND shrgrde_levl_code     = shrtckl_levl_code
        AND e.shrtckg_seq_no      = (
           SELECT MAX(f.shrtckg_seq_no)
            FROM shrtckg f
            WHERE f.shrtckg_pidm        = spriden_pidm
             AND f.shrtckg_term_code   = e.shrtckg_term_code
             AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
attempted_credits
 FROM spriden, sgbstdn a, sgbstdn b, sgbstdn g
 WHERE spriden_change_ind IS NULL
  AND a.sgbstdn_pidm = spriden_pidm
  AND a.sgbstdn_term_code_eff >= '201001'
  AND a.sgbstdn_term_code_eff <  '201501'
  AND a.sgbstdn_program_1 = 'INACTIVE'
  AND a.sgbstdn_term_code_eff = (
     select max(c.sgbstdn_term_code_eff)
      from sgbstdn c
      where c.sgbstdn_pidm = spriden_pidm)
  AND b.sgbstdn_pidm = spriden_pidm
  AND b.sgbstdn_term_code_eff =
      (SELECT MAX(d.sgbstdn_term_code_eff)
        FROM sgbstdn d
        WHERE d.sgbstdn_pidm = spriden_pidm
```

```
            AND d.sgbstdn_term_code_eff < a.sgbstdn_term_code_eff)
  AND g.sgbstdn_pidm = spriden_pidm
  AND g.sgbstdn_term_code_eff =
      (SELECT MIN(h.sgbstdn_term_code_eff)
        FROM sgbstdn h
        WHERE h.sgbstdn_pidm = spriden_pidm)
  AND ( b.sgbstdn_program_1 LIKE 'B%'
     OR
     b.sgbstdn_program_1 LIKE 'TCB%')
  AND 6 <=(SELECT SUM(shrtckg_credit_hours)
        FROM shrtckn, shrtckg e, shrtckl, shrgrde
        WHERE shrtckn_pidm         = spriden_pidm
          AND e.shrtckg_pidm       = shrtckn_pidm
          AND e.shrtckg_term_code   = shrtckn_term_code
          AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
          AND shrtckn_pidm         = shrtckl_pidm
          AND shrtckn_term_code     = shrtckl_term_code
          AND shrtckn_seq_no       = shrtckl_tckn_seq_no
          AND shrgrde_code         = shrtckg_grde_code_final
          AND shrgrde_levl_code     = shrtckl_levl_code
          AND shrgrde_passed_ind    = 'N'
          AND e.shrtckg_seq_no      = (
              SELECT MAX(f.shrtckg_seq_no)
               FROM shrtckg f
               WHERE f.shrtckg_pidm       = spriden_pidm
                 AND f.shrtckg_term_code   = e.shrtckg_term_code
                 AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
```

```
AND 30 <=(SELECT SUM(shrtckg_credit_hours)
     FROM shrtckn, shrtckg e, shrtckl, shrgrde
     WHERE shrtckn_pidm          = spriden_pidm
      AND e.shrtckg_pidm        = shrtckn_pidm
      AND e.shrtckg_term_code   = shrtckn_term_code
      AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
      AND shrtckn_pidm          = shrtckl_pidm
      AND shrtckn_term_code     = shrtckl_term_code
      AND shrtckn_seq_no        = shrtckl_tckn_seq_no
      AND shrgrde_code          = shrtckg_grde_code_final
      AND shrgrde_levl_code     = shrtckl_levl_code
      AND e.shrtckg_seq_no      = (
         SELECT MAX(f.shrtckg_seq_no)
          FROM shrtckg f
          WHERE f.shrtckg_pidm        = spriden_pidm
           AND f.shrtckg_term_code   = e.shrtckg_term_code
           AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
AND 0 = (SELECT COUNT(*)                    --not mount royal collab
     FROM sgrsatt
     WHERE sgrsatt_pidm = spriden_pidm
      AND sgrsatt_term_code_eff = b.sgbstdn_term_code_eff
      AND sgrsatt_atts_code IN ('MRC','NMRC'))
AND 0 = (SELECT COUNT(*)                    --not mount royal collab
     FROM saraatt
     WHERE saraatt_pidm = spriden_pidm
      AND saraatt_term_code = b.sgbstdn_term_code_eff
      AND saraatt_atts_code IN ('MRC','NMRC'))
```

```
   AND 0 = (SELECT COUNT(*)                          --not expelled
             FROM sprhold
             WHERE sprhold_pidm = spriden_pidm
               AND sprhold_hldd_code IN ('EX','C2'))
   AND 0 = (SELECT COUNT(*)              --were they inactivated because of graduation?
             FROM shrdgmr
             WHERE shrdgmr_pidm = spriden_pidm
               AND shrdgmr_program = b.sgbstdn_program_1
               AND shrdgmr_degs_code = 'AW')
  ORDER BY spriden_id;

--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
--case  2411795 student course list
--              students who have dropped their program (System Inactivated)
--  PSYC 205 has 54 assignments listed in trix.course_asg,

SELECT spriden_id,
       spriden_last_name,
       spriden_first_name,
       shrtckn_term_code,
       shrtckn_crn,
       shrtckn_subj_code,
       shrtckn_crse_numb,
       shrtckn_seq_numb,
       shrtckn_schd_code,
       shrtckl_levl_code,
```

```
decode(ssbsect_schd_code,
    'R', '9922',
    decode(ssbsect_camp_code,
        'CIM', null,
        decode(substr(ssbsect_seq_numb, 0, 1),
            '0', substr(ssbsect_seq_numb, -2),
            '1', substr(ssbsect_seq_numb, -2),
            '2', substr(ssbsect_seq_numb, -2),
            '3', substr(ssbsect_seq_numb, -2),
            '4', substr(ssbsect_seq_numb, -2),
            '5', substr(ssbsect_seq_numb, -2),
            '6', substr(ssbsect_seq_numb, -2),
            '7', substr(ssbsect_seq_numb, -2),
            '8', substr(ssbsect_seq_numb, -2),
            '9', substr(ssbsect_seq_numb, -2), null)
    )
) as loc_id, --translate seqnumb into seminar location
' ',
shrtckg_grde_code_final,
shrgrde_passed_ind,
shrgrde_quality_points,
shrtckg_credit_hours    credits_attempted,
(shrtckg_credit_hours *
 DECODE(shrgrde_passed_ind, 'Y', 1, 'N', 0, 0)) credits_earned,
sfrstcr_start_date,
sfrstcr_contract_date,
sfrstcr_rsts_code,
```

```
' ',
(SELECT crs_del
  FROM nazrat.tmpn_all_regs
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb)    newtreg_crs_del,
(SELECT  cm_revision
  FROM nazrat.tmpn_all_regs
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb)    newtreg_cm_revision,
(SELECT crs_scm
  FROM nazrat.tmpn_all_regs
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb)    newtreg_crs_schema,
(SELECT calc_grade
  FROM nazrat.tmpn_all_regs
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb)    newtreg_calc_grade,
NVL((SELECT MAX(asg_no)
      FROM nazrat.tmpn_all_ass
```

```
        WHERE stu_pidm   = shrtckn_pidm
          AND start_term  = shrtckn_term_code
          AND subj_code  = shrtckn_subj_code
          AND crse_numb  = shrtckn_crse_numb), 0)           AS
max_assg_num_found,
    ' ',
    (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
      FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
      WHERE tn.stu_pidm    = shrtckn_pidm
        AND tn.start_term  = shrtckn_term_code
        AND tn.subj_code   = shrtckn_subj_code
        AND tn.crse_numb   = shrtckn_crse_numb
        AND tca.subj_code = tn.subj_code
        AND tca.crse_numb = tn.crse_numb
        AND tca.crs_del   = tn.crs_del
        AND tca.crs_scm   = tn.crs_scm
        AND tca.asg_no    =  1)              AS assg_01,
    (SELECT mark
      FROM nazrat.tmpn_all_ass
      WHERE stu_pidm   = shrtckn_pidm
        AND start_term = shrtckn_term_code
        AND subj_code  = shrtckn_subj_code
        AND crse_numb  = shrtckn_crse_numb
        AND asg_no     =  1)                 AS mark_01,
    (SELECT receive_date
      FROM nazrat.tmpn_all_ass
      WHERE stu_pidm   = shrtckn_pidm
```

```
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  1)               AS receive_date_01,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  1)               AS mark_date_01,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  1)               AS create_date_01,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
```

```
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  2)               AS assg_02,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  2)                  AS mark_02,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  2)                  AS receive_date_02,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  2)                  AS mark_date_02,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  2)                 AS create_date_02,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  3)                AS assg_03,
(SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  3)                 AS mark_03,
(SELECT receive_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
```

```
    AND asg_no     =  3)                  AS receive_date_03,
(SELECT mark_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  3)                  AS mark_date_03,
(SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  3)                  AS create_date_03,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  4)               AS assg_04,
(SELECT mark
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  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  4)                 AS mark_04,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  4)                 AS receive_date_04,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  4)                 AS mark_date_04,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  4)                 AS create_date_04,
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(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  5)              AS assg_05,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  5)                 AS mark_05,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  5)                 AS receive_date_05,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
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   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     =  5)                 AS mark_date_05,
 (SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     =  5)                 AS create_date_05,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
     AND tn.start_term  = shrtckn_term_code
     AND tn.subj_code   = shrtckn_subj_code
     AND tn.crse_numb   = shrtckn_crse_numb
     AND tca.subj_code = tn.subj_code
     AND tca.crse_numb = tn.crse_numb
     AND tca.crs_del   = tn.crs_del
     AND tca.crs_scm   = tn.crs_scm
     AND tca.asg_no    =  6)              AS assg_06,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
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    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  6)                AS mark_06,
(SELECT receive_date
   FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  6)                AS receive_date_06,
(SELECT mark_date
   FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  6)                AS mark_date_06,
(SELECT create_date
   FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  6)                AS create_date_06,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
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      AND tn.start_term  = shrtckn_term_code
      AND tn.subj_code   = shrtckn_subj_code
      AND tn.crse_numb   = shrtckn_crse_numb
      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    =  7)              AS assg_07,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     =  7)                 AS mark_07,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     =  7)                 AS receive_date_07,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
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    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  7)                  AS mark_date_07,
 (SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  7)                  AS create_date_07,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  8)               AS assg_08,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  8)                  AS mark_08,
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(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  8)                 AS receive_date_08,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  8)                 AS mark_date_08,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  8)                 AS create_date_08,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
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      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    =  9)              AS assg_09,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     =  9)                 AS mark_09,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     =  9)                 AS receive_date_09,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     =  9)                 AS mark_date_09,
  (SELECT create_date
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  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  9)                  AS create_date_09,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 10)               AS assg_10,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 10)                  AS mark_10,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
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    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 10)              AS receive_date_10,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 10)              AS mark_date_10,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 10)              AS create_date_10,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
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    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 11)              AS assg_11,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 11)               AS mark_11,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 11)               AS receive_date_11,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 11)               AS mark_date_11,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
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    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 11)                 AS create_date_11,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 12)              AS assg_12,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 12)                 AS mark_12,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
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    AND asg_no     = 12)                 AS receive_date_12,
(SELECT mark_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 12)                 AS mark_date_12,
(SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 12)                 AS create_date_12,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 13)               AS assg_13,
(SELECT mark
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    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 13)                AS mark_13,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 13)                AS receive_date_13,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 13)                AS mark_date_13,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 13)                AS create_date_13,
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(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 14)               AS assg_14,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 14)                  AS mark_14,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 14)                  AS receive_date_14,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
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  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 14)                 AS mark_date_14,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 14)                 AS create_date_14,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 15)              AS assg_15,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 15)                 AS mark_15,
 (SELECT receive_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 15)                 AS receive_date_15,
 (SELECT mark_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 15)                 AS mark_date_15,
 (SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 15)                 AS create_date_15,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
```

```
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 16)              AS assg_16,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 16)                 AS mark_16,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 16)                 AS receive_date_16,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
```

```
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 16)                  AS mark_date_16,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 16)                  AS create_date_16,
  (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
    FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
    WHERE tn.stu_pidm    = shrtckn_pidm
      AND tn.start_term  = shrtckn_term_code
      AND tn.subj_code   = shrtckn_subj_code
      AND tn.crse_numb   = shrtckn_crse_numb
      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    = 17)               AS assg_17,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 17)                  AS mark_17,
```

```
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 17)              AS receive_date_17,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 17)              AS mark_date_17,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 17)              AS create_date_17,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
```

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    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 18)              AS assg_18,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 18)                 AS mark_18,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 18)                 AS receive_date_18,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 18)                 AS mark_date_18,
(SELECT create_date
```

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    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 18)                  AS create_date_18,
  (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
    FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
    WHERE tn.stu_pidm    = shrtckn_pidm
      AND tn.start_term  = shrtckn_term_code
      AND tn.subj_code   = shrtckn_subj_code
      AND tn.crse_numb   = shrtckn_crse_numb
      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    = 19)               AS assg_19,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 19)                  AS mark_19,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
```

```
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 19)                AS receive_date_19,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 19)                AS mark_date_19,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 19)                AS create_date_19,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
```

```
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 20)              AS assg_20,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 20)                 AS mark_20,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 20)                 AS receive_date_20,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 20)                 AS mark_date_20,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 20)                  AS create_date_20,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 21)               AS assg_21,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 21)                  AS mark_21,
 (SELECT receive_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
```

```
    AND asg_no     = 21)                AS receive_date_21,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 21)                AS mark_date_21,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 21)                AS create_date_21,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 22)             AS assg_22,
(SELECT mark
```

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    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 22)                AS mark_22,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 22)                AS receive_date_22,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 22)                AS mark_date_22,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 22)                AS create_date_22,
```

```
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 23)              AS assg_23,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 23)                 AS mark_23,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 23)                 AS receive_date_23,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
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  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 23)                  AS mark_date_23,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 23)                  AS create_date_23,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 24)               AS assg_24,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 24)              AS mark_24,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 24)              AS receive_date_24,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 24)              AS mark_date_24,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 24)              AS create_date_24,
  (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
    FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
    WHERE tn.stu_pidm    = shrtckn_pidm
```

```
     AND tn.start_term  = shrtckn_term_code
     AND tn.subj_code   = shrtckn_subj_code
     AND tn.crse_numb   = shrtckn_crse_numb
     AND tca.subj_code = tn.subj_code
     AND tca.crse_numb = tn.crse_numb
     AND tca.crs_del   = tn.crs_del
     AND tca.crs_scm   = tn.crs_scm
     AND tca.asg_no    = 25)            AS assg_25,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 25)               AS mark_25,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 25)               AS receive_date_25,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
```

```
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 25)                  AS mark_date_25,
 (SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 25)                  AS create_date_25,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 26)                AS assg_26,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 26)                  AS mark_26,
```

```
(SELECT receive_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 26)                AS receive_date_26,
(SELECT mark_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 26)                AS mark_date_26,
(SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 26)                AS create_date_26,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
     AND tn.start_term  = shrtckn_term_code
     AND tn.subj_code   = shrtckn_subj_code
     AND tn.crse_numb   = shrtckn_crse_numb
```

```
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 27)           AS assg_27,
(SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 27)              AS mark_27,
(SELECT receive_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 27)              AS receive_date_27,
(SELECT mark_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 27)              AS mark_date_27,
(SELECT create_date
```

```
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 27)                  AS create_date_27,
  (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
    FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
    WHERE tn.stu_pidm    = shrtckn_pidm
      AND tn.start_term  = shrtckn_term_code
      AND tn.subj_code   = shrtckn_subj_code
      AND tn.crse_numb   = shrtckn_crse_numb
      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    = 28)               AS assg_28,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 28)                  AS mark_28,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
```

```
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 28)              AS receive_date_28,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 28)              AS mark_date_28,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 28)              AS create_date_28,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
```

```
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 29)            AS assg_29,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 29)               AS mark_29,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 29)               AS receive_date_29,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 29)               AS mark_date_29,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
        AND subj_code  = shrtckn_subj_code
        AND crse_numb  = shrtckn_crse_numb
        AND asg_no     = 29)                  AS create_date_29,
    (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
      FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
      WHERE tn.stu_pidm    = shrtckn_pidm
        AND tn.start_term  = shrtckn_term_code
        AND tn.subj_code   = shrtckn_subj_code
        AND tn.crse_numb   = shrtckn_crse_numb
        AND tca.subj_code = tn.subj_code
        AND tca.crse_numb = tn.crse_numb
        AND tca.crs_del   = tn.crs_del
        AND tca.crs_scm   = tn.crs_scm
        AND tca.asg_no    = 30)               AS assg_30,
    (SELECT mark
      FROM nazrat.tmpn_all_ass
      WHERE stu_pidm   = shrtckn_pidm
        AND start_term = shrtckn_term_code
        AND subj_code  = shrtckn_subj_code
        AND crse_numb  = shrtckn_crse_numb
        AND asg_no     = 30)                  AS mark_30,
    (SELECT receive_date
      FROM nazrat.tmpn_all_ass
      WHERE stu_pidm   = shrtckn_pidm
        AND start_term = shrtckn_term_code
        AND subj_code  = shrtckn_subj_code
        AND crse_numb  = shrtckn_crse_numb
```

```
    AND asg_no     = 30)                AS receive_date_30,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 30)                AS mark_date_30,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 30)                AS create_date_30,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 31)             AS assg_31,
(SELECT mark
```

```
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 31)                AS mark_31,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 31)                AS receive_date_31,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 31)                AS mark_date_31,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 31)                AS create_date_31,
```

```
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 32)              AS assg_32,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 32)                 AS mark_32,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 32)                 AS receive_date_32,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
```

```
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 32)              AS mark_date_32,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 32)              AS create_date_32,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 33)           AS assg_33,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 33)                 AS mark_33,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 33)                 AS receive_date_33,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 33)                 AS mark_date_33,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 33)                 AS create_date_33,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
```

```
      AND tn.start_term  = shrtckn_term_code
      AND tn.subj_code   = shrtckn_subj_code
      AND tn.crse_numb   = shrtckn_crse_numb
      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    = 34)              AS assg_34,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 34)                 AS mark_34,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 34)                 AS receive_date_34,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
```

```
        AND crse_numb  = shrtckn_crse_numb
        AND asg_no     = 34)                 AS mark_date_34,
     (SELECT create_date
       FROM nazrat.tmpn_all_ass
       WHERE stu_pidm   = shrtckn_pidm
        AND start_term = shrtckn_term_code
        AND subj_code  = shrtckn_subj_code
        AND crse_numb  = shrtckn_crse_numb
        AND asg_no     = 34)                 AS create_date_34
FROM spriden, sgbstdn a, sgbstdn b,
     shrtckn, shrtckl, shrtckg ga, shrgrde, sfrstcr, ssbsect
WHERE spriden_change_ind IS NULL
  AND a.sgbstdn_pidm = spriden_pidm
  AND a.sgbstdn_term_code_eff >= '201001'
  AND a.sgbstdn_term_code_eff <  '201501'
  AND a.sgbstdn_program_1 = 'INACTIVE'
  AND a.sgbstdn_term_code_eff = (
       select max(c.sgbstdn_term_code_eff)
        from sgbstdn c
        where c.sgbstdn_pidm = spriden_pidm)
  AND b.sgbstdn_pidm = spriden_pidm
  AND b.sgbstdn_term_code_eff =
        (SELECT MAX(d.sgbstdn_term_code_eff)
          FROM sgbstdn d
          WHERE d.sgbstdn_pidm = spriden_pidm
            AND d.sgbstdn_term_code_eff < a.sgbstdn_term_code_eff)
  AND ( b.sgbstdn_program_1 LIKE 'B%'
```

```
    OR
    b.sgbstdn_program_1 LIKE 'TCB%')
AND 6 <=(SELECT SUM(shrtckg_credit_hours)
      FROM shrtckn, shrtckg e, shrtckl, shrgrde
      WHERE shrtckn_pidm          = spriden_pidm
        AND e.shrtckg_pidm        = shrtckn_pidm
        AND e.shrtckg_term_code   = shrtckn_term_code
        AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
        AND shrtckn_pidm          = shrtckl_pidm
        AND shrtckn_term_code     = shrtckl_term_code
        AND shrtckn_seq_no        = shrtckl_tckn_seq_no
        AND shrgrde_code          = shrtckg_grde_code_final
        AND shrgrde_levl_code     = shrtckl_levl_code
        AND shrgrde_passed_ind    = 'N'
        AND e.shrtckg_seq_no      = (
            SELECT MAX(f.shrtckg_seq_no)
              FROM shrtckg f
              WHERE f.shrtckg_pidm        = spriden_pidm
                AND f.shrtckg_term_code   = e.shrtckg_term_code
                AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
AND 30 <=(SELECT SUM(shrtckg_credit_hours)
      FROM shrtckn, shrtckg e, shrtckl, shrgrde
      WHERE shrtckn_pidm          = spriden_pidm
        AND e.shrtckg_pidm        = shrtckn_pidm
        AND e.shrtckg_term_code   = shrtckn_term_code
        AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
        AND shrtckn_pidm          = shrtckl_pidm
```

```
            AND shrtckn_term_code     = shrtckl_term_code
            AND shrtckn_seq_no        = shrtckl_tckn_seq_no
            AND shrgrde_code          = shrtckg_grde_code_final
            AND shrgrde_levl_code     = shrtckl_levl_code
            AND e.shrtckg_seq_no      = (
                SELECT MAX(f.shrtckg_seq_no)
                  FROM shrtckg f
                  WHERE f.shrtckg_pidm       = spriden_pidm
                    AND f.shrtckg_term_code   = e.shrtckg_term_code
                    AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
AND 0 = (SELECT COUNT(*)                      --not mount royal collab
          FROM sgrsatt
          WHERE sgrsatt_pidm = spriden_pidm
            AND sgrsatt_term_code_eff = b.sgbstdn_term_code_eff
            AND sgrsatt_atts_code IN ('MRC','NMRC'))
AND 0 = (SELECT COUNT(*)                      --not mount royal collab
          FROM saraatt
          WHERE saraatt_pidm = spriden_pidm
            AND saraatt_term_code = b.sgbstdn_term_code_eff
            AND saraatt_atts_code IN ('MRC','NMRC'))
AND 0 = (SELECT COUNT(*)                      --not expelled
          FROM sprhold
          WHERE sprhold_pidm = spriden_pidm
            AND sprhold_hldd_code IN ('EX','C2'))
AND 0 = (SELECT COUNT(*)              --were they inactivated because of graduation?
          FROM shrdgmr
          WHERE shrdgmr_pidm = spriden_pidm
```

```
            AND shrdgmr_program = b.sgbstdn_program_1
            AND shrdgmr_degs_code = 'AW')
   AND shrtckn_pidm       = spriden_pidm
   AND shrtckl_pidm       = shrtckn_pidm
   AND shrtckl_term_code   = shrtckn_term_code
   AND shrtckl_tckn_seq_no = shrtckn_seq_no
   AND shrtckg_pidm       = shrtckn_pidm
   AND shrtckg_term_code   = shrtckn_term_code
   AND shrtckg_tckn_seq_no = shrtckn_seq_no
   AND shrtckg_seq_no = (
       SELECT MAX(gb.shrtckg_seq_no)
         FROM shrtckg gb
        WHERE gb.shrtckg_pidm       = ga.shrtckg_pidm
          AND gb.shrtckg_term_code   = ga.shrtckg_term_code
          AND gb.shrtckg_tckn_seq_no = ga.shrtckg_tckn_seq_no)
   AND shrgrde_code       = shrtckg_grde_code_final
   AND shrgrde_levl_code   = shrtckl_levl_code
   AND sfrstcr_pidm(+)      = shrtckn_pidm
   AND sfrstcr_term_code(+) = shrtckn_term_code
   AND sfrstcr_crn(+)       = shrtckn_crn
   AND ssbsect_term_code    = shrtckn_term_code
   AND ssbsect_crn          = shrtckn_crn
--   AND spriden_id = '2010033'
  ORDER BY spriden_id,
           shrtckn_term_code,
           shrtckn_subj_code,
           shrtckn_crse_numb;
```

--7:26 min, 21408 rows

Appendix D: Structured Querying Language for the Graduate Data Extract

```
-- Case 2604437 list of students graduated as bachelors
-- 2015 12 21 Changed to get trix as well as newton data.
--          tables tmpn_all_ass and tmpn_all_regs created in
--          case_2604437_drop_c_sql.txt file
--
SELECT spriden_id,
     spriden_last_name,
     spriden_first_name,
     spriden_mi,
     ' ',
     g.sgbstdn_program_1      first_program,                    --*
     g.sgbstdn_term_code_eff  first_term_code_eff,
     SUBSTR(g.sgbstdn_term_code_eff,1,4)
     || '-' || SUBSTR(g.sgbstdn_term_code_eff,5,2)
     || '-01'            first_date,
     ' ',
     a.sgbstdn_program_1      current_program,
     a.sgbstdn_term_code_eff  current_term_code_eff,
     SUBSTR(a.sgbstdn_term_code_eff,1,4)
     || '-' || SUBSTR(a.sgbstdn_term_code_eff,5,2)
     || '-01'            current_start_date,
     ' ',
     b.sgbstdn_term_code_eff  previous_term_code_eff,
```

```
b.sgbstdn_program_1      previous_program,
b.sgbstdn_majr_code_1    previous_majr_code_1,
b.sgbstdn_majr_code_1_2  previous_majr_code_1_2,
' ',
shrdgmr_term_code_sturec,
shrdgmr_term_code_ctlg_1,
shrdgmr_term_code_grad,
shrdgmr_program,
shrdgmr_degc_code,
shrdgmr_degs_code,
TO_CHAR(shrdgmr_grad_date,'YYYYMMDD')   grad_date,
' ',
(SELECT SUM(shrtckg_credit_hours)
       FROM shrtckn, shrtckg e, shrtckl, shrgrde
       WHERE shrtckn_pidm          = spriden_pidm
         AND e.shrtckg_pidm        = shrtckn_pidm
         AND e.shrtckg_term_code   = shrtckn_term_code
         AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
         AND shrtckn_pidm          = shrtckl_pidm
         AND shrtckn_term_code     = shrtckl_term_code
         AND shrtckn_seq_no        = shrtckl_tckn_seq_no
         AND shrgrde_code          = shrtckg_grde_code_final
         AND shrgrde_levl_code     = shrtckl_levl_code
         AND shrgrde_passed_ind    = 'N'
```

```
                AND e.shrtckg_seq_no      = (
                    SELECT MAX(f.shrtckg_seq_no)
                      FROM shrtckg f
                     WHERE f.shrtckg_pidm        = spriden_pidm
                       AND f.shrtckg_term_code   = e.shrtckg_term_code
                       AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) ) failed_credits,
       (SELECT SUM(shrtckg_credit_hours)
          FROM shrtckn, shrtckg e, shrtckl, shrgrde
         WHERE shrtckn_pidm          = spriden_pidm
           AND e.shrtckg_pidm        = shrtckn_pidm
           AND e.shrtckg_term_code   = shrtckn_term_code
           AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
           AND shrtckn_pidm          = shrtckl_pidm
           AND shrtckn_term_code     = shrtckl_term_code
           AND shrtckn_seq_no        = shrtckl_tckn_seq_no
           AND shrgrde_code          = shrtckg_grde_code_final
           AND shrgrde_levl_code     = shrtckl_levl_code
           AND shrgrde_passed_ind    = 'Y'
           AND e.shrtckg_seq_no      = (
                    SELECT MAX(f.shrtckg_seq_no)
                      FROM shrtckg f
                     WHERE f.shrtckg_pidm        = spriden_pidm
                       AND f.shrtckg_term_code   = e.shrtckg_term_code
                       AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
passed_credits,
```

```
    (SELECT SUM(shrtckg_credit_hours)
        FROM shrtckn, shrtckg e, shrtckl, shrgrde
        WHERE shrtckn_pidm          = spriden_pidm
          AND e.shrtckg_pidm        = shrtckn_pidm
          AND e.shrtckg_term_code   = shrtckn_term_code
          AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
          AND shrtckn_pidm          = shrtckl_pidm
          AND shrtckn_term_code     = shrtckl_term_code
          AND shrtckn_seq_no        = shrtckl_tckn_seq_no
          AND shrgrde_code          = shrtckg_grde_code_final
          AND shrgrde_levl_code     = shrtckl_levl_code
          AND e.shrtckg_seq_no      = (
                SELECT MAX(f.shrtckg_seq_no)
                  FROM shrtckg f
                  WHERE f.shrtckg_pidm        = spriden_pidm
                    AND f.shrtckg_term_code   = e.shrtckg_term_code
                    AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
attempted_credits
  FROM spriden, sgbstdn a, sgbstdn b, sgbstdn g, shrdgmr
  WHERE spriden_change_ind IS NULL
    AND shrdgmr_pidm = spriden_pidm
    AND shrdgmr_degs_code = 'AW'
    AND shrdgmr_grad_date >= '01-jan-2010'
    AND shrdgmr_grad_date <  '01-jan-2015'
    AND ( shrdgmr_program LIKE 'B%' OR
```

```
    shrdgmr_program LIKE 'TCB%')
AND a.sgbstdn_pidm = spriden_pidm
AND a.sgbstdn_term_code_eff = (
    select max(c.sgbstdn_term_code_eff)
      from sgbstdn c
      where c.sgbstdn_pidm = spriden_pidm)
AND b.sgbstdn_pidm = spriden_pidm
AND b.sgbstdn_term_code_eff =
      (SELECT MAX(d.sgbstdn_term_code_eff)
        FROM sgbstdn d
        WHERE d.sgbstdn_pidm = spriden_pidm
          AND d.sgbstdn_term_code_eff = shrdgmr_term_code_sturec)
AND g.sgbstdn_pidm = spriden_pidm
AND g.sgbstdn_term_code_eff =
      (SELECT MIN(h.sgbstdn_term_code_eff)
        FROM sgbstdn h
        WHERE h.sgbstdn_pidm = spriden_pidm)
AND 6 <=(SELECT SUM(shrtckg_credit_hours)
        FROM shrtckn, shrtckg e, shrtckl, shrgrde
        WHERE shrtckn_pidm         = spriden_pidm
          AND e.shrtckg_pidm        = shrtckn_pidm
          AND e.shrtckg_term_code   = shrtckn_term_code
          AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
          AND shrtckn_pidm          = shrtckl_pidm
```

```
      AND shrtckn_term_code     = shrtckl_term_code
      AND shrtckn_seq_no        = shrtckl_tckn_seq_no
      AND shrgrde_code          = shrtckg_grde_code_final
      AND shrgrde_levl_code     = shrtckl_levl_code
      AND shrgrde_passed_ind    = 'N'
      AND e.shrtckg_seq_no      = (
         SELECT MAX(f.shrtckg_seq_no)
          FROM shrtckg f
          WHERE f.shrtckg_pidm        = spriden_pidm
           AND f.shrtckg_term_code   = e.shrtckg_term_code
           AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
AND 30 <=(SELECT SUM(shrtckg_credit_hours)
     FROM shrtckn, shrtckg e, shrtckl, shrgrde
     WHERE shrtckn_pidm          = spriden_pidm
      AND e.shrtckg_pidm        = shrtckn_pidm
      AND e.shrtckg_term_code   = shrtckn_term_code
      AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
      AND shrtckn_pidm          = shrtckl_pidm
      AND shrtckn_term_code     = shrtckl_term_code
      AND shrtckn_seq_no        = shrtckl_tckn_seq_no
      AND shrgrde_code          = shrtckg_grde_code_final
      AND shrgrde_levl_code     = shrtckl_levl_code
      AND e.shrtckg_seq_no      = (
         SELECT MAX(f.shrtckg_seq_no)
```

```
          FROM shrtckg f
          WHERE f.shrtckg_pidm        = spriden_pidm
            AND f.shrtckg_term_code   = e.shrtckg_term_code
            AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
  AND 0 = (SELECT COUNT(*)                          --not mount royal collab
      FROM sgrsatt
      WHERE sgrsatt_pidm = spriden_pidm
        AND sgrsatt_term_code_eff = b.sgbstdn_term_code_eff
        AND sgrsatt_atts_code IN ('MRC','NMRC'))
  AND 0 = (SELECT COUNT(*)                          --not mount royal collab
      FROM saraatt
      WHERE saraatt_pidm = spriden_pidm
        AND saraatt_term_code = b.sgbstdn_term_code_eff
        AND saraatt_atts_code IN ('MRC','NMRC'))
  AND 0 = (SELECT COUNT(*)                          --not expelled
      FROM sprhold
      WHERE sprhold_pidm = spriden_pidm
        AND sprhold_hldd_code IN ('EX','C2'))
 ORDER BY spriden_id;

-- 862 rows
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
--case  2604437 student course list with assignments up to 34
```

```
--successful graduates
--

SELECT spriden_id,
       spriden_last_name,
       spriden_first_name,
       shrtckn_term_code,
       shrtckn_crn,
       shrtckn_subj_code,
       shrtckn_crse_numb,
       shrtckn_seq_numb,
       shrtckn_schd_code,
       shrtckl_levl_code,
       decode(ssbsect_schd_code,
              'R', '9922',
              decode(ssbsect_camp_code,
                     'CIM', null,
                     decode(substr(ssbsect_seq_numb, 0, 1),
                            '0', substr(ssbsect_seq_numb, -2),
                            '1', substr(ssbsect_seq_numb, -2),
                            '2', substr(ssbsect_seq_numb, -2),
                            '3', substr(ssbsect_seq_numb, -2),
                            '4', substr(ssbsect_seq_numb, -2),
                            '5', substr(ssbsect_seq_numb, -2),
```

```
                    '6', substr(ssbsect_seq_numb, -2),
                    '7', substr(ssbsect_seq_numb, -2),
                    '8', substr(ssbsect_seq_numb, -2),
                    '9', substr(ssbsect_seq_numb, -2), null)
          )
     ) as loc_id, --translate seqnumb into seminar location
     ' ',
     shrtckg_grde_code_final,
     shrgrde_passed_ind,
     shrgrde_quality_points,
     shrtckg_credit_hours       credits_attempted,
     (shrtckg_credit_hours *
      DECODE(shrgrde_passed_ind, 'Y', 1, 'N', 0, 0)) credits_earned,
     sfrstcr_start_date,
     sfrstcr_contract_date,
     sfrstcr_rsts_code,
     ' ',
     (SELECT crs_del
        FROM nazrat.tmpn_all_regs
        WHERE stu_pidm   = shrtckn_pidm
          AND start_term = shrtckn_term_code
          AND subj_code  = shrtckn_subj_code
          AND crse_numb  = shrtckn_crse_numb)    newtreg_crs_del,
     (SELECT  cm_revision
```

```
    FROM nazrat.tmpn_all_regs
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb)    newtreg_cm_revision,
  (SELECT crs_scm
    FROM nazrat.tmpn_all_regs
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb)    newtreg_crs_schema,
  (SELECT calc_grade
    FROM nazrat.tmpn_all_regs
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb)    newtreg_calc_grade,
  NVL((SELECT MAX(asg_no)
        FROM nazrat.tmpn_all_ass
        WHERE stu_pidm   = shrtckn_pidm
          AND start_term  = shrtckn_term_code
          AND subj_code  = shrtckn_subj_code
          AND crse_numb  = shrtckn_crse_numb), 0)            AS
max_assg_num_found,
  ' ',
```

```
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  1)              AS assg_01,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  1)                 AS mark_01,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
```

```
    AND asg_no     =  1)                  AS receive_date_01,
 (SELECT mark_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  1)                  AS mark_date_01,
 (SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  1)                  AS create_date_01,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
```

```
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  2)               AS assg_02,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  2)                  AS mark_02,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  2)                  AS receive_date_02,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  2)                  AS mark_date_02,
(SELECT create_date
```

```
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     =  2)                  AS create_date_02,
  (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
    FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
    WHERE tn.stu_pidm    = shrtckn_pidm
      AND tn.start_term  = shrtckn_term_code
      AND tn.subj_code   = shrtckn_subj_code
      AND tn.crse_numb   = shrtckn_crse_numb
      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    =  3)               AS assg_03,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     =  3)                  AS mark_03,
```

```
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  3)                 AS receive_date_03,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  3)                 AS mark_date_03,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  3)                 AS create_date_03,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
```

```
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  4)              AS assg_04,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  4)                 AS mark_04,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  4)                 AS receive_date_04,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
```

```
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  4)                  AS mark_date_04,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  4)                  AS create_date_04,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  5)               AS assg_05,
(SELECT mark
```

```
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  5)              AS mark_05,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  5)              AS receive_date_05,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  5)              AS mark_date_05,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  5)                  AS create_date_05,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  6)               AS assg_06,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  6)                  AS mark_06,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
```

```
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  6)                AS receive_date_06,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  6)                AS mark_date_06,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  6)                AS create_date_06,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
```

```
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  7)             AS assg_07,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  7)                AS mark_07,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  7)                AS receive_date_07,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
```

```
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  7)                  AS mark_date_07,
 (SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  7)                  AS create_date_07,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  8)               AS assg_08,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  8)                 AS mark_08,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  8)                 AS receive_date_08,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  8)                 AS mark_date_08,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  8)                 AS create_date_08,
```

```
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    =  9)               AS assg_09,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     =  9)                  AS mark_09,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
```

```
     AND asg_no     =  9)                  AS receive_date_09,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     =  9)                  AS mark_date_09,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     =  9)                  AS create_date_09,
  (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
    FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
    WHERE tn.stu_pidm    = shrtckn_pidm
     AND tn.start_term  = shrtckn_term_code
     AND tn.subj_code   = shrtckn_subj_code
     AND tn.crse_numb   = shrtckn_crse_numb
     AND tca.subj_code = tn.subj_code
     AND tca.crse_numb = tn.crse_numb
     AND tca.crs_del   = tn.crs_del
```

```
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 10)               AS assg_10,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 10)                  AS mark_10,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 10)                  AS receive_date_10,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 10)                  AS mark_date_10,
(SELECT create_date
```

```
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 10)                AS create_date_10,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 11)             AS assg_11,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 11)                AS mark_11,
```

```
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 11)                  AS receive_date_11,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 11)                  AS mark_date_11,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 11)                  AS create_date_11,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
```

```
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 12)            AS assg_12,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 12)               AS mark_12,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 12)               AS receive_date_12,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
```

```
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 12)                  AS mark_date_12,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 12)                  AS create_date_12,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 13)               AS assg_13,
(SELECT mark
```

```
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 13)                AS mark_13,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 13)                AS receive_date_13,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 13)                AS mark_date_13,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
```

```
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 13)                  AS create_date_13,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 14)               AS assg_14,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 14)                  AS mark_14,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
```

```
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 14)              AS receive_date_14,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 14)              AS mark_date_14,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 14)              AS create_date_14,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
```

```
     AND tca.subj_code = tn.subj_code
     AND tca.crse_numb = tn.crse_numb
     AND tca.crs_del   = tn.crs_del
     AND tca.crs_scm   = tn.crs_scm
     AND tca.asg_no    = 15)            AS assg_15,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 15)               AS mark_15,
 (SELECT receive_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 15)               AS receive_date_15,
 (SELECT mark_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
```

```
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 15)                  AS mark_date_15,
 (SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 15)                  AS create_date_15,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 16)               AS assg_16,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 16)              AS mark_16,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 16)              AS receive_date_16,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 16)              AS mark_date_16,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 16)              AS create_date_16,
```

```
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 17)              AS assg_17,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 17)                 AS mark_17,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
```

```
    AND asg_no     = 17)                  AS receive_date_17,
(SELECT mark_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 17)                  AS mark_date_17,
(SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 17)                  AS create_date_17,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
```

```
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 18)              AS assg_18,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 18)                 AS mark_18,
 (SELECT receive_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 18)                 AS receive_date_18,
 (SELECT mark_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 18)                 AS mark_date_18,
 (SELECT create_date
```

```
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 18)                AS create_date_18,
  (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
    FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
    WHERE tn.stu_pidm    = shrtckn_pidm
      AND tn.start_term  = shrtckn_term_code
      AND tn.subj_code   = shrtckn_subj_code
      AND tn.crse_numb   = shrtckn_crse_numb
      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    = 19)             AS assg_19,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 19)                AS mark_19,
```

```
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 19)                  AS receive_date_19,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 19)                  AS mark_date_19,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 19)                  AS create_date_19,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
```

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     AND tn.start_term  = shrtckn_term_code
     AND tn.subj_code   = shrtckn_subj_code
     AND tn.crse_numb   = shrtckn_crse_numb
     AND tca.subj_code = tn.subj_code
     AND tca.crse_numb = tn.crse_numb
     AND tca.crs_del   = tn.crs_del
     AND tca.crs_scm   = tn.crs_scm
     AND tca.asg_no    = 20)            AS assg_20,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 20)               AS mark_20,
 (SELECT receive_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 20)               AS receive_date_20,
 (SELECT mark_date
   FROM nazrat.tmpn_all_ass
```

```
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 20)                 AS mark_date_20,
(SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
     AND start_term = shrtckn_term_code
     AND subj_code  = shrtckn_subj_code
     AND crse_numb  = shrtckn_crse_numb
     AND asg_no     = 20)                 AS create_date_20,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
     AND tn.start_term  = shrtckn_term_code
     AND tn.subj_code   = shrtckn_subj_code
     AND tn.crse_numb   = shrtckn_crse_numb
     AND tca.subj_code = tn.subj_code
     AND tca.crse_numb = tn.crse_numb
     AND tca.crs_del   = tn.crs_del
     AND tca.crs_scm   = tn.crs_scm
     AND tca.asg_no    = 21)               AS assg_21,
(SELECT mark
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    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 21)                AS mark_21,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 21)                AS receive_date_21,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 21)                AS mark_date_21,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
```

```
  AND subj_code  = shrtckn_subj_code
  AND crse_numb  = shrtckn_crse_numb
  AND asg_no     = 21)                  AS create_date_21,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
 FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
 WHERE tn.stu_pidm    = shrtckn_pidm
  AND tn.start_term  = shrtckn_term_code
  AND tn.subj_code   = shrtckn_subj_code
  AND tn.crse_numb   = shrtckn_crse_numb
  AND tca.subj_code = tn.subj_code
  AND tca.crse_numb = tn.crse_numb
  AND tca.crs_del   = tn.crs_del
  AND tca.crs_scm   = tn.crs_scm
  AND tca.asg_no    = 22)               AS assg_22,
(SELECT mark
 FROM nazrat.tmpn_all_ass
 WHERE stu_pidm   = shrtckn_pidm
  AND start_term = shrtckn_term_code
  AND subj_code  = shrtckn_subj_code
  AND crse_numb  = shrtckn_crse_numb
  AND asg_no     = 22)                  AS mark_22,
(SELECT receive_date
 FROM nazrat.tmpn_all_ass
 WHERE stu_pidm   = shrtckn_pidm
```

```
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 22)              AS receive_date_22,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 22)              AS mark_date_22,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 22)              AS create_date_22,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
```

```
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 23)              AS assg_23,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 23)                 AS mark_23,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 23)                 AS receive_date_23,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
```

```
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 23)                 AS mark_date_23,
 (SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 23)                 AS create_date_23,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 24)              AS assg_24,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 24)               AS mark_24,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 24)               AS receive_date_24,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 24)               AS mark_date_24,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 24)               AS create_date_24,
```

```
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 25)              AS assg_25,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 25)                 AS mark_25,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
```

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    AND asg_no     = 25)                AS receive_date_25,
 (SELECT mark_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 25)                AS mark_date_25,
 (SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 25)                AS create_date_25,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
```

```
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 26)              AS assg_26,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 26)                 AS mark_26,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 26)                 AS receive_date_26,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 26)                 AS mark_date_26,
(SELECT create_date
```

```
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 26)                 AS create_date_26,
  (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
    FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
    WHERE tn.stu_pidm    = shrtckn_pidm
      AND tn.start_term  = shrtckn_term_code
      AND tn.subj_code   = shrtckn_subj_code
      AND tn.crse_numb   = shrtckn_crse_numb
      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    = 27)              AS assg_27,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 27)                 AS mark_27,
```

```
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 27)                 AS receive_date_27,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 27)                 AS mark_date_27,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 27)                 AS create_date_27,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
```

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      AND tn.start_term  = shrtckn_term_code
      AND tn.subj_code   = shrtckn_subj_code
      AND tn.crse_numb   = shrtckn_crse_numb
      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    = 28)             AS assg_28,
  (SELECT mark
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 28)                AS mark_28,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 28)                AS receive_date_28,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
```

```
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 28)                AS mark_date_28,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 28)                AS create_date_28,
  (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
    FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
    WHERE tn.stu_pidm    = shrtckn_pidm
      AND tn.start_term  = shrtckn_term_code
      AND tn.subj_code   = shrtckn_subj_code
      AND tn.crse_numb   = shrtckn_crse_numb
      AND tca.subj_code = tn.subj_code
      AND tca.crse_numb = tn.crse_numb
      AND tca.crs_del   = tn.crs_del
      AND tca.crs_scm   = tn.crs_scm
      AND tca.asg_no    = 29)              AS assg_29,
  (SELECT mark
```

```
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 29)                 AS mark_29,
  (SELECT receive_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 29)                 AS receive_date_29,
  (SELECT mark_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 29)                 AS mark_date_29,
  (SELECT create_date
    FROM nazrat.tmpn_all_ass
    WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
```

```
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 29)                 AS create_date_29,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 30)              AS assg_30,
(SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 30)                 AS mark_30,
(SELECT receive_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
```

```
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 30)              AS receive_date_30,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 30)              AS mark_date_30,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 30)              AS create_date_30,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
```

```
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 31)            AS assg_31,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 31)               AS mark_31,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 31)               AS receive_date_31,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
```

```
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 31)                  AS mark_date_31,
 (SELECT create_date
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 31)                  AS create_date_31,
 (SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
   FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
   WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 32)               AS assg_32,
 (SELECT mark
   FROM nazrat.tmpn_all_ass
   WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
```

```
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 32)              AS mark_32,
   (SELECT receive_date
     FROM nazrat.tmpn_all_ass
     WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 32)              AS receive_date_32,
   (SELECT mark_date
     FROM nazrat.tmpn_all_ass
     WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 32)              AS mark_date_32,
   (SELECT create_date
     FROM nazrat.tmpn_all_ass
     WHERE stu_pidm   = shrtckn_pidm
      AND start_term = shrtckn_term_code
      AND subj_code  = shrtckn_subj_code
      AND crse_numb  = shrtckn_crse_numb
      AND asg_no     = 32)              AS create_date_32,
```

```
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 33)              AS assg_33,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 33)                 AS mark_33,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
```

```
    AND asg_no     = 33)                 AS receive_date_33,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 33)                 AS mark_date_33,
(SELECT create_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 33)                 AS create_date_33,
(SELECT asg_type || ', '|| RPAD(asg_nm,12,' ') || ', ' || descr
  FROM trix.course_asg tca, nazrat.tmpn_all_regs tn
  WHERE tn.stu_pidm    = shrtckn_pidm
    AND tn.start_term  = shrtckn_term_code
    AND tn.subj_code   = shrtckn_subj_code
    AND tn.crse_numb   = shrtckn_crse_numb
    AND tca.subj_code = tn.subj_code
    AND tca.crse_numb = tn.crse_numb
    AND tca.crs_del   = tn.crs_del
```

```
    AND tca.crs_scm   = tn.crs_scm
    AND tca.asg_no    = 34)              AS assg_34,
(SELECT mark
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 34)                 AS mark_34,
(SELECT receive_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 34)                 AS receive_date_34,
(SELECT mark_date
  FROM nazrat.tmpn_all_ass
  WHERE stu_pidm   = shrtckn_pidm
    AND start_term = shrtckn_term_code
    AND subj_code  = shrtckn_subj_code
    AND crse_numb  = shrtckn_crse_numb
    AND asg_no     = 34)                 AS mark_date_34,
(SELECT create_date
```

```
        FROM nazrat.tmpn_all_ass
        WHERE stu_pidm   = shrtckn_pidm
          AND start_term = shrtckn_term_code
          AND subj_code  = shrtckn_subj_code
          AND crse_numb  = shrtckn_crse_numb
          AND asg_no     = 34)                  AS create_date_34
 FROM spriden, sgbstdn b, ssbsect,
     shrtckn, shrtckl, shrtckg ga, shrgrde, sfrstcr, shrdgmr
 WHERE spriden_change_ind IS NULL
   AND shrdgmr_pidm = spriden_pidm
   AND shrdgmr_degs_code = 'AW'
   AND shrdgmr_grad_date >= '01-jan-2010'
   AND shrdgmr_grad_date <  '01-jan-2015'
   AND ( shrdgmr_program LIKE 'B%' OR
        shrdgmr_program LIKE 'TCB%')
   AND 6 <=(SELECT SUM(shrtckg_credit_hours)
            FROM shrtckn, shrtckg e, shrtckl, shrgrde
            WHERE shrtckn_pidm          = spriden_pidm
              AND e.shrtckg_pidm        = shrtckn_pidm
              AND e.shrtckg_term_code   = shrtckn_term_code
              AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
              AND shrtckn_pidm          = shrtckl_pidm
              AND shrtckn_term_code     = shrtckl_term_code
              AND shrtckn_seq_no        = shrtckl_tckn_seq_no
```

```
            AND shrgrde_code          = shrtckg_grde_code_final
            AND shrgrde_levl_code     = shrtckl_levl_code
            AND shrgrde_passed_ind    = 'N'
            AND e.shrtckg_seq_no      = (
               SELECT MAX(f.shrtckg_seq_no)
                FROM shrtckg f
                WHERE f.shrtckg_pidm        = spriden_pidm
                 AND f.shrtckg_term_code   = e.shrtckg_term_code
                 AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
      AND 30 <=(SELECT SUM(shrtckg_credit_hours)
           FROM shrtckn, shrtckg e, shrtckl, shrgrde
           WHERE shrtckn_pidm          = spriden_pidm
            AND e.shrtckg_pidm        = shrtckn_pidm
            AND e.shrtckg_term_code   = shrtckn_term_code
            AND e.shrtckg_tckn_seq_no = shrtckn_seq_no
            AND shrtckn_pidm          = shrtckl_pidm
            AND shrtckn_term_code     = shrtckl_term_code
            AND shrtckn_seq_no        = shrtckl_tckn_seq_no
            AND shrgrde_code          = shrtckg_grde_code_final
            AND shrgrde_levl_code     = shrtckl_levl_code
            AND e.shrtckg_seq_no      = (
               SELECT MAX(f.shrtckg_seq_no)
                FROM shrtckg f
                WHERE f.shrtckg_pidm        = spriden_pidm
```

```
                    AND f.shrtckg_term_code   = e.shrtckg_term_code
                    AND f.shrtckg_tckn_seq_no = e.shrtckg_tckn_seq_no) )
AND b.sgbstdn_pidm = spriden_pidm
AND b.sgbstdn_term_code_eff =
      (SELECT MAX(d.sgbstdn_term_code_eff)
         FROM sgbstdn d
         WHERE d.sgbstdn_pidm = spriden_pidm
           AND d.sgbstdn_term_code_eff = shrdgmr_term_code_sturec)
AND 0 = (SELECT COUNT(*)                     --not mount royal collab
         FROM sgrsatt
         WHERE sgrsatt_pidm = spriden_pidm
           AND sgrsatt_term_code_eff = b.sgbstdn_term_code_eff
           AND sgrsatt_atts_code IN ('MRC','NMRC'))
AND 0 = (SELECT COUNT(*)                     --not mount royal collab
         FROM saraatt
         WHERE saraatt_pidm = spriden_pidm
           AND saraatt_term_code = b.sgbstdn_term_code_eff
           AND saraatt_atts_code IN ('MRC','NMRC'))
AND 0 = (SELECT COUNT(*)                     --not expelled
         FROM sprhold
         WHERE sprhold_pidm = spriden_pidm
           AND sprhold_hldd_code IN ('EX','C2'))
AND shrtckn_pidm       = spriden_pidm
AND shrtckl_pidm       = shrtckn_pidm
```

```
  AND shrtckl_term_code   = shrtckn_term_code
  AND shrtckl_tckn_seq_no = shrtckn_seq_no
  AND shrtckg_pidm        = shrtckn_pidm
  AND shrtckg_term_code   = shrtckn_term_code
  AND shrtckg_tckn_seq_no = shrtckn_seq_no
  AND shrtckg_seq_no = (
    SELECT MAX(gb.shrtckg_seq_no)
     FROM shrtckg gb
     WHERE gb.shrtckg_pidm        = ga.shrtckg_pidm
      AND gb.shrtckg_term_code   = ga.shrtckg_term_code
      AND gb.shrtckg_tckn_seq_no = ga.shrtckg_tckn_seq_no)
  AND shrgrde_code        = shrtckg_grde_code_final
  AND shrgrde_levl_code   = shrtckl_levl_code
  AND sfrstcr_pidm(+)      = shrtckn_pidm
  AND sfrstcr_term_code(+) = shrtckn_term_code
  AND sfrstcr_crn(+)       = shrtckn_crn
  AND ssbsect_term_code    = shrtckn_term_code
  AND ssbsect_crn          = shrtckn_crn
 ORDER BY spriden_id,
      shrtckn_term_code,
      shrtckn_subj_code,
      shrtckn_crse_numb;

--19168 rows  02:17 min
```

Appendix E: Flickering Calculations for the Program Withdrawal Group

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
1	20%	80%	60%	Rise in Flickering
2	18%	41%	24%	Rise in Flickering
3	33%	17%	-17%	Decline in Flickering
4	18%	55%	36%	Rise in Flickering
5	20%	40%	20%	Rise in Flickering
6	17%	67%	50%	Rise in Flickering
7	31%	77%	46%	Rise in Flickering
8	73%	100%	27%	Rise in Flickering
9	78%	89%	11%	Rise in Flickering
10	0%	60%	60%	Rise in Flickering
11	20%	60%	40%	Rise in Flickering
12	0%	33%	33%	Rise in Flickering
13	14%	71%	57%	Rise in Flickering
14	17%	83%	67%	Rise in Flickering
15	0%	33%	33%	Rise in Flickering
16	67%	33%	-33%	Decline in Flickering
17	50%	17%	-33%	Decline in Flickering
18	90%	60%	-30%	Decline in Flickering
19	67%	100%	33%	Rise in Flickering
20	20%	60%	40%	Rise in Flickering
21	33%	0%	-33%	Decline in Flickering
22	14%	43%	29%	Rise in Flickering
23	14%	86%	71%	Rise in Flickering
24	9%	82%	73%	Rise in Flickering
25	0%	40%	40%	Rise in Flickering
26	0%	79%	79%	Rise in Flickering
27	23%	38%	15%	Rise in Flickering
28	50%	100%	50%	Rise in Flickering
29	27%	55%	27%	Rise in Flickering
30	14%	57%	43%	Rise in Flickering
31	0%	57%	57%	Rise in Flickering
32	17%	100%	83%	Rise in Flickering
33	57%	100%	43%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
34	20%	40%	20%	Rise in Flickering
35	45%	36%	-9%	Decline in Flickering
36	29%	57%	29%	Rise in Flickering
37	20%	20%	0%	No change in Flickering
38	0%	33%	33%	Rise in Flickering
39	17%	50%	33%	Rise in Flickering
40	0%	67%	67%	Rise in Flickering
41	17%	17%	0%	No change in Flickering
42	0%	40%	40%	Rise in Flickering
43	64%	36%	-29%	Decline in Flickering
44	20%	100%	80%	Rise in Flickering
45	67%	67%	0%	No change in Flickering
46	44%	44%	0%	No change in Flickering
47	83%	67%	-17%	Decline in Flickering
48	8%	23%	15%	Rise in Flickering
49	40%	20%	-20%	Decline in Flickering
50	33%	33%	0%	No change in Flickering
51	0%	25%	25%	Rise in Flickering
52	50%	88%	38%	Rise in Flickering
53	57%	14%	-43%	Decline in Flickering
54	47%	67%	20%	Rise in Flickering
55	71%	57%	-14%	Decline in Flickering
56	83%	100%	17%	Rise in Flickering
57	23%	0%	-23%	Decline in Flickering
58	67%	100%	33%	Rise in Flickering
59	42%	67%	25%	Rise in Flickering
60	50%	100%	50%	Rise in Flickering
61	50%	100%	50%	Rise in Flickering
62	0%	33%	33%	Rise in Flickering
63	29%	29%	0%	No change Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
64	6%	69%	63%	Rise in Flickering
65	75%	88%	13%	Rise in Flickering
66	0%	50%	50%	Rise in Flickering
67	29%	29%	0%	No change in Flickering
68	20%	20%	0%	No change in Flickering
69	0%	100%	100%	Rise in Flickering
70	13%	87%	73%	Rise in Flickering
71	33%	100%	67%	Rise in Flickering
72	60%	100%	40%	Rise in Flickering
73	17%	50%	33%	Rise in Flickering
74	29%	57%	29%	Rise in Flickering
75	11%	33%	22%	Rise in Flickering
76	32%	42%	11%	Rise in Flickering
77	0%	50%	50%	Rise in Flickering
78	0%	30%	30%	Rise in Flickering
79	19%	56%	38%	Rise in Flickering
80	31%	8%	-23%	Decline in Flickering
81	0%	25%	25%	Rise in Flickering
82	33%	67%	33%	Rise in Flickering
83	30%	40%	10%	Rise in Flickering
84	67%	100%	33%	Rise in Flickering
85	80%	53%	-27%	Decline in Flickering
86	80%	60%	-20%	Decline in Flickering
87	0%	70%	70%	Rise in Flickering
88	63%	100%	38%	Rise in Flickering
89	50%	50%	0%	No change in Flickering
90	7%	13%	7%	Rise in Flickering
91	13%	13%	0%	No change in Flickering
92	20%	90%	70%	Rise in Flickering
93	0%	67%	67%	Rise in Flickering
94	44%	67%	22%	Rise in Flickering
95	14%	100%	86%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
96	44%	11%	-33%	Decline in Flickering
97	50%	38%	-13%	Decline in Flickering
98	0%	56%	56%	Rise in Flickering
99	36%	82%	45%	Rise in Flickering
100	13%	75%	63%	Rise in Flickering
101	56%	61%	6%	Rise in Flickering
102	13%	50%	38%	Rise in Flickering
103	9%	9%	0%	No change in Flickering
104	31%	77%	46%	Rise in Flickering
105	14%	71%	57%	Rise in Flickering
106	33%	50%	17%	Rise in Flickering
107	0%	50%	50%	Rise in Flickering
108	14%	29%	14%	Rise in Flickering
109	33%	100%	67%	Rise in Flickering
110	17%	50%	33%	Rise in Flickering
111	62%	100%	38%	Rise in Flickering
112	33%	50%	17%	Rise in Flickering
113	10%	10%	0%	No change in Flickering
114	50%	83%	33%	Rise in Flickering
115	14%	100%	86%	Rise in Flickering
116	0%	31%	31%	Rise in Flickering
117	58%	92%	33%	Rise in Flickering
118	6%	69%	63%	Rise in Flickering
119	44%	33%	-11%	Decline in Flickering
120	27%	36%	9%	Rise in Flickering
121	45%	45%	0%	No change in Flickering
122	17%	50%	33%	Rise in Flickering
123	0%	29%	29%	Rise in Flickering
124	0%	33%	33%	Rise in Flickering
125	22%	56%	33%	Rise in Flickering
126	10%	50%	40%	Rise in Flickering
127	64%	64%	0%	No change in Flickering
128	0%	22%	22%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
129	43%	57%	14%	Rise in Flickering
130	83%	67%	-17%	Decline in Flickering
131	31%	54%	23%	Rise in Flickering
132	20%	30%	10%	Rise in Flickering
133	38%	38%	0%	No change in Flickering
134	0%	88%	88%	Rise in Flickering
135	36%	64%	27%	Rise in Flickering
136	20%	60%	40%	Rise in Flickering
137	50%	90%	40%	Rise in Flickering
138	40%	40%	0%	No change in Flickering
139	56%	19%	-38%	Decline in Flickering
140	17%	67%	50%	Rise in Flickering
141	45%	64%	18%	Rise in Flickering
142	45%	73%	27%	Rise in Flickering
143	71%	100%	29%	Rise in Flickering
144	70%	10%	-60%	Decline in Flickering
145	29%	43%	14%	Rise in Flickering
146	13%	13%	0%	No change in Flickering
147	57%	43%	-14%	Decline in Flickering
148	17%	33%	17%	Rise in Flickering
149	38%	38%	0%	No change in Flickering
150	13%	50%	38%	Rise in Flickering
151	0%	67%	67%	Rise in Flickering
152	0%	31%	31%	Rise in Flickering
153	57%	43%	-14%	Decline in Flickering
154	22%	44%	22%	Rise in Flickering
155	11%	44%	33%	Rise in Flickering
156	71%	86%	14%	Rise in Flickering
157	0%	60%	60%	Rise in Flickering
158	43%	71%	29%	Rise in Flickering
159	20%	40%	20%	Rise in Flickering
160	67%	100%	33%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
161	57%	43%	-14%	Decline in Flickering
162	0%	80%	80%	Rise in Flickering
163	14%	64%	50%	Rise in Flickering
164	33%	67%	33%	Rise in Flickering
165	0%	33%	33%	Rise in Flickering
166	33%	50%	17%	Rise in Flickering
167	7%	29%	21%	Rise in Flickering
168	0%	100%	100%	Rise in Flickering
169	0%	29%	29%	Rise in Flickering
170	17%	33%	17%	Rise in Flickering
171	0%	80%	80%	Rise in Flickering
172	0%	40%	40%	Rise in Flickering
173	17%	67%	50%	Rise in Flickering
174	14%	71%	57%	Rise in Flickering
175	33%	100%	67%	Rise in Flickering
176	17%	50%	33%	Rise in Flickering
177	64%	50%	-14%	Decline in Flickering
178	6%	35%	29%	Rise in Flickering
179	29%	86%	57%	Rise in Flickering
180	62%	43%	-19%	Decline in Flickering
181	21%	63%	42%	Rise in Flickering
182	30%	80%	50%	Rise in Flickering
183	50%	70%	20%	Rise in Flickering
184	26%	21%	-5%	Decline in Flickering
185	0%	25%	25%	Rise in Flickering
186	50%	100%	50%	Rise in Flickering
187	37%	26%	-11%	Decline in Flickering
188	0%	63%	63%	Rise in Flickering
189	75%	100%	25%	Rise in Flickering
190	0%	40%	40%	Rise in Flickering
191	40%	40%	0%	No change in Flickering
192	18%	100%	82%	Rise in Flickering
193	71%	57%	-14%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
194	0%	22%	22%	Rise in Flickering
195	8%	33%	25%	Rise in Flickering
196	29%	14%	-14%	Decline in Flickering
197	30%	43%	13%	Rise in Flickering
198	0%	29%	29%	Rise in Flickering
199	20%	20%	0%	No change in Flickering
200	20%	80%	60%	Rise in Flickering
201	17%	33%	17%	Rise in Flickering
202	33%	67%	33%	Rise in Flickering
203	21%	57%	36%	Rise in Flickering
204	11%	67%	56%	Rise in Flickering
205	63%	75%	13%	Rise in Flickering
206	14%	71%	57%	Rise in Flickering
207	20%	100%	80%	Rise in Flickering
208	0%	25%	25%	Rise in Flickering
209	0%	57%	57%	Rise in Flickering
210	50%	60%	10%	Rise in Flickering
211	40%	90%	50%	Rise in Flickering
212	20%	60%	40%	Rise in Flickering
213	13%	38%	25%	Rise in Flickering
214	10%	80%	70%	Rise in Flickering
215	50%	33%	-17%	Decline in Flickering
216	0%	80%	80%	Rise in Flickering
217	0%	71%	71%	Rise in Flickering
218	13%	63%	50%	Rise in Flickering
219	17%	67%	50%	Rise in Flickering
220	8%	17%	8%	Rise in Flickering
221	45%	55%	9%	Rise in Flickering
222	0%	67%	67%	Rise in Flickering
223	0%	43%	43%	Rise in Flickering
224	9%	55%	45%	Rise in Flickering
225	20%	20%	0%	No change in Flickering
226	0%	50%	50%	Rise in Flickering
227	30%	70%	40%	Rise in Flickering
228	45%	36%	-9%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
229	60%	40%	-20%	Decline in Flickering
230	29%	71%	43%	Rise in Flickering
231	60%	80%	20%	Rise in Flickering
232	50%	80%	30%	Rise in Flickering
233	20%	20%	0%	No change in Flickering
234	22%	89%	67%	Rise in Flickering
235	0%	57%	57%	Rise in Flickering
236	0%	60%	60%	Rise in Flickering
237	20%	40%	20%	Rise in Flickering
238	67%	67%	0%	No change in Flickering
239	7%	50%	43%	Rise in Flickering
240	18%	27%	9%	Rise in Flickering
241	43%	43%	0%	No change in Flickering
242	33%	56%	22%	Rise in Flickering
243	8%	31%	23%	Rise in Flickering
244	50%	100%	50%	Rise in Flickering
245	50%	75%	25%	Rise in Flickering
246	15%	38%	23%	Rise in Flickering
247	0%	33%	33%	Rise in Flickering
248	13%	63%	50%	Rise in Flickering
249	50%	33%	-17%	Decline in Flickering
250	45%	36%	-9%	Decline in Flickering
251	43%	100%	57%	Rise in Flickering
252	33%	83%	50%	Rise in Flickering
253	0%	29%	29%	Rise in Flickering
254	13%	63%	50%	Rise in Flickering
255	40%	0%	-40%	Decline in Flickering
256	28%	59%	31%	Rise in Flickering
257	40%	60%	20%	Rise in Flickering
258	0%	33%	33%	Rise in Flickering
259	25%	75%	50%	Rise in Flickering
260	0%	43%	43%	Rise in Flickering
261	43%	100%	57%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
262	17%	33%	17%	Rise in Flickering
263	0%	60%	60%	Rise in Flickering
264	70%	60%	-10%	Decline in Flickering
265	25%	67%	42%	Rise in Flickering
266	50%	100%	50%	Rise in Flickering
267	50%	50%	0%	No change in Flickering
268	9%	36%	27%	Rise in Flickering
269	33%	100%	67%	Rise in Flickering
270	55%	55%	0%	No change in Flickering
271	29%	93%	64%	Rise in Flickering
272	11%	22%	11%	Rise in Flickering
273	50%	75%	25%	Rise in Flickering
274	80%	40%	-40%	Decline in Flickering
275	63%	100%	38%	Rise in Flickering
276	25%	88%	63%	Rise in Flickering
277	0%	50%	50%	Rise in Flickering
278	17%	50%	33%	Rise in Flickering
279	0%	50%	50%	Rise in Flickering
280	78%	67%	-11%	Decline in Flickering
281	75%	56%	-19%	Decline in Flickering
282	0%	67%	67%	Rise in Flickering
283	43%	86%	43%	Rise in Flickering
284	8%	8%	0%	No change in Flickering
285	17%	67%	50%	Rise in Flickering
286	50%	33%	-17%	Decline in Flickering
287	0%	60%	60%	Rise in Flickering
288	17%	30%	13%	Rise in Flickering
289	31%	46%	15%	Rise in Flickering
290	30%	40%	10%	Rise in Flickering
291	13%	75%	63%	Rise in Flickering
292	17%	33%	17%	Rise in Flickering
293	50%	67%	17%	Rise in Flickering
294	16%	53%	37%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
295	17%	33%	17%	Rise in Flickering
296	78%	78%	0%	No change in Flickering
297	27%	33%	7%	Rise in Flickering
298	29%	57%	29%	Rise in Flickering
299	0%	40%	40%	Rise in Flickering
300	0%	70%	70%	Rise in Flickering
301	0%	40%	40%	Rise in Flickering
302	44%	67%	22%	Rise in Flickering
303	33%	67%	33%	Rise in Flickering
304	38%	50%	13%	Rise in Flickering
305	50%	100%	50%	Rise in Flickering
306	37%	79%	42%	Rise in Flickering
307	0%	33%	33%	Rise in Flickering
308	17%	67%	50%	Rise in Flickering
309	14%	29%	14%	Rise in Flickering
310	43%	86%	43%	Rise in Flickering
311	10%	90%	80%	Rise in Flickering
312	83%	33%	-50%	Decline in Flickering
313	17%	100%	83%	Rise in Flickering
314	29%	57%	29%	Rise in Flickering
315	20%	40%	20%	Rise in Flickering
316	0%	67%	67%	Rise in Flickering
317	50%	30%	-20%	Decline in Flickering
318	0%	50%	50%	Rise in Flickering
319	25%	63%	38%	Rise in Flickering
320	57%	86%	29%	Rise in Flickering
321	29%	71%	43%	Rise in Flickering
322	29%	65%	35%	Rise in Flickering
323	17%	50%	33%	Rise in Flickering
324	15%	85%	69%	Rise in Flickering
325	30%	30%	0%	No change in Flickering
326	0%	33%	33%	Rise in Flickering
327	0%	45%	45%	Rise in Flickering
328	29%	57%	29%	Rise in Flickering
329	33%	17%	-17%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
330	0%	50%	50%	Rise in Flickering
331	0%	60%	60%	Rise in Flickering
332	38%	63%	25%	Rise in Flickering
333	73%	91%	18%	Rise in Flickering
334	44%	89%	44%	Rise in Flickering
335	38%	88%	50%	Rise in Flickering
336	33%	50%	17%	Rise in Flickering
337	30%	60%	30%	Rise in Flickering
338	38%	88%	50%	Rise in Flickering
339	38%	8%	-31%	Decline in Flickering
340	17%	67%	50%	Rise in Flickering
341	45%	100%	55%	Rise in Flickering
342	17%	67%	50%	Rise in Flickering
343	0%	50%	50%	Rise in Flickering
344	25%	56%	31%	Rise in Flickering
345	0%	60%	60%	Rise in Flickering
346	67%	42%	-25%	Decline in Flickering
347	0%	25%	25%	Rise in Flickering
348	27%	53%	27%	Rise in Flickering
349	0%	100%	100%	Rise in Flickering
350	0%	40%	40%	Rise in Flickering
351	0%	33%	33%	Rise in Flickering
352	17%	83%	67%	Rise in Flickering
353	0%	29%	29%	Rise in Flickering
354	50%	67%	17%	Rise in Flickering
355	33%	33%	0%	No change in Flickering
356	50%	67%	17%	Rise in Flickering
357	33%	22%	-11%	Decline in Flickering
358	0%	33%	33%	Rise in Flickering
359	0%	30%	30%	Rise in Flickering
360	14%	43%	29%	Rise in Flickering
361	17%	50%	33%	Rise in Flickering
362	25%	25%	0%	No change in Flickering
363	17%	25%	8%	Rise in Flickering
364	33%	50%	17%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
365	77%	54%	-23%	Decline in Flickering
366	18%	9%	-9%	Decline in Flickering
367	6%	31%	25%	Rise in Flickering
368	33%	17%	-17%	Decline in Flickering
369	0%	71%	71%	Rise in Flickering
370	0%	67%	67%	Rise in Flickering
371	0%	40%	40%	Rise in Flickering
372	0%	50%	50%	Rise in Flickering
373	33%	33%	0%	No change in Flickering
374	0%	33%	33%	Rise in Flickering
375	43%	93%	50%	Rise in Flickering
376	17%	50%	33%	Rise in Flickering
377	17%	83%	67%	Rise in Flickering
378	33%	33%	0%	No change in Flickering
379	62%	77%	15%	Rise in Flickering
380	11%	22%	11%	Rise in Flickering
381	17%	67%	50%	Rise in Flickering
382	17%	17%	0%	No change in Flickering
383	25%	33%	8%	Rise in Flickering
384	0%	44%	44%	Rise in Flickering
385	7%	14%	7%	Rise in Flickering
386	0%	33%	33%	Rise in Flickering
387	20%	40%	20%	Rise in Flickering
388	0%	29%	29%	Rise in Flickering
389	0%	43%	43%	Rise in Flickering
390	14%	14%	0%	No change in Flickering
391	40%	80%	40%	Rise in Flickering
392	43%	43%	0%	No change in Flickering
393	13%	38%	25%	Rise in Flickering
394	17%	50%	33%	Rise in Flickering
395	50%	60%	10%	Rise in Flickering
396	29%	100%	71%	Rise in Flickering
397	33%	100%	67%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
398	13%	13%	0%	No change in Flickering
399	14%	57%	43%	Rise in Flickering
400	50%	50%	0%	No change in Flickering

Appendix F: Flickering Calculations for the Graduate Group

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
1	15%	23%	8%	Rise in Flickering
2	47%	6%	-41%	Decline in Flickering
3	19%	23%	4%	Rise in Flickering
4	57%	0%	-57%	Decline in Flickering
5	36%	27%	-9%	Decline in Flickering
6	54%	62%	8%	Rise in Flickering
7	17%	17%	0%	No change in Flickering
8	36%	9%	-27%	Decline in Flickering
9	13%	25%	13%	Rise in Flickering
10	15%	0%	-15%	Decline in Flickering
11	18%	0%	-18%	Decline in Flickering
12	43%	43%	0%	No change in Flickering
13	6%	6%	0%	No change in Flickering
14	33%	38%	5%	Rise in Flickering
15	7%	21%	14%	Rise in Flickering
16	27%	27%	0%	No change in Flickering
17	17%	33%	17%	Rise in Flickering
18	29%	57%	29%	Rise in Flickering
19	20%	60%	40%	Rise in Flickering
20	83%	50%	-33%	Decline in Flickering
21	40%	0%	-40%	Decline in Flickering
22	11%	0%	-11%	Decline in Flickering
23	18%	45%	27%	Rise in Flickering
24	50%	33%	-17%	Decline in Flickering
25	0%	40%	40%	Rise in Flickering
26	29%	0%	-29%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
27	17%	50%	33%	Rise in Flickering
28	0%	10%	10%	Rise in Flickering
29	18%	73%	55%	Rise in Flickering
30	13%	50%	38%	Rise in Flickering
31	8%	17%	8%	Rise in Flickering
32	14%	43%	29%	Rise in Flickering
33	33%	56%	22%	Rise in Flickering
34	0%	33%	33%	Rise in Flickering
35	0%	11%	11%	Rise in Flickering
36	14%	29%	14%	Rise in Flickering
37	38%	75%	38%	Rise in Flickering
38	7%	7%	0%	No change in Flickering
39	13%	7%	-7%	Decline in Flickering
40	0%	27%	27%	Rise in Flickering
41	9%	27%	18%	Rise in Flickering
42	33%	0%	-33%	Decline in Flickering
43	31%	19%	-13%	Decline in Flickering
44	0%	28%	28%	Rise in Flickering
45	0%	22%	22%	Rise in Flickering
46	25%	8%	-17%	Decline in Flickering
47	43%	29%	-14%	Decline in Flickering
48	0%	25%	25%	Rise in Flickering
49	42%	63%	21%	Rise in Flickering
50	14%	43%	29%	Rise in Flickering
51	29%	14%	-14%	Decline in Flickering
52	33%	0%	-33%	Decline in Flickering
53	11%	17%	6%	Rise in Flickering
54	0%	43%	43%	Rise in Flickering
55	0%	38%	38%	Rise in Flickering
56	0%	21%	21%	Rise in Flickering
57	29%	29%	0%	No change in Flickering
58	14%	7%	-7%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
59	0%	50%	50%	Rise in Flickering
60	23%	0%	-23%	Decline in Flickering
61	0%	27%	27%	Rise in Flickering
62	36%	55%	18%	Rise in Flickering
63	19%	24%	5%	Rise in Flickering
64	27%	0%	-27%	Decline in Flickering
65	0%	17%	17%	Rise in Flickering
66	45%	64%	18%	Rise in Flickering
67	20%	20%	0%	No change in Flickering
68	20%	10%	-10%	Decline in Flickering
69	44%	33%	-11%	Decline in Flickering
70	29%	43%	14%	Rise in Flickering
71	13%	13%	0%	No change in Flickering
72	30%	20%	-10%	Decline in Flickering
73	29%	29%	0%	No change in Flickering
74	57%	0%	-57%	Decline in Flickering
75	25%	13%	-13%	Decline in Flickering
76	22%	0%	-22%	Decline in Flickering
77	8%	8%	0%	No change in Flickering
78	14%	71%	57%	Rise in Flickering
79	82%	36%	-45%	Decline in Flickering
80	9%	26%	17%	Rise in Flickering
81	20%	25%	5%	Rise in Flickering
82	13%	50%	38%	Rise in Flickering
83	25%	56%	31%	Rise in Flickering
84	20%	40%	20%	Rise in Flickering
85	19%	23%	4%	Rise in Flickering
86	33%	4%	-30%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
87	8%	25%	17%	Rise in Flickering
88	40%	0%	-40%	Decline in Flickering
89	17%	0%	-17%	Decline in Flickering
90	57%	43%	-14%	Decline in Flickering
91	30%	0%	-30%	Decline in Flickering
92	14%	14%	0%	No change in Flickering
93	13%	0%	-13%	Decline in Flickering
94	40%	0%	-40%	Decline in Flickering
95	0%	13%	13%	Rise in Flickering
96	7%	7%	0%	No change in Flickering
97	25%	0%	-25%	Decline in Flickering
98	19%	31%	13%	Rise in Flickering
99	8%	31%	23%	Rise in Flickering
100	0%	22%	22%	Rise in Flickering
101	10%	0%	-10%	Decline in Flickering
102	8%	36%	28%	Rise in Flickering
103	0%	13%	13%	Rise in Flickering
104	18%	18%	0%	No change in Flickering
105	0%	33%	33%	Rise in Flickering
106	57%	43%	-14%	Decline in Flickering
107	25%	13%	-13%	Decline in Flickering
108	0%	43%	43%	Rise in Flickering
109	0%	22%	22%	Rise in Flickering
110	20%	20%	0%	No change in Flickering
111	14%	7%	-7%	Decline in Flickering
112	29%	5%	-24%	Decline in Flickering
113	0%	31%	31%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
114	17%	50%	33%	Rise in Flickering
115	14%	14%	0%	No change in Flickering
116	50%	0%	-50%	Decline in Flickering
117	6%	24%	18%	Rise in Flickering
118	33%	0%	-33%	Decline in Flickering
119	9%	14%	5%	Rise in Flickering
120	21%	14%	-7%	Decline in Flickering
121	70%	10%	-60%	Decline in Flickering
122	0%	57%	57%	Rise in Flickering
123	41%	52%	11%	Rise in Flickering
124	10%	30%	20%	Rise in Flickering
125	18%	24%	6%	Rise in Flickering
126	0%	13%	13%	Rise in Flickering
127	38%	38%	0%	No change in Flickering
128	23%	23%	0%	No change in Flickering
129	36%	0%	-36%	Decline in Flickering
130	0%	18%	18%	Rise in Flickering
131	20%	53%	33%	Rise in Flickering
132	24%	29%	6%	Rise in Flickering
133	8%	8%	0%	No change in Flickering
134	0%	40%	40%	Rise in Flickering
135	29%	29%	0%	No change in Flickering
136	50%	0%	-50%	Decline in Flickering
137	17%	17%	0%	No change in Flickering
138	11%	6%	-6%	Decline in Flickering
139	0%	50%	50%	Rise in Flickering
140	32%	74%	42%	Rise in Flickering
141	20%	20%	0%	No change in Flickering
142	0%	10%	10%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
143	8%	17%	8%	Rise in Flickering
144	73%	82%	9%	Rise in Flickering
145	33%	0%	-33%	Decline in Flickering
146	14%	29%	14%	Rise in Flickering
147	14%	0%	-14%	Decline in Flickering
148	50%	25%	-25%	Decline in Flickering
149	14%	0%	-14%	Decline in Flickering
150	14%	7%	-7%	Decline in Flickering
151	22%	11%	-11%	Decline in Flickering
152	33%	0%	-33%	Decline in Flickering
153	11%	11%	0%	No change in Flickering
154	0%	40%	40%	Rise in Flickering
155	29%	14%	-14%	Decline in Flickering
156	92%	8%	-83%	Decline in Flickering
157	8%	23%	15%	Rise in Flickering
158	0%	18%	18%	Rise in Flickering
159	0%	50%	50%	Rise in Flickering
160	8%	25%	17%	Rise in Flickering
161	33%	0%	-33%	Decline in Flickering
162	0%	50%	50%	Rise in Flickering
163	36%	7%	-29%	Decline in Flickering
164	13%	13%	0%	No change in Flickering
165	6%	39%	33%	Rise in Flickering
166	9%	4%	-4%	Decline in Flickering
167	0%	15%	15%	Rise in Flickering
168	20%	20%	0%	No change in Flickering
169	53%	33%	-20%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
170	25%	50%	25%	Rise in Flickering
171	18%	50%	32%	Rise in Flickering
172	20%	20%	0%	No change in Flickering
173	25%	0%	-25%	Decline in Flickering
174	25%	63%	38%	Rise in Flickering
175	5%	10%	5%	Rise in Flickering
176	14%	29%	14%	Rise in Flickering
177	20%	0%	-20%	Decline in Flickering
178	0%	40%	40%	Rise in Flickering
179	10%	20%	10%	Rise in Flickering
180	0%	29%	29%	Rise in Flickering
181	18%	0%	-18%	Decline in Flickering
182	0%	29%	29%	Rise in Flickering
183	43%	17%	-26%	Decline in Flickering
184	12%	6%	-6%	Decline in Flickering
185	40%	0%	-40%	Decline in Flickering
186	17%	0%	-17%	Decline in Flickering
187	56%	0%	-56%	Decline in Flickering
188	19%	38%	19%	Rise in Flickering
189	50%	33%	-17%	Decline in Flickering
190	50%	38%	-13%	Decline in Flickering
191	43%	29%	-14%	Decline in Flickering
192	17%	17%	0%	No change in Flickering
193	29%	29%	0%	No change in Flickering
194	5%	5%	0%	No change in Flickering
195	33%	20%	-13%	Decline in Flickering
196	33%	33%	0%	No change in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
197	5%	24%	19%	Rise in Flickering
198	20%	20%	0%	No change in Flickering
199	21%	21%	0%	No change in Flickering
200	0%	17%	17%	Rise in Flickering
201	20%	0%	-20%	Decline in Flickering
202	14%	43%	29%	Rise in Flickering
203	14%	14%	0%	No change in Flickering
204	15%	0%	-15%	Decline in Flickering
205	11%	11%	0%	No change in Flickering
206	20%	0%	-20%	Decline in Flickering
207	25%	20%	-5%	Decline in Flickering
208	9%	9%	0%	No change in Flickering
209	17%	50%	33%	Rise in Flickering
210	7%	33%	27%	Rise in Flickering
211	0%	29%	29%	Rise in Flickering
212	25%	13%	-13%	Decline in Flickering
213	25%	25%	0%	No change in Flickering
214	0%	25%	25%	Rise in Flickering
215	18%	6%	-12%	Decline in Flickering
216	13%	6%	-6%	Decline in Flickering
217	29%	43%	14%	Rise in Flickering
218	0%	20%	20%	Rise in Flickering
219	22%	22%	0%	No change in Flickering
220	18%	0%	-18%	Decline in Flickering
221	7%	20%	13%	Rise in Flickering
222	14%	43%	29%	Rise in Flickering
223	15%	38%	23%	Rise in Flickering
224	13%	25%	13%	Rise in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
225	25%	13%	-13%	Decline in Flickering
226	6%	18%	12%	Rise in Flickering
227	8%	15%	8%	Rise in Flickering
228	11%	28%	17%	Rise in Flickering
229	38%	25%	-13%	Decline in Flickering
230	0%	42%	42%	Rise in Flickering
231	22%	0%	-22%	Decline in Flickering
232	0%	23%	23%	Rise in Flickering
233	57%	0%	-57%	Decline in Flickering
234	0%	31%	31%	Rise in Flickering
235	0%	22%	22%	Rise in Flickering
236	25%	0%	-25%	Decline in Flickering
237	22%	33%	11%	Rise in Flickering
238	13%	0%	-13%	Decline in Flickering
239	0%	23%	23%	Rise in Flickering
240	27%	0%	-27%	Decline in Flickering
241	33%	33%	0%	No change in Flickering
242	17%	25%	8%	Rise in Flickering
243	20%	20%	0%	No change in Flickering
244	27%	55%	27%	Rise in Flickering
245	20%	20%	0%	No change in Flickering
246	38%	15%	-23%	Decline in Flickering
247	0%	25%	25%	Rise in Flickering
248	17%	8%	-8%	Decline in Flickering
249	29%	29%	0%	No change in Flickering
250	33%	8%	-25%	Decline in Flickering
251	13%	0%	-13%	Decline in Flickering
252	23%	15%	-8%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
253	17%	8%	-8%	Decline in Flickering
254	25%	8%	-17%	Decline in Flickering
255	17%	0%	-17%	Decline in Flickering
256	19%	38%	19%	Rise in Flickering
257	22%	0%	-22%	Decline in Flickering
258	20%	20%	0%	No change in Flickering
259	5%	5%	0%	No change in Flickering
260	10%	10%	0%	No change in Flickering
261	18%	55%	36%	Rise in Flickering
262	33%	0%	-33%	Decline in Flickering
263	18%	12%	-6%	Decline in Flickering
264	0%	15%	15%	Rise in Flickering
265	14%	5%	-9%	Decline in Flickering
266	40%	0%	-40%	Decline in Flickering
267	25%	13%	-13%	Decline in Flickering
268	8%	8%	0%	No change in Flickering
269	14%	29%	14%	Rise in Flickering
270	0%	33%	33%	Rise in Flickering
271	0%	14%	14%	Rise in Flickering
272	9%	9%	0%	No change in Flickering
273	25%	0%	-25%	Decline in Flickering
274	18%	0%	-18%	Decline in Flickering
275	20%	40%	20%	Rise in Flickering
276	5%	18%	14%	Rise in Flickering
277	33%	8%	-25%	Decline in Flickering
278	25%	25%	0%	No change in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
279	23%	31%	8%	Rise in Flickering
280	27%	7%	-20%	Decline in Flickering
281	45%	45%	0%	No change in Flickering
282	14%	43%	29%	Rise in Flickering
283	10%	0%	-10%	Decline in Flickering
284	9%	9%	0%	No change in Flickering
285	0%	18%	18%	Rise in Flickering
286	12%	12%	0%	No change in Flickering
287	26%	11%	-16%	Decline in Flickering
288	26%	16%	-11%	Decline in Flickering
289	0%	20%	20%	Rise in Flickering
290	27%	0%	-27%	Decline in Flickering
291	0%	13%	13%	Rise in Flickering
292	24%	0%	-24%	Decline in Flickering
293	16%	21%	5%	Rise in Flickering
294	0%	13%	13%	Rise in Flickering
295	18%	6%	-12%	Decline in Flickering
296	6%	12%	6%	Rise in Flickering
297	33%	0%	-33%	Decline in Flickering
298	0%	31%	31%	Rise in Flickering
299	12%	18%	6%	Rise in Flickering
300	17%	50%	33%	Rise in Flickering
301	0%	22%	22%	Rise in Flickering
302	27%	27%	0%	No change in Flickering
303	11%	22%	11%	Rise in Flickering
304	90%	10%	-80%	Decline in Flickering
305	9%	18%	9%	Rise in Flickering
306	43%	14%	-29%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
307	6%	13%	6%	Rise in Flickering
308	17%	17%	0%	No change in Flickering
309	14%	14%	0%	No change in Flickering
310	29%	29%	0%	No change in Flickering
311	24%	53%	29%	Rise in Flickering
312	20%	10%	-10%	Decline in Flickering
313	60%	50%	-10%	Decline in Flickering
314	27%	18%	-9%	Decline in Flickering
315	25%	0%	-25%	Decline in Flickering
316	38%	0%	-38%	Decline in Flickering
317	15%	23%	8%	Rise in Flickering
318	7%	14%	7%	Rise in Flickering
319	25%	50%	25%	Rise in Flickering
320	38%	13%	-25%	Decline in Flickering
321	50%	21%	-29%	Decline in Flickering
322	0%	25%	25%	Rise in Flickering
323	9%	27%	18%	Rise in Flickering
324	18%	9%	-9%	Decline in Flickering
325	50%	17%	-33%	Decline in Flickering
326	63%	25%	-38%	Decline in Flickering
327	19%	31%	13%	Rise in Flickering
328	40%	0%	-40%	Decline in Flickering
329	0%	43%	43%	Rise in Flickering
330	0%	20%	20%	Rise in Flickering
331	13%	20%	7%	Rise in Flickering
332	33%	33%	0%	No change in Flickering
333	50%	13%	-38%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
334	75%	75%	0%	No change in Flickering
335	38%	29%	-9%	Decline in Flickering
336	0%	17%	17%	Rise in Flickering
337	80%	40%	-40%	Decline in Flickering
338	25%	29%	4%	Rise in Flickering
339	79%	55%	-24%	Decline in Flickering
340	43%	0%	-43%	Decline in Flickering
341	42%	0%	-42%	Decline in Flickering
342	0%	20%	20%	Rise in Flickering
343	57%	50%	-7%	Decline in Flickering
344	17%	17%	0%	No change in Flickering
345	25%	0%	-25%	Decline in Flickering
346	29%	14%	-14%	Decline in Flickering
347	50%	50%	0%	No change in Flickering
348	60%	60%	0%	No change in Flickering
349	7%	7%	0%	No change in Flickering
350	25%	0%	-25%	Decline in Flickering
351	40%	0%	-40%	Decline in Flickering
352	91%	18%	-73%	Decline in Flickering
353	38%	25%	-13%	Decline in Flickering
354	0%	33%	33%	Rise in Flickering
355	22%	56%	33%	Rise in Flickering
356	44%	69%	25%	Rise in Flickering
357	76%	24%	-53%	Decline in Flickering
358	60%	40%	-20%	Decline in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
359	60%	0%	-60%	Decline in Flickering
360	13%	16%	3%	Rise in Flickering
361	40%	20%	-20%	Decline in Flickering
362	0%	20%	20%	Rise in Flickering
363	30%	0%	-30%	Decline in Flickering
364	11%	44%	33%	Rise in Flickering
365	0%	27%	27%	Rise in Flickering
366	38%	38%	0%	No change in Flickering
367	44%	0%	-44%	Decline in Flickering
368	7%	29%	21%	Rise in Flickering
369	25%	13%	-13%	Decline in Flickering
370	22%	22%	0%	No change in Flickering
371	22%	0%	-22%	Decline in Flickering
372	38%	0%	-38%	Decline in Flickering
373	14%	14%	0%	No change in Flickering
374	5%	19%	14%	Rise in Flickering
375	22%	11%	-11%	Decline in Flickering
376	0%	57%	57%	Rise in Flickering
377	0%	25%	25%	Rise in Flickering
378	12%	24%	12%	Rise in Flickering
379	17%	17%	0%	No change in Flickering
380	15%	0%	-15%	Decline in Flickering
381	27%	18%	-9%	Decline in Flickering
382	25%	50%	25%	Rise in Flickering
383	73%	60%	-13%	Decline in Flickering
384	63%	25%	-38%	Decline in Flickering
385	31%	31%	0%	No change in Flickering

ID	Flickering % Prior to Midpoint of Course Completion	Flickering % Post Midpoint of Course Completion	Change in Flickering	Conclusion on the Flickering Signal
386	52%	62%	10%	Rise in Flickering
387	15%	23%	8%	Rise in Flickering
388	6%	6%	0%	No change in Flickering
389	38%	13%	-25%	Decline in Flickering
390	20%	0%	-20%	Decline in Flickering
391	4%	50%	46%	Rise in Flickering
392	25%	0%	-25%	Decline in Flickering
393	50%	0%	-50%	Decline in Flickering
394	21%	29%	7%	Rise in Flickering
395	12%	12%	0%	No change in Flickering
396	11%	22%	11%	Rise in Flickering
397	20%	7%	-13%	Decline in Flickering
398	33%	0%	-33%	Decline in Flickering
399	7%	20%	13%	Rise in Flickering
400	78%	33%	-44%	Decline in Flickering

Appendix G: Critical Slowing Down Calculations for Program Withdrawal Group

(The 28 IDs for students with majority group study or challenge courses have been skipped)

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
1	222.4	340.0	117.6	More time spent in course
2	136.4	201.2	64.9	More time spent in course
3	202.3	380.5	178.2	More time spent in course
4	246.6	526.3	279.6	More time spent in course
5	317.0	1309.0	992.0	More time spent in course
6	266.7	624.5	357.8	More time spent in course
7	253.8	315.1	61.2	More time spent in course
8	316.5	283.4	-33.2	Less time spent in course
9	277.9	222.1	-55.8	Less time spent in course
10	209.4	317.4	108.0	More time spent in course
11	301.4	1838.2	1536.8	More time spent in course
12	286.7	674.0	387.3	More time spent in course
13	299.1	367.4	68.3	More time spent in course
14	262.2	1057.7	795.5	More time spent in course
15	271.3	618.7	347.3	More time spent in course
16	286.3	424.2	137.8	More time spent in course
19	275.3	280.7	5.3	More time spent in course
20	292.0	742.8	450.8	More time spent in course
21	194.6	162.4	-32.2	Less time spent in course
22	211.9	235.9	24.0	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
24	158.5	312.9	154.4	More time spent in course
25	219.0	435.8	216.8	More time spent in course
26	226.5	1087.1	860.6	More time spent in course
27	208.6	271.5	62.8	More time spent in course
28	250.0	270.0	20.0	More time spent in course
29	206.0	314.6	108.6	More time spent in course
30	199.8	460.0	260.2	More time spent in course
31	323.9	1063.4	739.6	More time spent in course
32	279.3	280.3	1.0	More time spent in course
33	364.3	1554.0	1189.7	More time spent in course
34	278.0	392.4	114.4	More time spent in course
35	124.0	277.0	153.0	More time spent in course
36	286.0	834.0	548.0	More time spent in course
37	442.2	396.0	-46.2	Less time spent in course
38	153.7	330.0	176.3	More time spent in course
39	265.2	615.6	350.4	More time spent in course
40	299.8	291.7	-8.2	Less time spent in course
41	116.5	98.2	-18.3	Less time spent in course
42	237.4	310.4	73.0	More time spent in course
44	292.0	256.6	-35.4	Less time spent in course
45	233.0	282.0	49.0	More time spent in course
46	191.3	234.9	43.6	More time spent in course
47	271.3	306.2	34.8	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
48	114.6	395.1	280.5	More time spent in course
50	307.3	291.8	-15.5	Less time spent in course
51	176.3	570.1	393.9	More time spent in course
52	285.4	305.1	19.7	More time spent in course
53	319.1	295.1	-24.0	Less time spent in course
55	254.6	1390.1	1135.6	More time spent in course
56	234.8	249.5	14.7	More time spent in course
57	80.8	56.8	-24.0	Less time spent in course
58	286.5	281.0	-5.5	Less time spent in course
60	322.0	353.5	31.5	More time spent in course
61	242.2	288.2	46.0	More time spent in course
62	60.3	193.8	133.5	More time spent in course
63	179.8	379.2	199.4	More time spent in course
64	240.8	978.4	737.6	More time spent in course
65	296.9	313.9	17.0	More time spent in course
66	204.0	240.3	36.3	More time spent in course
67	205.0	389.7	184.7	More time spent in course
68	188.4	219.4	31.0	More time spent in course
69	219.0	1405.3	1186.3	More time spent in course
70	286.9	1221.1	934.1	More time spent in course
71	1182.7	2188.0	1005.3	More time spent in course
72	414.6	1598.6	1184.0	More time spent in course
73	254.5	860.2	605.7	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
74	314.5	542.9	228.4	More time spent in course
75	315.8	278.7	-37.1	Less time spent in course
76	189.9	291.0	101.1	More time spent in course
77	317.3	1329.0	1011.7	More time spent in course
78	164.2	207.0	42.7	More time spent in course
79	305.4	432.2	126.8	More time spent in course
80	163.1	192.1	29.0	More time spent in course
81	163.5	209.8	46.3	More time spent in course
83	281.0	281.0	0.0	Equal time spent in course
84	337.8	853.2	515.3	More time spent in course
87	165.5	360.6	195.1	More time spent in course
88	222.9	294.1	71.3	More time spent in course
89	149.9	149.5	-0.4	Less time spent in course
90	251.7	253.1	1.4	More time spent in course
92	255.8	683.6	427.8	More time spent in course
93	180.0	1481.0	1301.0	More time spent in course
94	364.3	709.3	345.0	More time spent in course
95	164.9	1479.3	1314.4	More time spent in course
96	365.2	319.2	-46.0	Less time spent in course
97	259.1	394.1	135.0	More time spent in course
98	338.0	575.6	237.6	More time spent in course
99	197.9	233.4	35.5	More time spent in course
100	264.7	269.6	4.9	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
101	267.0	282.0	15.0	More time spent in course
102	236.3	495.6	259.4	More time spent in course
103	142.7	450.6	307.9	More time spent in course
104	165.8	214.1	48.3	More time spent in course
105	159.3	289.7	130.4	More time spent in course
106	219.3	644.7	425.3	More time spent in course
107	181.7	272.3	90.7	More time spent in course
108	250.3	309.6	59.3	More time spent in course
109	270.8	1146.4	875.7	More time spent in course
110	250.5	793.5	543.0	More time spent in course
111	265.8	290.2	24.3	More time spent in course
112	232.8	279.5	46.7	More time spent in course
113	169.0	445.1	276.1	More time spent in course
114	315.7	1209.3	893.7	More time spent in course
115	234.4	1231.0	996.6	More time spent in course
116	222.0	1183.3	961.3	More time spent in course
117	296.7	806.3	509.7	More time spent in course
118	178.9	222.6	43.8	More time spent in course
119	146.0	184.3	38.3	More time spent in course
120	210.2	209.7	-0.5	Less time spent in course
121	290.6	322.6	32.0	More time spent in course
123	107.1	248.0	140.9	More time spent in course
124	175.5	352.8	177.3	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
126	239.8	317.4	77.6	More time spent in course
127	298.5	240.6	-57.8	Less time spent in course
128	111.7	204.6	92.9	More time spent in course
129	309.1	878.9	569.7	More time spent in course
130	330.0	588.8	258.8	More time spent in course
131	229.5	237.7	8.2	More time spent in course
132	143.6	219.0	75.4	More time spent in course
133	206.3	322.0	115.8	More time spent in course
134	200.8	1217.5	1016.7	More time spent in course
135	235.2	291.5	56.3	More time spent in course
136	426.4	404.4	-22.0	Less time spent in course
137	191.5	224.3	32.8	More time spent in course
138	398.4	485.2	86.8	More time spent in course
139	193.2	268.0	74.8	More time spent in course
140	241.5	366.3	124.8	More time spent in course
141	273.5	277.0	3.5	More time spent in course
142	217.7	278.0	60.3	More time spent in course
143	727.9	1487.9	760.0	More time spent in course
144	348.3	257.2	-91.1	Less time spent in course
146	178.3	175.9	-2.4	Less time spent in course
147	662.6	188.0	-474.6	Less time spent in course
148	168.5	217.8	49.3	More time spent in course
149	227.8	524.0	296.2	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
151	209.0	224.6	15.6	More time spent in course
152	202.6	296.4	93.8	More time spent in course
153	221.3	482.7	261.4	More time spent in course
154	127.0	928.0	801.0	More time spent in course
155	173.3	414.6	241.2	More time spent in course
156	298.9	568.9	270.0	More time spent in course
157	202.4	253.4	51.0	More time spent in course
158	228.0	304.9	76.9	More time spent in course
159	192.2	303.8	111.6	More time spent in course
160	205.5	248.5	43.0	More time spent in course
161	268.0	284.1	16.1	More time spent in course
162	357.8	804.0	446.2	More time spent in course
163	156.6	233.4	76.7	More time spent in course
164	191.7	546.7	355.0	More time spent in course
165	164.0	225.6	61.6	More time spent in course
167	214.4	248.2	33.8	More time spent in course
168	194.4	466.2	271.8	More time spent in course
169	266.4	280.4	14.0	More time spent in course
170	185.5	215.0	29.5	More time spent in course
171	192.2	1177.6	985.4	More time spent in course
172	156.2	717.4	561.2	More time spent in course
173	284.5	922.5	638.0	More time spent in course
174	192.9	217.9	25.0	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
175	293.6	383.2	89.6	More time spent in course
176	195.6	264.1	68.5	More time spent in course
178	161.4	219.3	57.9	More time spent in course
179	163.4	810.0	646.6	More time spent in course
180	126.0	126.0	0.0	Equal time spent in course
181	313.6	569.6	256.0	More time spent in course
182	186.7	316.2	129.5	More time spent in course
183	212.6	220.1	7.5	More time spent in course
184	153.3	159.0	5.7	More time spent in course
185	267.8	465.3	197.5	More time spent in course
186	217.3	887.6	670.3	More time spent in course
187	193.0	198.0	5.0	More time spent in course
188	321.8	612.1	290.4	More time spent in course
189	311.3	817.8	506.5	More time spent in course
190	462.0	462.0	0.0	Equal time spent in course
191	254.2	304.0	49.8	More time spent in course
192	301.8	381.3	79.5	More time spent in course
193	240.0	257.8	17.8	More time spent in course
194	78.2	185.7	107.4	More time spent in course
195	170.3	456.1	285.8	More time spent in course
196	257.5	190.2	-67.3	Less time spent in course
197	247.3	230.6	-16.7	Less time spent in course
198	179.7	277.6	97.9	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
199	202.4	225.2	22.8	More time spent in course
200	292.6	817.4	524.8	More time spent in course
201	249.2	584.3	335.2	More time spent in course
202	193.3	949.3	756.0	More time spent in course
203	194.0	316.6	122.6	More time spent in course
204	169.3	483.8	314.4	More time spent in course
205	327.1	334.9	7.8	More time spent in course
206	129.3	228.6	99.4	More time spent in course
207	262.4	331.3	68.9	More time spent in course
208	163.0	193.9	30.9	More time spent in course
209	145.3	315.6	170.3	More time spent in course
210	167.9	217.5	49.6	More time spent in course
211	209.8	327.4	117.6	More time spent in course
212	272.8	730.0	457.2	More time spent in course
213	200.1	317.8	117.6	More time spent in course
214	133.3	191.2	57.9	More time spent in course
215	318.2	912.3	594.2	More time spent in course
216	231.6	708.4	476.8	More time spent in course
217	144.7	240.3	95.6	More time spent in course
218	228.4	941.7	713.3	More time spent in course
219	323.2	311.2	-12.0	Less time spent in course
220	183.3	287.1	103.8	More time spent in course
221	226.8	238.5	11.7	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
222	200.8	356.2	155.3	More time spent in course
223	161.0	213.0	52.0	More time spent in course
224	161.4	167.5	6.1	More time spent in course
225	278.0	215.4	-62.6	Less time spent in course
226	143.8	178.0	34.2	More time spent in course
227	396.8	768.5	371.8	More time spent in course
228	390.5	701.2	310.6	More time spent in course
229	238.1	254.0	15.9	More time spent in course
230	141.4	817.6	676.1	More time spent in course
231	226.6	222.6	-4.0	Less time spent in course
232	228.7	916.8	688.1	More time spent in course
234	189.3	261.3	72.0	More time spent in course
235	246.9	346.1	99.3	More time spent in course
236	118.2	265.8	147.6	More time spent in course
237	248.0	345.0	97.0	More time spent in course
238	201.6	192.8	-8.8	Less time spent in course
239	139.3	386.0	246.7	More time spent in course
240	105.3	271.5	166.2	More time spent in course
241	559.0	927.4	368.4	More time spent in course
243	203.2	284.2	80.9	More time spent in course
244	409.4	1382.8	973.4	More time spent in course
245	189.1	297.3	108.1	More time spent in course
246	201.7	289.9	88.2	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
247	228.5	309.0	80.5	More time spent in course
248	107.9	372.3	264.4	More time spent in course
249	179.5	219.2	39.7	More time spent in course
250	163.5	227.5	64.0	More time spent in course
251	217.3	486.4	269.1	More time spent in course
252	200.7	215.3	14.7	More time spent in course
253	186.0	260.6	74.6	More time spent in course
254	152.6	205.9	53.3	More time spent in course
255	185.0	111.0	-74.0	Less time spent in course
256	151.4	195.2	43.8	More time spent in course
257	173.4	200.4	27.0	More time spent in course
258	139.8	251.5	111.7	More time spent in course
259	201.3	282.3	81.0	More time spent in course
260	218.0	261.6	43.6	More time spent in course
261	251.4	396.4	145.0	More time spent in course
262	150.8	236.7	85.8	More time spent in course
263	210.0	400.0	190.0	More time spent in course
264	250.9	236.7	-14.2	Less time spent in course
265	170.8	292.3	121.5	More time spent in course
266	364.5	291.3	-73.3	Less time spent in course
267	140.7	196.0	55.3	More time spent in course
268	196.3	249.9	53.6	More time spent in course
269	210.2	794.0	583.8	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
270	251.1	324.1	73.0	More time spent in course
271	195.5	285.0	89.5	More time spent in course
272	186.3	175.8	-10.6	Less time spent in course
273	283.0	496.3	213.3	More time spent in course
274	176.0	250.3	74.3	More time spent in course
275	219.5	250.6	31.1	More time spent in course
276	210.3	269.7	59.3	More time spent in course
277	248.7	415.5	166.8	More time spent in course
278	209.8	735.0	525.2	More time spent in course
279	203.5	281.0	77.5	More time spent in course
280	191.1	207.7	16.6	More time spent in course
281	264.4	347.3	82.9	More time spent in course
282	127.7	190.2	62.5	More time spent in course
283	174.6	324.4	149.9	More time spent in course
285	208.7	555.8	347.2	More time spent in course
286	255.5	232.3	-23.2	Less time spent in course
287	149.4	484.4	335.0	More time spent in course
288	208.7	359.9	151.2	More time spent in course
291	225.7	260.3	34.7	More time spent in course
292	124.8	239.7	114.8	More time spent in course
293	318.6	309.9	-8.8	Less time spent in course
294	280.0	278.0	-2.0	Less time spent in course
295	146.7	126.0	-20.7	Less time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
296	246.7	450.7	204.0	More time spent in course
298	209.4	620.6	411.1	More time spent in course
299	202.8	346.8	144.0	More time spent in course
300	187.5	300.2	112.7	More time spent in course
301	243.0	397.0	154.0	More time spent in course
302	256.2	708.6	452.3	More time spent in course
303	164.0	181.2	17.2	More time spent in course
304	151.6	223.9	72.3	More time spent in course
305	253.7	279.0	25.3	More time spent in course
306	148.2	227.5	79.4	More time spent in course
307	185.8	229.6	43.8	More time spent in course
308	126.5	566.5	440.0	More time spent in course
309	281.0	82.0	-199.0	Less time spent in course
310	189.4	212.4	23.0	More time spent in course
311	146.7	211.7	65.0	More time spent in course
312	178.8	152.7	-26.2	Less time spent in course
313	257.0	262.7	5.7	More time spent in course
314	246.7	675.6	428.9	More time spent in course
315	148.4	240.6	92.2	More time spent in course
316	294.6	343.8	49.2	More time spent in course
318	157.7	375.5	217.8	More time spent in course
319	175.5	393.3	217.8	More time spent in course
320	240.3	335.7	95.4	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
321	151.7	178.7	27.0	More time spent in course
322	159.4	229.6	70.2	More time spent in course
324	140.0	221.2	81.2	More time spent in course
325	120.0	112.5	-7.5	Less time spent in course
326	238.2	666.7	428.5	More time spent in course
327	157.3	281.0	123.8	More time spent in course
328	193.6	223.7	30.1	More time spent in course
329	146.7	211.7	65.0	More time spent in course
330	221.2	405.2	184.0	More time spent in course
331	239.0	451.8	212.8	More time spent in course
332	139.5	217.3	77.8	More time spent in course
333	226.9	627.7	400.8	More time spent in course
334	217.9	273.8	55.9	More time spent in course
335	186.5	224.4	37.9	More time spent in course
336	221.3	804.0	582.8	More time spent in course
337	122.1	182.3	60.2	More time spent in course
338	197.5	191.6	-5.9	Less time spent in course
339	234.3	270.3	36.0	More time spent in course
340	142.3	186.2	43.8	More time spent in course
342	234.5	228.8	-5.8	Less time spent in course
343	247.8	416.2	168.3	More time spent in course
345	182.4	211.5	29.1	More time spent in course
346	173.2	263.2	90.0	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
347	205.4	417.9	212.5	More time spent in course
348	228.6	385.1	156.5	More time spent in course
349	220.4	289.0	68.6	More time spent in course
350	124.2	223.8	99.6	More time spent in course
351	252.0	488.0	236.0	More time spent in course
352	286.8	624.2	337.3	More time spent in course
353	190.3	175.6	-14.7	Less time spent in course
354	171.2	205.3	34.2	More time spent in course
355	316.5	326.5	10.0	More time spent in course
356	192.4	304.3	111.9	More time spent in course
357	108.4	225.8	117.3	More time spent in course
358	153.8	245.8	92.0	More time spent in course
359	222.8	225.0	2.2	More time spent in course
360	133.9	230.1	96.3	More time spent in course
361	197.0	303.2	106.2	More time spent in course
362	187.6	216.7	29.1	More time spent in course
363	163.6	240.1	76.5	More time spent in course
364	138.8	432.7	293.8	More time spent in course
365	281.0	282.0	1.0	More time spent in course
366	245.4	169.9	-75.5	Less time spent in course
367	163.1	258.9	95.8	More time spent in course
369	178.4	208.9	30.4	More time spent in course
370	208.1	391.6	183.4	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
371	169.8	404.2	234.4	More time spent in course
372	196.4	227.8	31.4	More time spent in course
373	172.2	363.1	190.9	More time spent in course
374	132.9	166.8	33.9	More time spent in course
375	162.4	215.1	52.6	More time spent in course
376	288.4	895.6	607.2	More time spent in course
377	168.0	280.5	112.5	More time spent in course
378	219.7	217.5	-2.2	Less time spent in course
379	251.9	242.3	-9.6	Less time spent in course
380	141.1	147.7	6.6	More time spent in course
381	210.3	429.0	218.7	More time spent in course
382	190.3	217.3	27.0	More time spent in course
383	199.8	332.9	133.1	More time spent in course
384	170.0	198.1	28.1	More time spent in course
385	131.3	168.0	36.7	More time spent in course
386	214.9	371.6	156.7	More time spent in course
387	185.8	234.4	48.6	More time spent in course
388	274.4	307.3	32.9	More time spent in course
389	177.1	182.4	5.3	More time spent in course
390	175.6	246.6	71.0	More time spent in course
391	130.0	219.4	89.4	More time spent in course
392	281.3	272.5	-8.8	Less time spent in course
393	285.6	247.9	-37.8	Less time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
394	255.4	295.8	40.4	More time spent in course
395	225.0	244.8	19.8	More time spent in course
396	148.3	218.7	70.4	More time spent in course
397	332.7	519.7	187.0	More time spent in course
398	198.3	347.3	149.0	More time spent in course
399	180.9	249.1	68.3	More time spent in course
400	207.5	256.7	49.2	More time spent in course

Appendix H: Critical Slowing Down Calculations for the Graduate Group

(The 13 IDs for students with majority group study or challenge courses have been skipped)

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
1	219.5	717.1	497.5	More time spent in course
2	211.7	267.9	56.2	More time spent in course
3	170.7	199.5	28.8	More time spent in course
4	270.0	216.0	-54.0	Less time spent in course
5	179.5	227.0	47.5	More time spent in course
6	431.8	379.7	-52.2	Less time spent in course
7	230.3	256.8	26.5	More time spent in course
8	170.0	253.6	83.6	More time spent in course
9	247.8	514.1	266.4	More time spent in course
10	215.9	267.4	51.5	More time spent in course
11	225.7	168.6	-57.1	Less time spent in course
12	380.7	453.3	72.6	More time spent in course
13	252.2	284.9	32.7	More time spent in course
14	276.0	433.5	157.5	More time spent in course
15	187.9	259.4	71.6	More time spent in course
16	141.9	250.0	108.1	More time spent in course
17	218.0	240.8	22.8	More time spent in course
18	389.6	401.9	12.3	More time spent in course
19	234.9	1070.8	835.9	More time spent in course
20	245.6	217.6	-28.0	Less time spent in course
21	297.4	216.4	-81.0	Less time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
22	249.3	148.1	-101.2	Less time spent in course
23	274.8	276.0	1.3	More time spent in course
24	220.0	456.2	236.2	More time spent in course
25	223.0	644.4	421.4	More time spent in course
26	317.4	272.3	-45.1	Less time spent in course
27	275.3	650.7	375.3	More time spent in course
28	199.7	271.9	72.2	More time spent in course
29	189.7	1183.7	994.0	More time spent in course
30	159.9	459.3	299.4	More time spent in course
31	218.7	579.6	360.9	More time spent in course
32	321.9	870.4	548.6	More time spent in course
33	196.8	660.7	463.9	More time spent in course
34	237.5	1034.0	796.5	More time spent in course
35	149.1	371.3	222.2	More time spent in course
36	166.3	208.7	42.3	More time spent in course
37	217.0	203.5	-13.5	Less time spent in course
38	247.9	433.7	185.8	More time spent in course
39	218.2	215.4	-2.8	Less time spent in course
40	206.0	634.3	428.3	More time spent in course
41	198.6	375.6	177.0	More time spent in course
42	207.7	193.3	-14.3	Less time spent in course
43	297.5	203.9	-93.7	Less time spent in course
44	163.8	476.9	313.1	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
45	203.3	179.5	-23.8	Less time spent in course
46	205.6	216.5	10.9	More time spent in course
47	416.6	309.4	-107.1	Less time spent in course
48	175.3	512.4	337.1	More time spent in course
49	537.3	235.0	-302.3	Less time spent in course
50	307.3	251.0	-56.3	Less time spent in course
51	198.1	175.0	-23.1	Less time spent in course
52	253.8	179.8	-74.0	Less time spent in course
53	314.8	302.5	-12.3	Less time spent in course
54	152.3	931.3	779.0	More time spent in course
55	370.7	318.3	-52.3	Less time spent in course
56	241.2	201.2	-40.1	Less time spent in course
57	156.5	154.5	-2.0	Less time spent in course
58	275.5	396.1	120.6	More time spent in course
59	326.6	1468.0	1141.4	More time spent in course
60	210.5	87.9	-122.5	Less time spent in course
61	183.2	501.0	317.8	More time spent in course
62	310.5	1406.5	1096.0	More time spent in course
63	231.1	255.8	24.6	More time spent in course
64	124.9	166.2	41.3	More time spent in course
65	180.3	136.8	-43.5	Less time spent in course
66	248.3	483.9	235.6	More time spent in course
67	184.4	439.4	255.0	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
68	193.0	227.0	34.0	More time spent in course
69	346.5	302.9	-43.6	Less time spent in course
70	203.9	453.3	249.4	More time spent in course
71	281.1	272.8	-8.4	Less time spent in course
72	269.4	447.4	178.0	More time spent in course
73	201.4	213.4	12.0	More time spent in course
74	191.3	166.5	-24.8	Less time spent in course
75	248.7	577.2	328.5	More time spent in course
76	205.1	200.8	-4.3	Less time spent in course
77	117.5	132.5	15.0	More time spent in course
78	285.1	557.4	272.3	More time spent in course
80	169.0	292.9	123.8	More time spent in course
81	170.8	190.7	19.8	More time spent in course
82	130.4	345.9	215.5	More time spent in course
83	288.7	282.0	-6.7	Less time spent in course
84	202.1	251.3	49.2	More time spent in course
85	220.0	191.7	-28.3	Less time spent in course
86	240.0	209.4	-30.7	Less time spent in course
87	329.7	465.1	135.4	More time spent in course
88	201.0	63.9	-137.1	Less time spent in course
89	178.9	92.8	-86.1	Less time spent in course
90	273.7	198.6	-75.1	Less time spent in course
91	167.4	125.9	-41.5	Less time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
92	288.4	187.7	-100.7	Less time spent in course
93	289.5	207.9	-81.6	Less time spent in course
94	163.6	149.6	-14.0	Less time spent in course
95	174.7	622.9	448.3	More time spent in course
96	200.9	158.5	-42.4	Less time spent in course
97	283.9	179.4	-104.5	Less time spent in course
98	173.3	222.7	49.4	More time spent in course
99	107.2	214.4	107.2	More time spent in course
100	204.0	462.0	258.0	More time spent in course
101	185.1	224.0	38.9	More time spent in course
102	127.6	446.5	318.9	More time spent in course
103	160.3	199.4	39.2	More time spent in course
104	204.3	317.8	113.5	More time spent in course
105	218.0	224.3	6.3	More time spent in course
106	293.2	839.9	546.8	More time spent in course
107	204.5	428.0	223.5	More time spent in course
108	164.3	543.0	378.7	More time spent in course
109	198.0	148.3	-49.7	Less time spent in course
110	251.2	243.2	-8.0	Less time spent in course
111	174.3	169.1	-5.2	Less time spent in course
112	146.6	145.4	-1.1	Less time spent in course
113	236.5	847.8	611.3	More time spent in course
114	802.3	1207.3	405.0	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
115	256.0	674.5	418.5	More time spent in course
116	767.8	189.0	-578.8	Less time spent in course
117	148.5	170.6	22.1	More time spent in course
118	199.5	188.3	-11.2	Less time spent in course
119	165.1	180.6	15.5	More time spent in course
120	234.5	447.5	213.1	More time spent in course
121	952.4	132.0	-820.4	Less time spent in course
122	285.6	482.0	196.4	More time spent in course
123	388.0	751.4	363.5	More time spent in course
124	285.0	1354.0	1069.0	More time spent in course
125	200.8	255.6	54.9	More time spent in course
126	253.2	215.3	-37.9	Less time spent in course
127	213.3	205.3	-8.0	Less time spent in course
128	168.2	328.4	160.2	More time spent in course
129	149.9	154.9	5.0	More time spent in course
130	220.9	218.1	-2.8	Less time spent in course
131	275.4	228.4	-47.0	Less time spent in course
132	215.5	299.9	84.4	More time spent in course
133	210.6	314.5	103.8	More time spent in course
134	125.3	1404.0	1278.7	More time spent in course
135	204.1	327.3	123.1	More time spent in course
136	256.5	114.0	-142.5	Less time spent in course
137	375.0	461.5	86.5	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
138	186.1	188.5	2.4	More time spent in course
139	216.8	207.2	-9.7	Less time spent in course
140	179.9	281.9	102.1	More time spent in course
141	229.6	648.6	419.0	More time spent in course
142	194.4	356.0	161.7	More time spent in course
143	100.0	247.0	147.0	More time spent in course
144	679.5	1273.4	593.9	More time spent in course
145	358.8	218.0	-140.8	Less time spent in course
146	262.3	163.7	-98.7	Less time spent in course
147	208.5	198.8	-9.7	Less time spent in course
148	231.9	246.3	14.4	More time spent in course
149	205.7	235.0	29.3	More time spent in course
150	246.1	362.2	116.1	More time spent in course
151	207.8	269.1	61.4	More time spent in course
152	189.0	182.5	-6.5	Less time spent in course
153	206.8	277.2	70.4	More time spent in course
154	429.4	869.4	440.0	More time spent in course
155	186.0	227.5	41.5	More time spent in course
156	329.2	198.0	-131.2	Less time spent in course
157	232.5	211.1	-21.5	Less time spent in course
158	237.8	171.6	-66.2	Less time spent in course
159	165.8	1126.5	960.7	More time spent in course
160	153.6	117.1	-36.5	Less time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
161	573.8	243.8	-330.0	Less time spent in course
162	183.0	420.3	237.3	More time spent in course
163	162.8	192.5	29.7	More time spent in course
164	267.8	261.5	-6.3	Less time spent in course
165	180.1	222.1	41.9	More time spent in course
166	243.1	228.4	-14.7	Less time spent in course
167	174.5	383.0	208.5	More time spent in course
168	175.7	205.1	29.4	More time spent in course
169	255.2	390.2	135.0	More time spent in course
170	193.9	878.0	684.1	More time spent in course
171	217.5	1033.1	815.6	More time spent in course
172	248.8	172.8	-76.0	Less time spent in course
173	218.5	158.1	-60.4	Less time spent in course
174	254.3	895.6	641.3	More time spent in course
175	173.8	191.1	17.2	More time spent in course
176	223.7	383.7	160.0	More time spent in course
177	220.5	196.8	-23.8	Less time spent in course
178	227.4	253.6	26.2	More time spent in course
179	270.1	324.6	54.5	More time spent in course
180	191.0	274.5	83.5	More time spent in course
181	264.5	207.4	-57.1	Less time spent in course
182	154.1	249.0	94.9	More time spent in course
183	143.3	179.7	36.3	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
184	132.0	172.0	40.0	More time spent in course
185	246.2	189.0	-57.2	Less time spent in course
186	148.9	223.8	74.9	More time spent in course
187	228.7	127.3	-101.4	Less time spent in course
188	208.6	195.4	-13.2	Less time spent in course
189	207.0	205.0	-2.0	Less time spent in course
190	249.9	345.1	95.3	More time spent in course
191	233.1	211.6	-21.6	Less time spent in course
192	262.0	220.0	-42.0	Less time spent in course
193	280.4	341.4	61.0	More time spent in course
194	141.6	174.7	33.1	More time spent in course
195	283.1	442.3	159.1	More time spent in course
196	230.0	234.5	4.5	More time spent in course
197	124.7	166.1	41.4	More time spent in course
198	239.6	214.4	-25.2	Less time spent in course
199	166.1	133.8	-32.3	Less time spent in course
200	142.0	437.4	295.4	More time spent in course
201	108.3	90.5	-17.8	Less time spent in course
202	184.8	385.2	200.3	More time spent in course
203	160.4	229.7	69.3	More time spent in course
204	83.6	55.5	-28.1	Less time spent in course
205	208.6	384.9	176.3	More time spent in course
206	222.3	163.3	-59.0	Less time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
207	202.3	201.5	-0.8	Less time spent in course
208	293.8	207.1	-86.7	Less time spent in course
209	212.2	615.3	403.2	More time spent in course
210	169.3	357.9	188.6	More time spent in course
211	235.7	234.4	-1.3	Less time spent in course
212	139.6	142.3	2.7	More time spent in course
213	163.1	286.2	123.1	More time spent in course
214	182.5	232.3	49.8	More time spent in course
215	171.5	176.6	5.1	More time spent in course
216	158.2	191.1	32.9	More time spent in course
217	249.9	470.0	220.1	More time spent in course
218	284.3	403.7	119.3	More time spent in course
220	183.3	216.1	32.8	More time spent in course
221	194.1	150.8	-43.3	Less time spent in course
222	248.7	244.6	-4.1	Less time spent in course
223	260.2	338.0	77.8	More time spent in course
224	223.9	243.6	19.8	More time spent in course
225	159.5	169.8	10.3	More time spent in course
226	147.6	175.8	28.1	More time spent in course
227	155.6	268.3	112.7	More time spent in course
228	133.4	216.4	83.1	More time spent in course
229	201.4	225.5	24.1	More time spent in course
230	168.0	195.8	27.8	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
231	199.7	157.6	-42.1	Less time spent in course
232	190.0	335.6	145.6	More time spent in course
234	166.3	333.6	167.3	More time spent in course
235	164.8	167.7	2.9	More time spent in course
236	381.9	175.5	-206.4	Less time spent in course
237	239.8	279.4	39.7	More time spent in course
239	214.2	264.9	50.7	More time spent in course
240	135.3	146.1	10.7	More time spent in course
241	228.2	411.0	182.8	More time spent in course
242	149.7	151.7	2.0	More time spent in course
243	224.2	461.0	236.8	More time spent in course
244	156.5	255.8	99.3	More time spent in course
245	323.5	943.0	619.5	More time spent in course
246	326.8	135.9	-190.9	Less time spent in course
247	179.1	243.0	63.9	More time spent in course
248	222.4	165.2	-57.2	Less time spent in course
249	126.1	151.6	25.5	More time spent in course
250	159.9	211.2	51.3	More time spent in course
251	166.4	168.0	1.6	More time spent in course
252	188.4	162.6	-25.8	Less time spent in course
253	285.6	257.4	-28.2	Less time spent in course
254	166.6	222.6	56.1	More time spent in course
255	184.4	108.5	-75.9	Less time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
256	216.8	247.8	31.0	More time spent in course
257	281.2	163.4	-117.8	Less time spent in course
258	136.8	158.8	22.0	More time spent in course
259	135.0	265.0	130.0	More time spent in course
260	160.2	165.6	5.3	More time spent in course
261	195.5	487.5	292.1	More time spent in course
262	310.5	233.7	-76.8	Less time spent in course
263	158.3	174.7	16.4	More time spent in course
264	222.2	221.4	-0.8	Less time spent in course
265	135.0	140.9	5.9	More time spent in course
266	204.2	224.4	20.2	More time spent in course
267	147.9	143.0	-4.9	Less time spent in course
268	198.8	195.4	-3.4	Less time spent in course
269	184.0	727.0	543.0	More time spent in course
270	152.4	237.9	85.4	More time spent in course
271	160.6	162.8	2.2	More time spent in course
272	163.7	132.4	-31.3	Less time spent in course
273	337.5	155.8	-181.8	Less time spent in course
275	257.0	541.5	284.5	More time spent in course
276	145.8	191.9	46.1	More time spent in course
277	208.6	191.4	-17.2	Less time spent in course
278	266.0	199.5	-66.5	Less time spent in course
279	158.5	197.5	39.0	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
280	147.7	132.4	-15.3	Less time spent in course
281	329.1	270.9	-58.2	Less time spent in course
282	92.9	92.7	-0.1	Less time spent in course
283	152.1	111.5	-40.6	Less time spent in course
284	191.9	171.0	-20.9	Less time spent in course
285	199.0	213.2	14.2	More time spent in course
287	206.0	215.5	9.5	More time spent in course
288	232.5	195.5	-37.0	Less time spent in course
289	146.8	358.6	211.9	More time spent in course
290	183.4	201.7	18.3	More time spent in course
291	177.5	207.0	29.5	More time spent in course
293	171.0	182.0	11.0	More time spent in course
295	195.0	210.0	15.0	More time spent in course
296	131.5	255.4	123.8	More time spent in course
298	108.5	111.0	2.5	More time spent in course
299	181.8	214.1	32.3	More time spent in course
300	148.8	232.2	83.3	More time spent in course
301	267.8	274.1	6.4	More time spent in course
302	288.0	205.7	-82.3	Less time spent in course
303	126.2	196.9	70.7	More time spent in course
305	130.6	206.8	76.2	More time spent in course
306	278.0	480.9	202.9	More time spent in course
307	159.7	454.3	294.6	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
308	368.0	229.0	-139.0	Less time spent in course
309	175.0	334.0	159.0	More time spent in course
310	261.5	235.5	-26.0	Less time spent in course
311	184.9	394.4	209.5	More time spent in course
312	335.4	376.9	41.5	More time spent in course
313	206.1	252.8	46.7	More time spent in course
314	223.7	196.4	-27.4	Less time spent in course
315	90.1	136.9	46.8	More time spent in course
316	162.8	233.0	70.2	More time spent in course
317	222.4	757.2	534.8	More time spent in course
318	156.4	197.4	41.1	More time spent in course
319	234.3	315.3	81.0	More time spent in course
320	163.4	209.9	46.5	More time spent in course
321	215.5	283.5	68.0	More time spent in course
322	261.4	454.4	193.0	More time spent in course
323	144.5	179.5	34.9	More time spent in course
324	184.2	440.9	256.7	More time spent in course
325	339.7	261.5	-78.2	Less time spent in course
326	240.0	280.0	40.0	More time spent in course
327	164.6	214.6	50.0	More time spent in course
328	314.2	341.8	27.6	More time spent in course
329	196.0	266.0	70.0	More time spent in course
330	105.4	81.6	-23.8	Less time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
331	133.1	157.7	24.6	More time spent in course
332	172.2	363.1	190.9	More time spent in course
333	205.1	431.3	226.1	More time spent in course
334	211.1	261.8	50.6	More time spent in course
335	227.0	273.5	46.5	More time spent in course
336	216.8	313.3	96.5	More time spent in course
338	165.7	366.2	200.5	More time spent in course
339	188.0	285.6	97.6	More time spent in course
341	238.3	180.4	-57.8	Less time spent in course
342	86.8	166.6	79.8	More time spent in course
343	211.1	326.1	115.1	More time spent in course
344	233.2	327.3	94.2	More time spent in course
345	252.9	133.9	-119.0	Less time spent in course
346	239.1	628.7	389.6	More time spent in course
347	303.9	398.6	94.7	More time spent in course
348	169.7	278.3	108.6	More time spent in course
349	195.8	180.2	-15.6	Less time spent in course
350	180.0	155.0	-25.0	Less time spent in course
351	237.8	173.4	-64.3	Less time spent in course
352	181.0	166.0	-15.0	Less time spent in course
353	34.8	69.1	34.4	More time spent in course
354	357.0	613.0	256.0	More time spent in course
355	223.8	246.2	22.4	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
356	171.4	649.8	478.4	More time spent in course
357	214.3	247.3	33.0	More time spent in course
358	311.0	450.1	139.1	More time spent in course
359	187.4	147.5	-39.9	Less time spent in course
360	225.0	335.9	110.9	More time spent in course
361	328.6	633.6	305.0	More time spent in course
362	139.0	167.9	28.9	More time spent in course
363	204.2	166.0	-38.2	Less time spent in course
364	272.3	403.3	131.0	More time spent in course
365	179.7	229.7	50.0	More time spent in course
366	91.5	152.8	61.3	More time spent in course
367	332.1	296.3	-35.9	Less time spent in course
368	157.2	216.2	59.0	More time spent in course
369	139.0	108.0	-31.0	Less time spent in course
370	275.0	991.5	716.5	More time spent in course
371	219.3	255.0	35.7	More time spent in course
372	233.5	187.7	-45.8	Less time spent in course
373	190.0	201.1	11.1	More time spent in course
374	140.1	348.8	208.7	More time spent in course
375	307.8	621.3	313.6	More time spent in course
376	346.0	1083.4	737.4	More time spent in course
377	228.0	228.0	0.0	Equal time spent in course
378	155.1	223.7	68.6	More time spent in course

ID	Time in Course Prior to Midpoint	Time in Course Post Midpoint	Difference	Conclusion on Critical Slowing Down
379	216.3	302.3	86.0	More time spent in course
380	146.8	72.3	-74.5	Less time spent in course
381	215.5	134.0	-81.5	Less time spent in course
382	322.0	397.8	75.8	More time spent in course
383	180.2	322.7	142.5	More time spent in course
384	280.0	207.5	-72.5	Less time spent in course
385	180.5	578.4	397.9	More time spent in course
386	293.3	516.0	222.7	More time spent in course
387	172.3	149.5	-22.8	Less time spent in course
388	188.1	190.1	1.9	More time spent in course
389	148.9	157.1	8.3	More time spent in course
390	234.6	314.8	80.2	More time spent in course
391	225.1	490.3	265.2	More time spent in course
392	207.3	176.7	-30.6	Less time spent in course
393	176.5	107.1	-69.4	Less time spent in course
394	230.3	241.6	11.3	More time spent in course
395	140.3	93.6	-46.7	Less time spent in course
396	234.5	280.8	46.3	More time spent in course
397	201.3	274.7	73.4	More time spent in course
399	151.2	265.0	113.8	More time spent in course
400	253.9	143.6	-110.3	Less time spent in course

Appendix I: Autocorrelation Calculations for the Program Withdrawal Group

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
1	-0.0523	0.759552	0.811851	Increase in Autocorrelation
2	-0.05286	0.348178	0.401043	Increase in Autocorrelation
3	0.680007	0.340389	-0.33962	Decrease in Autocorrelation
4	0.10073	-0.29925	-0.39998	Decrease in Autocorrelation
5	-0.24071	0.511988	0.752701	Increase in Autocorrelation
6	0.733979	0.23206	-0.50192	Decrease in Autocorrelation
7	0.786683	0.013841	-0.77284	Decrease in Autocorrelation
8	0.448867	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
9	-0.00339	-0.125	-0.12161	Decrease in Autocorrelation
10	-0.20598	-0.64615	-0.44018	Decrease in Autocorrelation
11	-0.36635	0.166667	0.533015	Increase in Autocorrelation
12	0.399111	0.752175	0.353064	Increase in Autocorrelation
13	0.15213	-0.31623	-0.46836	Decrease in Autocorrelation
14	-0.31903	-0.40652	-0.08749	Decrease in Autocorrelation
15	-0.03574	-0.26106	-0.22531	Decrease in Autocorrelation
16	0.6421	-0.17122	-0.81332	Decrease in Autocorrelation
17	-0.40808	-0.7552	-0.34712	Decrease in Autocorrelation
18	0.619079	0.322846	-0.29623	Decrease in Autocorrelation
19	0.571885	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
20	0.609479	0.164527	-0.44495	Decrease in Autocorrelation
21	0.255292	0.033958	-0.22133	Decrease in Autocorrelation
22	0.287896	-0.11902	-0.40692	Decrease in Autocorrelation
23	-0.17701	0.625208	0.802222	Increase in Autocorrelation
24	0.030172	0.804575	0.774404	Increase in Autocorrelation
25	0.109784	0.749888	0.640104	Increase in Autocorrelation
26	-0.21369	0.303018	0.516708	Increase in Autocorrelation
27	0.227106	0.357107	0.130001	Increase in Autocorrelation
28	0.692689	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
29	0.015113	0.763858	0.748746	Increase in Autocorrelation
30	-0.09715	-0.04078	0.056368	Increase in Autocorrelation
31	0.251556	0.707107	0.455551	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
32	-0.19985	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
33	0.666667	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
34	-0.30467	-0.30264	0.002032	Increase in Autocorrelation
35	-0.29804	0.281167	0.579209	Increase in Autocorrelation
36	0.051763	-0.04452	-0.09628	Decrease in Autocorrelation
37	-0.11382	-0.25741	-0.14359	Decrease in Autocorrelation
38	-0.82215	0.730175	1.552323	Increase in Autocorrelation
39	-0.35934	0.383511	0.742846	Increase in Autocorrelation
40	-0.3709	0.612372	0.983268	Increase in Autocorrelation
41	-0.08923	0.422784	0.512019	Increase in Autocorrelation
42	0.103175	-0.66256	-0.76574	Decrease in Autocorrelation
43	0.392615	-0.07191	-0.46452	Decrease in Autocorrelation
44	-0.31526	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
45	0.390668	0.154671	-0.236	Decrease in Autocorrelation
46	0.138493	0.627297	0.488805	Increase in Autocorrelation
47	0.589901	0.789536	0.199635	Increase in Autocorrelation
48	0.04991	-0.33977	-0.38968	Decrease in Autocorrelation
49	-0.70165	-0.20574	0.495916	Increase in Autocorrelation
50	0.139732	0.69019	0.550458	Increase in Autocorrelation
51	-0.80986	0.648893	1.458748	Increase in Autocorrelation
52	-0.40372	-0.16667	0.237056	Increase in Autocorrelation
53	-0.29121	-0.33007	-0.03886	Decrease in Autocorrelation
54	0.183791	-0.00396	-0.18775	Decrease in Autocorrelation
55	-0.31603	0.583228	0.899262	Increase in Autocorrelation
56	#DIV/0!	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
57	0.690074	-0.1302	-0.82028	Decrease in Autocorrelation
58	0.848547	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
59	-0.2982	-0.19972	0.098472	Increase in Autocorrelation
60	0.435449	0.469218	0.033769	Increase in Autocorrelation
61	0.155423	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
62	-0.33364	0.811803	1.145445	Increase in Autocorrelation
63	0.149941	0.346145	0.196203	Increase in Autocorrelation
64	-0.01768	0.551751	0.569427	Increase in Autocorrelation
65	0.299493	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
66	-0.82436	0.332223	1.156582	Increase in Autocorrelation
67	0.800684	0.155367	-0.64532	Decrease in Autocorrelation
68	-0.09202	0.423058	0.515078	Increase in Autocorrelation
69	-0.51274	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
70	-0.0656	-0.11312	-0.04752	Decrease in Autocorrelation
71	0.607846	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
72	0.691296	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
73	0.215811	0.210172	-0.00564	Decrease in Autocorrelation
74	0.332252	0.493473	0.161221	Increase in Autocorrelation
75	-0.3055	0.0649	0.370397	Increase in Autocorrelation
76	0.184329	0.358108	0.173779	Increase in Autocorrelation
77	-0.09559	0.754412	0.85	Increase in Autocorrelation
78	0.459599	0.328608	-0.13099	Decrease in Autocorrelation
79	-0.35787	0.630647	0.98852	Increase in Autocorrelation
80	0.316659	0.56918	0.252521	Increase in Autocorrelation
81	0.394344	0.297517	-0.09683	Decrease in Autocorrelation
82	0.29162	0.534333	0.242713	Increase in Autocorrelation
83	0.157898	0.474448	0.31655	Increase in Autocorrelation
84	-0.09194	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
85	-0.00286	-0.21145	-0.20859	Decrease in Autocorrelation
86	-0.37252	0.050333	0.422855	Increase in Autocorrelation
87	-0.43407	0.770964	1.205031	Increase in Autocorrelation
88	0.199694	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
89	0.74841	0.010763	-0.73765	Decrease in Autocorrelation
90	-0.29634	-0.37545	-0.07911	Decrease in Autocorrelation
91	-0.09185	-0.19679	-0.10494	Decrease in Autocorrelation
92	-0.1218	-0.21787	-0.09607	Decrease in Autocorrelation
93	0.086879	0.54419	0.45731	Increase in Autocorrelation
94	0.459762	0.769649	0.309886	Increase in Autocorrelation
95	0.527158	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
96	0.264582	-0.21749	-0.48207	Decrease in Autocorrelation
97	0.459338	0.246065	-0.21327	Decrease in Autocorrelation
98	-0.22504	0.764618	0.989662	Increase in Autocorrelation
99	-0.41185	0.416667	0.828521	Increase in Autocorrelation
100	-0.02688	0.006095	0.032974	Increase in Autocorrelation
101	-0.34963	0.477866	0.827499	Increase in Autocorrelation
102	0.512769	0.729041	0.216272	Increase in Autocorrelation
103	-0.07266	-0.31407	-0.24141	Decrease in Autocorrelation
104	0.045458	0.054111	0.008653	Increase in Autocorrelation
105	-0.77396	0.10807	0.882027	Increase in Autocorrelation
106	0.627506	0.438709	-0.1888	Decrease in Autocorrelation
107	-0.34978	-0.12963	0.220155	Increase in Autocorrelation
108	-0.25338	0.671395	0.924776	Increase in Autocorrelation
109	0.372249	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
110	-0.10945	0.025957	0.135409	Increase in Autocorrelation
111	0.711395	0.512138	-0.19926	Decrease in Autocorrelation
112	0.10456	0.202634	0.098074	Increase in Autocorrelation
113	0.230026	0.177521	-0.0525	Decrease in Autocorrelation
114	-0.13381	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
115	-0.08123	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
116	-0.07364	0.118528	0.192165	Increase in Autocorrelation
117	0.525369	-0.1	-0.62537	Decrease in Autocorrelation
118	0.009666	0.343994	0.334328	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
119	-0.23766	0.532984	0.770642	Increase in Autocorrelation
120	-0.27049	0.366626	0.637116	Increase in Autocorrelation
121	0.222418	0.533678	0.31126	Increase in Autocorrelation
122	-0.33011	0.592172	0.922287	Increase in Autocorrelation
123	0.433582	0.681893	0.248311	Increase in Autocorrelation
124	0.116203	-0.32602	-0.44223	Decrease in Autocorrelation
125	0.168293	-0.10525	-0.27354	Decrease in Autocorrelation
126	0.522539	0.209296	-0.31324	Decrease in Autocorrelation
127	0.240103	0.059259	-0.18084	Decrease in Autocorrelation
128	-0.03759	0.359819	0.397414	Increase in Autocorrelation
129	0.070514	0.702091	0.631576	Increase in Autocorrelation
130	-0.2	0.240816	0.440816	Increase in Autocorrelation
131	-0.24705	0.273026	0.520081	Increase in Autocorrelation
132	-0.2932	-0.53098	-0.23778	Decrease in Autocorrelation
133	0.134189	0.318437	0.184247	Increase in Autocorrelation
134	-0.26847	0.278216	0.54669	Increase in Autocorrelation
135	0.573942	0.762455	0.188514	Increase in Autocorrelation
136	-0.35064	-0.28164	0.068996	Increase in Autocorrelation
137	0.597419	0.666667	0.069247	Increase in Autocorrelation
138	0.090525	-0.2424	-0.33293	Decrease in Autocorrelation
139	0.139677	0.340368	0.200691	Increase in Autocorrelation
140	-0.06758	-0.49841	-0.43083	Decrease in Autocorrelation
141	0.223501	0.790336	0.566835	Increase in Autocorrelation
142	-0.10289	0.42869	0.531577	Increase in Autocorrelation
143	0.632456	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
144	0.340934	-0.18003	-0.52097	Decrease in Autocorrelation
145	0.145904	-0.80414	-0.95004	Decrease in Autocorrelation
146	-0.02135	-0.20497	-0.18362	Decrease in Autocorrelation
147	0.249728	-0.57091	-0.82063	Decrease in Autocorrelation
148	-0.1097	0.095155	0.204852	Increase in Autocorrelation
149	-0.29435	0.34527	0.63962	Increase in Autocorrelation
150	-0.17669	0.754761	0.931453	Increase in Autocorrelation
151	-0.01064	0.6421	0.652738	Increase in Autocorrelation
152	-0.10738	0.407034	0.51441	Increase in Autocorrelation
153	0.766142	0.649013	-0.11713	Decrease in Autocorrelation
154	0.257099	-0.25075	-0.50785	Decrease in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
155	-0.27292	0.736877	1.009795	Increase in Autocorrelation
156	0.111605	-0.16667	-0.27827	Decrease in Autocorrelation
157	-0.86403	0.653537	1.517566	Increase in Autocorrelation
158	-0.13367	0.042953	0.176625	Increase in Autocorrelation
159	-0.5749	-0.38809	0.186811	Increase in Autocorrelation
160	0.714286	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
161	0.445361	0.401838	-0.04352	Decrease in Autocorrelation
162	0.21673	0.632982	0.416252	Increase in Autocorrelation
163	-0.03083	0.522041	0.552868	Increase in Autocorrelation
164	-0.3696	0.160726	0.530324	Increase in Autocorrelation
165	0.340226	0.145237	-0.19499	Decrease in Autocorrelation
166	-0.52366	-0.06906	0.4546	Increase in Autocorrelation
167	0.204575	0.276779	0.072203	Increase in Autocorrelation
168	-0.59035	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
169	0.221966	0.222914	0.000949	Increase in Autocorrelation
170	-0.31809	-0.069	0.249092	Increase in Autocorrelation
171	0.657869	0.581752	-0.07612	Decrease in Autocorrelation
172	-0.72978	0.475392	1.205174	Increase in Autocorrelation
173	4.87E-05	0.621207	0.621159	Increase in Autocorrelation
174	-0.80853	0.166131	0.97466	Increase in Autocorrelation
175	0.335852	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
176	0.550219	-0.12572	-0.67594	Decrease in Autocorrelation
177	-0.36315	0.116403	0.479553	Increase in Autocorrelation
178	0.093568	0.811329	0.717761	Increase in Autocorrelation
179	-0.43564	-0.2	0.235637	Increase in Autocorrelation
180	-0.26271	0.118816	0.38153	Increase in Autocorrelation
181	0.295725	0.402306	0.10658	Increase in Autocorrelation
182	-0.7575	0.293808	1.051312	Increase in Autocorrelation
183	0.074302	0.755929	0.681627	Increase in Autocorrelation
184	-0.08775	-0.22717	-0.13942	Decrease in Autocorrelation
185	-0.47335	-0.2092	0.26415	Increase in Autocorrelation
186	0.207942	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
187	0.229117	-0.05789	-0.28701	Decrease in Autocorrelation
188	-0.43905	0.841631	1.280684	Increase in Autocorrelation
189	-0.25484	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
190	-0.22979	0.701269	0.931061	Increase in Autocorrelation
191	0.233151	0.28886	0.055709	Increase in Autocorrelation
192	0.664135	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
193	-0.31122	0.101058	0.412278	Increase in Autocorrelation
194	0.213716	0.762251	0.548535	Increase in Autocorrelation
195	0.199771	0.818623	0.618853	Increase in Autocorrelation
196	0.351565	-0.52712	-0.87869	Decrease in Autocorrelation
197	0.147804	-0.10377	-0.25158	Decrease in Autocorrelation
198	-0.12605	-0.13551	-0.00946	Decrease in Autocorrelation
199	0.33145	-0.16889	-0.50034	Decrease in Autocorrelation
200	-0.03297	-0.25	-0.21703	Decrease in Autocorrelation
201	0.280635	0.097941	-0.18269	Decrease in Autocorrelation
202	0.201025	0.765857	0.564832	Increase in Autocorrelation
203	0.178962	0.733062	0.5541	Increase in Autocorrelation
204	0.289782	0.781203	0.491421	Increase in Autocorrelation
205	0.320514	0.671822	0.351309	Increase in Autocorrelation
206	0.083604	-0.02775	-0.11135	Decrease in Autocorrelation
207	-0.01678	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
208	-0.8514	0.249295	1.100698	Increase in Autocorrelation
209	-0.04935	0.102213	0.151559	Increase in Autocorrelation
210	-0.17765	-0.03633	0.141313	Increase in Autocorrelation
211	-0.07387	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
212	-0.18583	0.68259	0.868417	Increase in Autocorrelation
213	0.089459	0.240791	0.151332	Increase in Autocorrelation
214	-0.12471	0.684832	0.809541	Increase in Autocorrelation
215	-0.26217	0.611395	0.873569	Increase in Autocorrelation
216	-0.96783	0.820149	1.787983	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
217	0.418044	-0.39858	-0.81662	Decrease in Autocorrelation
218	-0.13484	-0.03842	0.096419	Increase in Autocorrelation
219	0.4432	-0.46892	-0.91212	Decrease in Autocorrelation
220	-0.23073	0.653597	0.884324	Increase in Autocorrelation
221	0.061965	0.052674	-0.00929	Decrease in Autocorrelation
222	-0.36936	-0.05352	0.315838	Increase in Autocorrelation
223	0.722	0.54118	-0.18082	Decrease in Autocorrelation
224	0.113834	0.691308	0.577474	Increase in Autocorrelation
225	-0.1508	0.261905	0.412702	Increase in Autocorrelation
226	0.176938	0.649185	0.472246	Increase in Autocorrelation
227	-0.23364	-0.29896	-0.06532	Decrease in Autocorrelation
228	-0.37274	0.730787	1.103522	Increase in Autocorrelation
229	-0.28563	0.262817	0.548448	Increase in Autocorrelation
230	-0.39094	0.663473	1.054417	Increase in Autocorrelation
231	0.513401	-0.25	-0.7634	Decrease in Autocorrelation
232	0.460607	-0.24342	-0.70403	Decrease in Autocorrelation
233	-0.05702	0.509042	0.56606	Increase in Autocorrelation
234	0.592645	-0.14286	-0.7355	Decrease in Autocorrelation
235	-0.44443	0.014035	0.458467	Increase in Autocorrelation
236	-0.80178	0.630319	1.432103	Increase in Autocorrelation
237	0.172483	-0.30528	-0.47777	Decrease in Autocorrelation
238	0.326857	0.13557	-0.19129	Decrease in Autocorrelation
239	-0.26945	0.42018	0.689626	Increase in Autocorrelation
240	0.160612	-0.17205	-0.33266	Decrease in Autocorrelation
241	0.782487	0.653802	-0.12869	Decrease in Autocorrelation
242	0.301653	0.540226	0.238572	Increase in Autocorrelation
243	0.128889	-0.15618	-0.28507	Decrease in Autocorrelation
244	0.02729	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
245	0.020477	0.243787	0.22331	Increase in Autocorrelation
246	-0.17492	-0.39592	-0.221	Decrease in Autocorrelation
247	-0.69303	0.294903	0.987936	Increase in Autocorrelation
248	-0.26788	0.187775	0.455654	Increase in Autocorrelation
249	0.433174	-0.57062	-1.00379	Decrease in Autocorrelation
250	-0.63907	-0.34616	0.292907	Increase in Autocorrelation
251	0.668982	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
252	-0.37222	-0.25	0.122219	Increase in Autocorrelation
253	-0.02568	-0.18034	-0.15466	Decrease in Autocorrelation
254	-0.03465	0.052733	0.087383	Increase in Autocorrelation
255	-0.80993	-0.591	0.218924	Increase in Autocorrelation
256	0.002236	0.20482	0.202584	Increase in Autocorrelation
257	-0.28975	-0.40825	-0.1185	Decrease in Autocorrelation
258	-0.36104	0.592261	0.953302	Increase in Autocorrelation
259	-0.2226	0.048756	0.271352	Increase in Autocorrelation
260	-0.16814	-0.00426	0.163883	Increase in Autocorrelation
261	-0.56903	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
262	-0.1325	0.523045	0.655542	Increase in Autocorrelation
263	-0.36845	-0.99113	-0.62268	Decrease in Autocorrelation
264	0.175102	0.760027	0.584925	Increase in Autocorrelation
265	-0.20792	0.275079	0.482996	Increase in Autocorrelation
266	0.659491	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
267	0.015049	0.722776	0.707727	Increase in Autocorrelation
268	-0.21683	-0.13163	0.085206	Increase in Autocorrelation
269	0.748064	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
270	0.172754	0.469335	0.296581	Increase in Autocorrelation
271	0.123188	0.118308	-0.00488	Decrease in Autocorrelation
272	-0.14751	0.42624	0.573755	Increase in Autocorrelation
273	-0.74825	-0.25553	0.492728	Increase in Autocorrelation
274	-0.54717	0.612292	1.159459	Increase in Autocorrelation
275	0.080593	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
276	-0.37462	-0.16667	0.207956	Increase in Autocorrelation
277	-0.24326	0.763927	1.007189	Increase in Autocorrelation
278	0.141641	0.592603	0.450962	Increase in Autocorrelation
279	0.28983	0.662631	0.372801	Increase in Autocorrelation
280	0.332714	0.70343	0.370716	Increase in Autocorrelation
281	0.180761	0.226709	0.045949	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
282	-0.11943	0.611758	0.731191	Increase in Autocorrelation
283	0.088074	-0.2	-0.28807	Decrease in Autocorrelation
284	0.065007	-0.18189	-0.24689	Decrease in Autocorrelation
285	-0.48463	-0.21247	0.272152	Increase in Autocorrelation
286	-0.95055	-0.35154	0.599007	Increase in Autocorrelation
287	0.624627	-0.13752	-0.76215	Decrease in Autocorrelation
288	-0.04336	0.108222	0.151577	Increase in Autocorrelation
289	-0.39336	0.131363	0.524722	Increase in Autocorrelation
290	0.353625	0.321006	-0.03262	Decrease in Autocorrelation
291	0.158644	0.29778	0.139136	Increase in Autocorrelation
292	0.114462	-0.53895	-0.65341	Decrease in Autocorrelation
293	0.466134	0.897664	0.431531	Increase in Autocorrelation
294	-0.02619	0.305831	0.332022	Increase in Autocorrelation
295	-0.12288	-0.65475	-0.53188	Decrease in Autocorrelation
296	0.263175	0.249373	-0.0138	Decrease in Autocorrelation
297	-0.35414	0.49177	0.845907	Increase in Autocorrelation
298	-0.48261	0.73351	1.216121	Increase in Autocorrelation
299	-0.21954	0.546642	0.766181	Increase in Autocorrelation
300	0.473627	0.786487	0.31286	Increase in Autocorrelation
301	-0.45689	0.720831	1.177721	Increase in Autocorrelation
302	0.220653	0.293901	0.073248	Increase in Autocorrelation
303	-0.36537	0.639093	1.004461	Increase in Autocorrelation
304	0.541208	-0.27556	-0.81677	Decrease in Autocorrelation
305	-0.7046	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
306	0.071706	-0.02758	-0.09929	Decrease in Autocorrelation
307	-0.39419	0.278975	0.67317	Increase in Autocorrelation
308	-0.2013	-0.10162	0.099676	Increase in Autocorrelation
309	-0.27599	-0.21494	0.061047	Increase in Autocorrelation
310	-0.41699	-0.25762	0.159376	Increase in Autocorrelation
311	-0.82372	0.041804	0.865522	Increase in Autocorrelation
312	#DIV/0!	0.654004	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
313	0.551201	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
314	-0.20361	0.282121	0.485734	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
315	-0.35197	-0.45873	-0.10676	Decrease in Autocorrelation
316	0.145481	0.433511	0.288031	Increase in Autocorrelation
317	0.524965	-0.23833	-0.7633	Decrease in Autocorrelation
318	-0.14682	0.680806	0.82763	Increase in Autocorrelation
319	0.211292	0.003025	-0.20827	Decrease in Autocorrelation
320	0.1627	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
321	-0.38072	-0.49841	-0.11769	Decrease in Autocorrelation
322	-0.1377	-0.11537	0.022327	Increase in Autocorrelation
323	-0.21028	0.186265	0.396547	Increase in Autocorrelation
324	0.080194	-0.13428	-0.21448	Decrease in Autocorrelation
325	0.691582	0.735988	0.044406	Increase in Autocorrelation
326	-0.01071	0.624748	0.63546	Increase in Autocorrelation
327	-0.18031	0.17169	0.352002	Increase in Autocorrelation
328	-0.32944	-0.31537	0.014074	Increase in Autocorrelation
329	-0.41092	-0.26224	0.14868	Increase in Autocorrelation
330	0.013558	0.596508	0.58295	Increase in Autocorrelation
331	-0.12067	0.68259	0.803259	Increase in Autocorrelation
332	-0.11604	-0.11541	0.000625	Increase in Autocorrelation
333	0.079626	-0.16645	-0.24607	Decrease in Autocorrelation
334	0.185446	-0.125	-0.31045	Decrease in Autocorrelation
335	-0.60597	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
336	0.580983	0.198697	-0.38229	Decrease in Autocorrelation
337	0.667423	0.365168	-0.30225	Decrease in Autocorrelation
338	0.581226	-0.32973	-0.91096	Decrease in Autocorrelation
339	0.623734	-0.02374	-0.64747	Decrease in Autocorrelation
340	0.191184	0.584933	0.393749	Increase in Autocorrelation
341	0.134058	0.668565	0.534507	Increase in Autocorrelation
342	-0.4625	0.510044	0.972543	Increase in Autocorrelation
343	0.664753	-0.51394	-1.17869	Decrease in Autocorrelation
344	-0.00809	0.405156	0.41325	Increase in Autocorrelation
345	0.127188	0.09752	-0.02967	Decrease in Autocorrelation
346	0.29521	0.002362	-0.29285	Decrease in Autocorrelation
347	0.714208	0.390877	-0.32333	Decrease in Autocorrelation
348	-0.47495	0.798057	1.273011	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
349	-0.30489	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
350	-0.46166	0.31419	0.775853	Increase in Autocorrelation
351	-0.54832	-0.16479	0.383535	Increase in Autocorrelation
352	-0.22768	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
353	-0.21081	0.752199	0.96301	Increase in Autocorrelation
354	-0.10163	0.249373	0.351002	Increase in Autocorrelation
355	-0.41902	-0.23487	0.184148	Increase in Autocorrelation
356	-0.09369	0.321643	0.415334	Increase in Autocorrelation
357	0.36235	0.484102	0.121752	Increase in Autocorrelation
358	-0.27129	0.751285	1.022579	Increase in Autocorrelation
359	0.565561	-0.08612	-0.65168	Decrease in Autocorrelation
360	-0.2789	-0.1546	0.124299	Increase in Autocorrelation
361	-0.21218	-0.15971	0.052478	Increase in Autocorrelation
362	0.298415	-0.09225	-0.39067	Decrease in Autocorrelation
363	0.07153	0.214776	0.143246	Increase in Autocorrelation
364	-0.08151	0.65419	0.7357	Increase in Autocorrelation
365	0.552059	0.423478	-0.12858	Decrease in Autocorrelation
366	-0.18822	0.071563	0.259787	Increase in Autocorrelation
367	-0.0503	0.522879	0.573182	Increase in Autocorrelation
368	-0.32232	0.308004	0.63032	Increase in Autocorrelation
369	0.59282	0.105513	-0.48731	Decrease in Autocorrelation
370	-0.43215	0.791391	1.223536	Increase in Autocorrelation
371	-0.25	0.681102	0.931102	Increase in Autocorrelation
372	-0.05434	0.059139	0.113474	Increase in Autocorrelation
373	0.293268	-0.03491	-0.32818	Decrease in Autocorrelation
374	-0.09955	0.752094	0.851641	Increase in Autocorrelation
375	0.045176	-0.11323	-0.1584	Decrease in Autocorrelation
376	-0.10686	-0.97603	-0.86918	Decrease in Autocorrelation
377	0.643542	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
378	0.22468	0.208218	-0.01646	Decrease in Autocorrelation
379	-0.31199	0.604636	0.916624	Increase in Autocorrelation
380	-0.25137	-0.10249	0.148879	Increase in Autocorrelation
381	-0.51791	-0.40522	0.112693	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
382	-0.79594	-0.07618	0.719766	Increase in Autocorrelation
383	0.329819	0.119171	-0.21065	Decrease in Autocorrelation
384	-0.25965	0.400057	0.659707	Increase in Autocorrelation
385	-0.00937	0.655414	0.664781	Increase in Autocorrelation
386	-0.4666	-0.32303	0.143574	Increase in Autocorrelation
387	-0.49115	0.155649	0.646797	Increase in Autocorrelation
388	-0.24919	-0.45814	-0.20895	Decrease in Autocorrelation
389	-0.63691	0.15695	0.793862	Increase in Autocorrelation
390	-0.17682	-0.08362	0.093198	Increase in Autocorrelation
391	0.666176	-0.25	-0.91618	Decrease in Autocorrelation
392	0.024188	0.170035	0.145847	Increase in Autocorrelation
393	-0.279	0.723456	1.002456	Increase in Autocorrelation
394	-0.08145	-0.58067	-0.49922	Decrease in Autocorrelation
395	0.325309	0.17663	-0.14868	Decrease in Autocorrelation
396	0.2631	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
397	0.590933	#DIV/0!	#DIV/0!	Undefined Autocorrelation Due to Zero Standard Deviation
398	-0.24108	0.723727	0.964808	Increase in Autocorrelation
399	-0.36051	0.39067	0.751178	Increase in Autocorrelation
400	0.175535	0.081048	-0.09449	Decrease in Autocorrelation

Appendix J: Autocorrelation Calculations for the Graduate Group

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
1	-0.23666	0.537674	0.774329	Increase in Autocorrelation
2	0.854812	0.038822	-0.81599	Decrease in Autocorrelation
3	0.146284	-0.23374	-0.38002	Decrease in Autocorrelation
4	0.021516	-0.51266	-0.53418	Decrease in Autocorrelation
5	-0.14619	-0.26404	-0.11785	Decrease in Autocorrelation
6	0.339376	0.783816	0.44444	Increase in Autocorrelation
7	0.421858	-0.12835	-0.55021	Decrease in Autocorrelation
8	0.124852	-0.33906	-0.46391	Decrease in Autocorrelation
9	0.188875	0.394123	0.205248	Increase in Autocorrelation
10	0.441015	0.087288	-0.35373	Decrease in Autocorrelation
11	0.489446	-0.2688	-0.75825	Decrease in Autocorrelation
12	0.033465	-0.65712	-0.69059	Decrease in Autocorrelation
13	-0.1511	0.156633	0.307737	Increase in Autocorrelation
14	-0.23315	0.079278	0.312432	Increase in Autocorrelation
15	0.618036	0.238887	-0.37915	Decrease in Autocorrelation
16	0.189123	0.590031	0.400908	Increase in Autocorrelation
17	-0.35978	-0.74085	-0.38106	Decrease in Autocorrelation
18	0.238967	-0.20175	-0.44072	Decrease in Autocorrelation
19	-0.13719	-0.09787	0.039321	Increase in Autocorrelation
20	0.012897	-0.0017	-0.0146	Decrease in Autocorrelation
21	0.219607	-0.67346	-0.89306	Decrease in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
22	0.279128	0.35996	0.080832	Increase in Autocorrelation
23	-0.29534	0.285357	0.5807	Increase in Autocorrelation
24	0.309434	0.101447	-0.20799	Decrease in Autocorrelation
25	-0.34539	0.529349	0.874736	Increase in Autocorrelation
26	0.243674	-0.32052	-0.5642	Decrease in Autocorrelation
27	-0.35311	-0.41589	-0.06278	Decrease in Autocorrelation
28	0.181876	-0.03484	-0.21671	Decrease in Autocorrelation
29	-0.28952	0.203351	0.492869	Increase in Autocorrelation
30	-0.19157	0.18538	0.376948	Increase in Autocorrelation
31	-0.06527	-0.17529	-0.11002	Decrease in Autocorrelation
32	-0.29971	0.396782	0.696488	Increase in Autocorrelation
33	-0.13619	0.142506	0.278699	Increase in Autocorrelation
34	-0.44195	0.543555	0.985503	Increase in Autocorrelation
35	0.161744	0.64213	0.480386	Increase in Autocorrelation
36	0.086436	0.348777	0.262341	Increase in Autocorrelation
37	0.46297	0.349137	-0.11383	Decrease in Autocorrelation
38	-0.13923	-0.29139	-0.15216	Decrease in Autocorrelation
39	0.405574	0.653655	0.248081	Increase in Autocorrelation
40	-0.10597	0.495367	0.601335	Increase in Autocorrelation
41	-0.48304	-0.40341	0.079628	Increase in Autocorrelation
42	0.345049	0.142688	-0.20236	Decrease in Autocorrelation
43	-0.01146	0.029762	0.041226	Increase in Autocorrelation
44	0.080252	0.380983	0.300731	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
45	0.228717	0.233498	0.004781	Increase in Autocorrelation
46	0.144035	-0.05906	-0.2031	Decrease in Autocorrelation
47	-0.23305	-0.24912	-0.01608	Decrease in Autocorrelation
48	-0.04153	0.565464	0.606998	Increase in Autocorrelation
49	0.157357	0.672023	0.514666	Increase in Autocorrelation
50	-0.01729	0.210432	0.227722	Increase in Autocorrelation
51	-0.26258	0.663938	0.926515	Increase in Autocorrelation
52	-0.47488	-0.06134	0.413544	Increase in Autocorrelation
53	-0.25227	-0.18361	0.068666	Increase in Autocorrelation
54	0.179731	0.640404	0.460673	Increase in Autocorrelation
55	-0.24495	-0.14594	0.099014	Increase in Autocorrelation
56	0.370755	-0.01927	-0.39003	Decrease in Autocorrelation
57	0.00119	0.206561	0.205371	Increase in Autocorrelation
58	0.417654	0.07008	-0.34757	Decrease in Autocorrelation
59	0.232908	0.474203	0.241295	Increase in Autocorrelation
60	-0.16394	-0.15426	0.009674	Increase in Autocorrelation
61	-0.11389	-0.206	-0.0921	Decrease in Autocorrelation
62	-0.36607	-0.01258	0.353484	Increase in Autocorrelation
63	0.049976	-0.06199	-0.11197	Decrease in Autocorrelation
64	0.195867	-0.62687	-0.82273	Decrease in Autocorrelation
65	0.01937	0.330059	0.310689	Increase in Autocorrelation
66	-0.43607	0.086047	0.522121	Increase in Autocorrelation
67	0.881011	0.543548	-0.33746	Decrease in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
68	0.07259	0.267883	0.195293	Increase in Autocorrelation
69	0.480267	-0.6185	-1.09877	Decrease in Autocorrelation
70	-0.01197	0.010138	0.022106	Increase in Autocorrelation
71	-0.32936	-0.20212	0.127242	Increase in Autocorrelation
72	0.180692	0.327677	0.146985	Increase in Autocorrelation
73	-0.13693	-0.55688	-0.41995	Decrease in Autocorrelation
74	-0.21249	0.453463	0.665951	Increase in Autocorrelation
75	0.639153	0.448051	-0.1911	Decrease in Autocorrelation
76	0.485574	-0.6821	-1.16768	Decrease in Autocorrelation
77	-0.39095	-0.0894	0.301549	Increase in Autocorrelation
78	-0.45924	0.116748	0.575991	Increase in Autocorrelation
79	0.177872	0.819368	0.641496	Increase in Autocorrelation
80	-0.11702	0.30567	0.422685	Increase in Autocorrelation
81	-0.22075	0.218751	0.439498	Increase in Autocorrelation
82	-0.22484	0.512437	0.737272	Increase in Autocorrelation
83	-0.33075	0.100095	0.430843	Increase in Autocorrelation
84	0.140995	0.493415	0.35242	Increase in Autocorrelation
85	0.165057	-0.03574	-0.2008	Decrease in Autocorrelation
86	0.46384	0.023669	-0.44017	Decrease in Autocorrelation
87	-0.23088	0.546451	0.777335	Increase in Autocorrelation
88	0.158182	0.113847	-0.04433	Decrease in Autocorrelation
89	0.67297	0.207552	-0.46542	Decrease in Autocorrelation
90	0.095444	0.60496	0.509515	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
91	0.633581	-0.1937	-0.82728	Decrease in Autocorrelation
92	0.576835	0.58492	0.008085	Increase in Autocorrelation
93	0.594922	-0.41328	-1.0082	Decrease in Autocorrelation
94	0.625247	0.007611	-0.61764	Decrease in Autocorrelation
95	0.068816	0.459748	0.390932	Increase in Autocorrelation
96	-0.17947	-0.33137	-0.1519	Decrease in Autocorrelation
97	0.32921	-0.08022	-0.40943	Decrease in Autocorrelation
98	0.047825	0.414609	0.366784	Increase in Autocorrelation
99	-0.21676	0.32126	0.538017	Increase in Autocorrelation
100	-0.63448	0.367035	1.001518	Increase in Autocorrelation
101	-0.23129	0.186189	0.417477	Increase in Autocorrelation
102	0.238046	0.251613	0.013567	Increase in Autocorrelation
103	0.079183	0.466558	0.387375	Increase in Autocorrelation
104	0.194048	0.765918	0.57187	Increase in Autocorrelation
105	-0.4639	-0.57925	-0.11535	Decrease in Autocorrelation
106	0.141229	0.386932	0.245703	Increase in Autocorrelation
107	0.559282	-0.14443	-0.70372	Decrease in Autocorrelation
108	0.116724	0.388273	0.271549	Increase in Autocorrelation
109	-0.19302	-0.3302	-0.13718	Decrease in Autocorrelation
110	0.537239	-0.04409	-0.58132	Decrease in Autocorrelation
111	0.584986	-0.39509	-0.98008	Decrease in Autocorrelation
112	0.580394	-0.23809	-0.81848	Decrease in Autocorrelation
113	-0.32667	0.422484	0.749153	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
114	-0.69973	0.665198	1.364928	Increase in Autocorrelation
115	-0.01338	0.069478	0.082854	Increase in Autocorrelation
116	-0.12612	-0.70164	-0.57552	Decrease in Autocorrelation
117	0.124646	0.367554	0.242908	Increase in Autocorrelation
118	-0.52518	0.306739	0.83192	Increase in Autocorrelation
119	0.713015	0.734775	0.02176	Increase in Autocorrelation
120	0.545211	0.444647	-0.10056	Decrease in Autocorrelation
121	0.13888	-0.42959	-0.56847	Decrease in Autocorrelation
122	0.315175	0.205247	-0.10993	Decrease in Autocorrelation
123	0.710517	0.929962	0.219445	Increase in Autocorrelation
124	-0.39507	0.103543	0.498616	Increase in Autocorrelation
125	0.558686	-0.21776	-0.77645	Decrease in Autocorrelation
126	-0.12148	-0.01701	0.104467	Increase in Autocorrelation
127	0.392022	-0.38219	-0.77422	Decrease in Autocorrelation
128	0.831378	0.312047	-0.51933	Decrease in Autocorrelation
129	0.361233	-0.13953	-0.50076	Decrease in Autocorrelation
130	-0.22702	-0.36497	-0.13795	Decrease in Autocorrelation
131	0.162611	0.861446	0.698834	Increase in Autocorrelation
132	-0.23639	0.082568	0.318957	Increase in Autocorrelation
133	0.204313	-0.27579	-0.48011	Decrease in Autocorrelation
134	-0.17237	0.626388	0.798763	Increase in Autocorrelation
135	0.134189	-0.11391	-0.2481	Decrease in Autocorrelation
136	0.011532	0.114716	0.103184	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
137	-0.07797	0.04349	0.121457	Increase in Autocorrelation
138	0.27283	0.104834	-0.168	Decrease in Autocorrelation
139	-0.28133	-0.73556	-0.45423	Decrease in Autocorrelation
140	0.42131	0.121788	-0.29952	Decrease in Autocorrelation
141	0.519318	-0.27315	-0.79247	Decrease in Autocorrelation
142	-0.15307	-0.19019	-0.03712	Decrease in Autocorrelation
143	0.334321	0.424042	0.089721	Increase in Autocorrelation
144	0.541667	0.650075	0.108408	Increase in Autocorrelation
145	0.379867	0.300022	-0.07984	Decrease in Autocorrelation
146	0.043947	-0.27913	-0.32307	Decrease in Autocorrelation
147	-0.11925	-0.19988	-0.08063	Decrease in Autocorrelation
148	0.041185	0.084011	0.042826	Increase in Autocorrelation
149	-0.22812	0.082169	0.310289	Increase in Autocorrelation
150	0.300406	0.046082	-0.25432	Decrease in Autocorrelation
151	0.198197	0.143813	-0.05438	Decrease in Autocorrelation
152	0.448675	-0.43126	-0.87994	Decrease in Autocorrelation
153	-0.20787	-0.18953	0.018334	Increase in Autocorrelation
154	-0.25	0.649116	0.899116	Increase in Autocorrelation
155	-0.60164	-0.00139	0.600247	Increase in Autocorrelation
156	-0.09091	0.68462	0.775529	Increase in Autocorrelation
157	-0.22662	-0.40592	-0.1793	Decrease in Autocorrelation
158	-0.33743	-0.27922	0.058206	Increase in Autocorrelation
159	0.133151	0.666618	0.533467	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
160	-0.22826	0.595456	0.823719	Increase in Autocorrelation
161	0.269284	-0.08463	-0.35391	Decrease in Autocorrelation
162	-0.41646	0.161495	0.577958	Increase in Autocorrelation
163	0.146169	-0.18357	-0.32974	Decrease in Autocorrelation
164	0.050813	0.68573	0.634916	Increase in Autocorrelation
165	0.160072	0.066952	-0.09312	Decrease in Autocorrelation
166	0.058361	-0.08131	-0.13967	Decrease in Autocorrelation
167	-0.32024	0.56158	0.881822	Increase in Autocorrelation
168	0.671508	-0.20643	-0.87794	Decrease in Autocorrelation
169	-0.2194	0.614303	0.833706	Increase in Autocorrelation
170	-0.11268	0.736634	0.849312	Increase in Autocorrelation
171	0.056809	0.81172	0.754911	Increase in Autocorrelation
172	-0.23559	-0.37786	-0.14227	Decrease in Autocorrelation
173	-0.2543	-0.31743	-0.06312	Decrease in Autocorrelation
174	0.326386	0.711668	0.385282	Increase in Autocorrelation
175	-0.13108	0.416465	0.547543	Increase in Autocorrelation
176	-0.22832	0.780763	1.009084	Increase in Autocorrelation
177	-0.43881	-0.36549	0.073324	Increase in Autocorrelation
178	-0.74014	0.175058	0.9152	Increase in Autocorrelation
179	-0.19152	0.413062	0.604586	Increase in Autocorrelation
180	0.368348	-0.03249	-0.40083	Decrease in Autocorrelation
181	-0.19029	-0.13847	0.051815	Increase in Autocorrelation
182	-0.30728	-0.23019	0.077088	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
183	-0.16872	0.395654	0.564375	Increase in Autocorrelation
184	-0.0502	0.058203	0.108405	Increase in Autocorrelation
185	-0.63612	-0.179	0.457122	Increase in Autocorrelation
186	0.312913	-0.23891	-0.55182	Decrease in Autocorrelation
187	0.569996	-0.0269	-0.59689	Decrease in Autocorrelation
188	-0.20118	0.466464	0.667641	Increase in Autocorrelation
189	-0.98386	-0.24376	0.740098	Increase in Autocorrelation
190	-0.0252	-0.34287	-0.31767	Decrease in Autocorrelation
191	0.296939	0.545326	0.248387	Increase in Autocorrelation
192	0.326002	0.146866	-0.17914	Decrease in Autocorrelation
193	-0.23927	-0.28498	-0.04572	Decrease in Autocorrelation
194	-0.10004	-0.10586	-0.00583	Decrease in Autocorrelation
195	0.686442	0.8004	0.113957	Increase in Autocorrelation
196	-0.09889	-0.6331	-0.5342	Decrease in Autocorrelation
197	0.01741	-0.0982	-0.11561	Decrease in Autocorrelation
198	-0.36348	-0.32015	0.043326	Increase in Autocorrelation
199	0.087332	0.246456	0.159124	Increase in Autocorrelation
200	0.038338	0.717354	0.679016	Increase in Autocorrelation
201	-0.3386	-0.37999	-0.04139	Decrease in Autocorrelation
202	-0.41526	0.431255	0.846519	Increase in Autocorrelation
203	-0.08349	-0.167	-0.08351	Decrease in Autocorrelation
204	-0.1648	0.135213	0.300014	Increase in Autocorrelation
205	-0.19679	-0.00371	0.193084	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
206	-0.09693	-0.30105	-0.20413	Decrease in Autocorrelation
207	-0.08608	0.011493	0.09757	Increase in Autocorrelation
208	-0.00931	-0.18794	-0.17863	Decrease in Autocorrelation
209	-0.24736	-0.16033	0.087034	Increase in Autocorrelation
210	0.030786	0.641601	0.610815	Increase in Autocorrelation
211	0.032419	-0.50544	-0.53785	Decrease in Autocorrelation
212	0.428968	-0.07786	-0.50683	Decrease in Autocorrelation
213	-0.33128	-0.16677	0.164505	Increase in Autocorrelation
214	0.07321	-0.31381	-0.38702	Decrease in Autocorrelation
215	-0.04439	-0.21542	-0.17103	Decrease in Autocorrelation
216	0.701826	-0.10501	-0.80684	Decrease in Autocorrelation
217	-0.22949	0.644038	0.873531	Increase in Autocorrelation
218	-0.37224	-0.18487	0.187374	Increase in Autocorrelation
219	0.070909	0.557777	0.486868	Increase in Autocorrelation
220	-0.15134	0.173818	0.325156	Increase in Autocorrelation
221	-0.07461	-0.12472	-0.05011	Decrease in Autocorrelation
222	0.11317	-0.15073	-0.2639	Decrease in Autocorrelation
223	-0.32329	0.224138	0.547428	Increase in Autocorrelation
224	0.473849	-0.22297	-0.69682	Decrease in Autocorrelation
225	-0.30754	-0.20634	0.101204	Increase in Autocorrelation
226	-0.25492	-0.25233	0.002592	Increase in Autocorrelation
227	-0.26677	-0.12653	0.140242	Increase in Autocorrelation
228	-0.12723	0.275923	0.403155	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
229	-0.20998	0.247746	0.457727	Increase in Autocorrelation
230	0.352563	0.414416	0.061853	Increase in Autocorrelation
231	0.701064	0.044126	-0.65694	Decrease in Autocorrelation
232	0.490658	0.091256	-0.3994	Decrease in Autocorrelation
233	0.07441	-0.58612	-0.66053	Decrease in Autocorrelation
234	0.346342	0.398442	0.0521	Increase in Autocorrelation
235	0.203234	0.349119	0.145885	Increase in Autocorrelation
236	-0.50136	-0.0374	0.463958	Increase in Autocorrelation
237	-0.04666	-0.10419	-0.05753	Decrease in Autocorrelation
238	0.098006	-0.23825	-0.33626	Decrease in Autocorrelation
239	-0.16286	-0.41641	-0.25355	Decrease in Autocorrelation
240	0.418097	-0.1619	-0.58	Decrease in Autocorrelation
241	-0.42378	0.029811	0.453589	Increase in Autocorrelation
242	-0.19755	-0.31348	-0.11593	Decrease in Autocorrelation
243	-0.40667	-0.35124	0.055437	Increase in Autocorrelation
244	0.13572	0.818621	0.682901	Increase in Autocorrelation
245	-0.00591	-0.24431	-0.23841	Decrease in Autocorrelation
246	0.373497	0.105981	-0.26752	Decrease in Autocorrelation
247	0.220723	0.477859	0.257136	Increase in Autocorrelation
248	0.014079	-0.03067	-0.04475	Decrease in Autocorrelation
249	-0.09572	0.144261	0.239977	Increase in Autocorrelation
250	0.448139	-0.47539	-0.92353	Decrease in Autocorrelation
251	-0.31405	-0.1961	0.117957	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
252	0.567771	0.023176	-0.54459	Decrease in Autocorrelation
253	-0.18164	0.274334	0.455972	Increase in Autocorrelation
254	0.107556	-0.01299	-0.12055	Decrease in Autocorrelation
255	0.153541	-0.12792	-0.28147	Decrease in Autocorrelation
256	0.184163	-0.36261	-0.54677	Decrease in Autocorrelation
257	0.33782	-0.59426	-0.93208	Decrease in Autocorrelation
258	0.048042	-0.25233	-0.30037	Decrease in Autocorrelation
259	-0.17209	0.058105	0.230199	Increase in Autocorrelation
260	0.326525	-0.08077	-0.4073	Decrease in Autocorrelation
261	-0.24749	0.223478	0.470972	Increase in Autocorrelation
262	0.262939	-0.52711	-0.79005	Decrease in Autocorrelation
263	0.520296	-0.08518	-0.60548	Decrease in Autocorrelation
264	-0.32843	-0.23451	0.093921	Increase in Autocorrelation
265	0.220152	0.047062	-0.17309	Decrease in Autocorrelation
266	0.670373	-0.28993	-0.9603	Decrease in Autocorrelation
267	0.617097	-0.19814	-0.81524	Decrease in Autocorrelation
268	-0.11137	-0.02869	0.082672	Increase in Autocorrelation
269	-0.42107	-0.19888	0.222188	Increase in Autocorrelation
270	0.016001	0.394061	0.37806	Increase in Autocorrelation
271	0.276135	0.210981	-0.06515	Decrease in Autocorrelation
272	-0.0957	-0.11105	-0.01535	Decrease in Autocorrelation
273	0.349499	-0.1382	-0.4877	Decrease in Autocorrelation
274	0.093404	-0.17486	-0.26826	Decrease in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
275	-0.336	0.587041	0.923041	Increase in Autocorrelation
276	0.317767	0.740832	0.423065	Increase in Autocorrelation
277	0.658707	-0.17962	-0.83833	Decrease in Autocorrelation
278	-0.19276	-0.11998	0.072772	Increase in Autocorrelation
279	0.043259	-0.46332	-0.50658	Decrease in Autocorrelation
280	-0.04023	0.295177	0.335409	Increase in Autocorrelation
281	-0.17512	-0.16463	0.010488	Increase in Autocorrelation
282	-0.16985	0.130039	0.299894	Increase in Autocorrelation
283	0.044407	-0.02301	-0.06741	Decrease in Autocorrelation
284	-0.10998	-0.10831	0.00167	Increase in Autocorrelation
285	0.233333	-0.27606	-0.50939	Decrease in Autocorrelation
286	0.017961	-0.19237	-0.21034	Decrease in Autocorrelation
287	-0.09973	-0.14005	-0.04032	Decrease in Autocorrelation
288	0.287072	0.228447	-0.05862	Decrease in Autocorrelation
289	0.102433	0.523677	0.421244	Increase in Autocorrelation
290	0.159038	-0.45046	-0.6095	Decrease in Autocorrelation
291	0.281885	-0.11518	-0.39706	Decrease in Autocorrelation
292	0.238867	-0.01313	-0.252	Decrease in Autocorrelation
293	-0.06944	0.115067	0.184511	Increase in Autocorrelation
294	0.112018	0.119318	0.0073	Increase in Autocorrelation
295	-0.06926	-0.19032	-0.12106	Decrease in Autocorrelation
296	-0.01866	0.718319	0.736975	Increase in Autocorrelation
297	-0.62948	0.34638	0.975858	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
298	-0.30147	-0.18017	0.121306	Increase in Autocorrelation
299	-0.23536	0.474705	0.710063	Increase in Autocorrelation
300	-0.46404	-0.25905	0.204991	Increase in Autocorrelation
301	0.000781	0.797998	0.797217	Increase in Autocorrelation
302	0.135903	-0.19286	-0.32877	Decrease in Autocorrelation
303	-0.36602	-0.11024	0.255777	Increase in Autocorrelation
304	-0.38209	-0.35235	0.029737	Increase in Autocorrelation
305	-0.05575	-0.53014	-0.47438	Decrease in Autocorrelation
306	-0.05657	-0.15113	-0.09456	Decrease in Autocorrelation
307	-0.14383	0.377137	0.520971	Increase in Autocorrelation
308	-0.20934	-0.05048	0.158861	Increase in Autocorrelation
309	0.25884	-0.07338	-0.33222	Decrease in Autocorrelation
310	-0.5846	0.708474	1.293078	Increase in Autocorrelation
311	0.590578	-0.01596	-0.60654	Decrease in Autocorrelation
312	-0.27456	0.103934	0.378491	Increase in Autocorrelation
313	0.418644	0.223662	-0.19498	Decrease in Autocorrelation
314	0.153888	-0.06435	-0.21823	Decrease in Autocorrelation
315	-0.3395	-0.02821	0.311295	Increase in Autocorrelation
316	0.06946	0.218963	0.149503	Increase in Autocorrelation
317	-0.1226	0.596223	0.718827	Increase in Autocorrelation
318	-0.02404	-0.13783	-0.11379	Decrease in Autocorrelation
319	0.547762	0.157447	-0.39032	Decrease in Autocorrelation
320	-0.40132	-0.00264	0.398686	Increase in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
321	0.36882	0.768411	0.399591	Increase in Autocorrelation
322	-0.62365	-0.39567	0.227979	Increase in Autocorrelation
323	-0.14536	0.002857	0.148213	Increase in Autocorrelation
324	-0.27149	0.194351	0.465843	Increase in Autocorrelation
325	0.002686	-0.02472	-0.02741	Decrease in Autocorrelation
326	0.4862	0.231438	-0.25476	Decrease in Autocorrelation
327	-0.14028	-0.11247	0.027813	Increase in Autocorrelation
328	0.48056	0.861602	0.381041	Increase in Autocorrelation
329	0.096725	0.344644	0.247918	Increase in Autocorrelation
330	-0.207	0.294463	0.501458	Increase in Autocorrelation
331	0.335943	-0.23203	-0.56797	Decrease in Autocorrelation
332	0.293268	-0.03491	-0.32818	Decrease in Autocorrelation
333	0.378911	-0.26712	-0.64603	Decrease in Autocorrelation
334	-0.56949	0.206007	0.775495	Increase in Autocorrelation
335	0.11728	0.060048	-0.05723	Decrease in Autocorrelation
336	-0.12876	-0.05943	0.069336	Increase in Autocorrelation
337	-0.8588	0.249751	1.108553	Increase in Autocorrelation
338	-0.31061	0.533841	0.844449	Increase in Autocorrelation
339	0.446086	0.367638	-0.07845	Decrease in Autocorrelation
340	0.705391	0.098468	-0.60692	Decrease in Autocorrelation
341	0.226049	0.191301	-0.03475	Decrease in Autocorrelation
342	-0.63942	0.667397	1.306816	Increase in Autocorrelation
343	0.800335	0.545011	-0.25532	Decrease in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
344	-0.08346	-0.39957	-0.31611	Decrease in Autocorrelation
345	0.227817	-0.3492	-0.57702	Decrease in Autocorrelation
346	-0.00874	-0.01514	-0.0064	Decrease in Autocorrelation
347	0.275901	0.037765	-0.23814	Decrease in Autocorrelation
348	0.370567	0.75213	0.381563	Increase in Autocorrelation
349	0.009055	-0.18221	-0.19127	Decrease in Autocorrelation
350	0.673186	-0.11615	-0.78933	Decrease in Autocorrelation
351	0.488731	0.430357	-0.05837	Decrease in Autocorrelation
352	0.134323	-0.13554	-0.26986	Decrease in Autocorrelation
353	-0.77597	-0.08523	0.690744	Increase in Autocorrelation
354	0.746914	-0.54907	-1.29599	Decrease in Autocorrelation
355	-0.47138	0.806021	1.2774	Increase in Autocorrelation
356	-0.07284	-0.08606	-0.01321	Decrease in Autocorrelation
357	0.583603	0.8271	0.243497	Increase in Autocorrelation
358	0.520586	0.030476	-0.49011	Decrease in Autocorrelation
359	-0.04966	-0.53568	-0.48602	Decrease in Autocorrelation
360	-0.15271	0.08946	0.242174	Increase in Autocorrelation
361	0.149874	-0.17811	-0.32798	Decrease in Autocorrelation
362	-0.3029	-0.17524	0.127664	Increase in Autocorrelation
363	0.603853	-0.42099	-1.02484	Decrease in Autocorrelation
364	0.040005	0.274278	0.234273	Increase in Autocorrelation
365	0.069484	0.017147	-0.05234	Decrease in Autocorrelation
366	0.708499	0.529354	-0.17914	Decrease in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
367	-0.3305	0.325688	0.656191	Increase in Autocorrelation
368	-0.04471	-0.06187	-0.01716	Decrease in Autocorrelation
369	0.310218	-0.14928	-0.4595	Decrease in Autocorrelation
370	-0.3134	0.31574	0.629138	Increase in Autocorrelation
371	0.45704	0.474809	0.017768	Increase in Autocorrelation
372	0.567091	-0.18663	-0.75372	Decrease in Autocorrelation
373	-0.12447	-0.28432	-0.15985	Decrease in Autocorrelation
374	-0.19497	0.068033	0.263	Increase in Autocorrelation
375	0.268654	0.353187	0.084533	Increase in Autocorrelation
376	-0.4871	0.04804	0.535141	Increase in Autocorrelation
377	-0.47709	0.230647	0.707735	Increase in Autocorrelation
378	-0.06338	0.025809	0.089188	Increase in Autocorrelation
379	-0.07711	-0.21585	-0.13874	Decrease in Autocorrelation
380	-0.22046	0.079328	0.299787	Increase in Autocorrelation
381	0.005367	-0.0439	-0.04926	Decrease in Autocorrelation
382	-0.36138	-0.02086	0.340512	Increase in Autocorrelation
383	0.208417	0.341989	0.133572	Increase in Autocorrelation
384	0.189841	-0.13582	-0.32566	Decrease in Autocorrelation
385	0.237635	0.011174	-0.22646	Decrease in Autocorrelation
386	-0.3601	-0.09782	0.262287	Increase in Autocorrelation
387	0.201864	-0.14874	-0.3506	Decrease in Autocorrelation
388	-0.17158	-0.05441	0.117175	Increase in Autocorrelation
389	0.833808	0.025583	-0.80822	Decrease in Autocorrelation

ID	Autocorrelation Prior to Midpoint of Course Completion	Autocorrelation Post Midpoint of Course Completion	Difference	Conclusion on Autocorrelation
390	-0.18706	0.091885	0.27894	Increase in Autocorrelation
391	-0.02257	0.354188	0.37676	Increase in Autocorrelation
392	-0.29392	-0.3844	-0.09048	Decrease in Autocorrelation
393	0.534353	0.295209	-0.23914	Decrease in Autocorrelation
394	-0.17738	-0.34089	-0.16351	Decrease in Autocorrelation
395	-0.11212	0.220013	0.332136	Increase in Autocorrelation
396	-0.13533	-0.02725	0.10808	Increase in Autocorrelation
397	-0.0145	-0.13617	-0.12167	Decrease in Autocorrelation
398	0.372685	-0.15946	-0.53214	Decrease in Autocorrelation
399	-0.15068	0.002603	0.15328	Increase in Autocorrelation
400	0.655711	0.779293	0.123581	Increase in Autocorrelation

Appendix K: Variance Calculations for the Program Withdrawal Group

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
1	47.77778	498.7778	451	Increase in Variance
2	360.375	1444.882	1084.507	Increase in Variance
3	2221.067	1204.167	-1016.9	Decrease in Variance
4	771.5636	785.7636	14.2	Increase in Variance
5	1701.3	1383.3	-318	Decrease in Variance
6	1111.1	1208.167	97.06667	Increase in Variance
7	800.7308	1042.769	242.0385	Increase in Variance
8	1334.544	0	-1334.54	Decrease in Variance
9	641.8611	336.1111	-305.75	Decrease in Variance
10	19.8	1668	1648.2	Increase in Variance
11	969.5	2017.2	1047.7	Increase in Variance
12	78	2010.267	1932.267	Increase in Variance
13	924.8095	1339.286	414.4762	Increase in Variance
14	801.9	1316.667	514.7667	Increase in Variance
15	23.5	2203.5	2180	Increase in Variance
16	1344.8	1333.8	-11	Decrease in Variance
17	472.1667	194.7	-277.467	Decrease in Variance
18	1096	1686.5	590.5	Increase in Variance
19	1584.667	0	-1584.67	Decrease in Variance
20	1254.7	2492.3	1237.6	Increase in Variance
21	1901.067	35.46667	-1865.6	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
22	937.6667	1530.286	592.619	Increase in Variance
23	355.6	1664.667	1309.067	Increase in Variance
24	553.4182	739.5636	186.1455	Increase in Variance
25	49.8	2252.3	2202.5	Increase in Variance
26	34.95055	1056.797	1021.846	Increase in Variance
27	1327.974	1481.5	153.5256	Increase in Variance
28	849.8667	0	-849.867	Decrease in Variance
29	620.4182	1380.891	760.4727	Increase in Variance
30	871.2381	1759.286	888.0476	Increase in Variance
31	11.2381	2578.571	2567.333	Increase in Variance
32	1084.967	0	-1084.97	Decrease in Variance
33	2707.5	0	-2707.5	Decrease in Variance
34	1166.7	1891.7	725	Increase in Variance
35	992.2333	977.3889	-14.8444	Decrease in Variance
36	704.8095	1187.619	482.8095	Increase in Variance
37	951.3	965.7	14.4	Increase in Variance
38	48.26667	1273.6	1225.333	Increase in Variance
39	621.2727	1596.964	975.6909	Increase in Variance
40	82.7	1793.067	1710.367	Increase in Variance
41	1276.167	1129.2	-146.967	Decrease in Variance
42	72.7	1847	1774.3	Increase in Variance
43	894.4061	909.041	14.63492	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
44	1024.5	0	-1024.5	Decrease in Variance
45	742.4615	733.1026	-9.35897	Decrease in Variance
46	878.8352	1380.555	501.7198	Increase in Variance
47	1504.167	1764	259.8333	Increase in Variance
48	91.60606	1250.727	1159.121	Increase in Variance
49	1080.8	1039.2	-41.6	Decrease in Variance
50	2311.8	1264.8	-1047	Decrease in Variance
51	19.41071	1694.411	1675	Increase in Variance
52	1802.857	946.125	-856.732	Decrease in Variance
53	1530.476	711.2381	-819.238	Decrease in Variance
54	968.4	1021.524	53.12381	Increase in Variance
55	1168	1669.286	501.2857	Increase in Variance
56	704.1667	0	-704.167	Decrease in Variance
57	1227.577	35.47436	-1192.1	Decrease in Variance
58	1380.567	0	-1380.57	Decrease in Variance
59	1333.879	951.6061	-382.273	Decrease in Variance
60	554.6778	67.73333	-486.944	Decrease in Variance
61	1734	0	-1734	Decrease in Variance
62	28.3	1453.6	1425.3	Increase in Variance
63	980.0662	1376.096	396.0294	Increase in Variance
64	388.8286	1351.857	963.0286	Increase in Variance
65	1065.696	760.5	-305.196	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
66	18.4	1954.267	1935.867	Increase in Variance
67	1217.286	955.9524	-261.333	Decrease in Variance
68	1409.5	1195.2	-214.3	Decrease in Variance
69	99.6	1014	914.4	Increase in Variance
70	986.4095	697.7143	-288.695	Decrease in Variance
71	1401.767	0	-1401.77	Decrease in Variance
72	1470.8	0	-1470.8	Decrease in Variance
73	1165.467	2041.767	876.3	Increase in Variance
74	1711.038	1581.846	-129.192	Decrease in Variance
75	416.4	799.6958	383.2958	Increase in Variance
76	326.2749	1111.544	785.269	Increase in Variance
77	79.76667	1954.267	1874.5	Increase in Variance
78	58.52964	1680.937	1622.407	Increase in Variance
79	1051.6	1760.363	708.7625	Increase in Variance
80	1161.902	1055.152	-106.75	Decrease in Variance
81	96.69643	1477.125	1380.429	Increase in Variance
82	169.0667	1764	1594.933	Increase in Variance
83	1160.011	1294.233	134.2222	Increase in Variance
84	1105.767	0	-1105.77	Decrease in Variance
85	927.4095	1325.314	397.9048	Increase in Variance
86	1012.838	1328.4	315.5619	Increase in Variance
87	67.83929	1190.125	1122.286	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
88	1125.839	0	-1125.84	Decrease in Variance
89	1110.554	503.5536	-607	Decrease in Variance
90	504.9945	493.8242	-11.1703	Decrease in Variance
91	735.6964	860.6964	125	Increase in Variance
92	826	578	-248	Decrease in Variance
93	84.26667	1591.067	1506.8	Increase in Variance
94	1195.268	1421.643	226.375	Increase in Variance
95	617.1429	0	-617.143	Decrease in Variance
96	1340.75	28.02778	-1312.72	Decrease in Variance
97	1789.554	1706.268	-83.2857	Decrease in Variance
98	17.125	1879.982	1862.857	Increase in Variance
99	847.2857	1481.143	633.8571	Increase in Variance
100	471.6625	880.9292	409.2667	Increase in Variance
101	945.5294	918.0654	-27.4641	Decrease in Variance
102	128.1429	1506.905	1378.762	Increase in Variance
103	610.4182	692.8727	82.45455	Increase in Variance
104	1353.974	948.6667	-405.308	Decrease in Variance
105	878.1429	1339.286	461.1429	Increase in Variance
106	1792.5	1886.8	94.3	Increase in Variance
107	22.96667	2199.1	2176.133	Increase in Variance
108	1016.143	1568.238	552.0952	Increase in Variance
109	1308.111	0	-1308.11	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
110	1075.367	1539.867	464.5	Increase in Variance
111	696.4545	112.4242	-584.03	Decrease in Variance
112	1254.8	1272	17.2	Increase in Variance
113	720.8889	677.3444	-43.5444	Decrease in Variance
114	1266.3	0	-1266.3	Decrease in Variance
115	891.2857	0	-891.286	Decrease in Variance
116	53.80769	1339.026	1285.218	Increase in Variance
117	1258.333	385.3333	-873	Decrease in Variance
118	478.2667	1149.2	670.9333	Increase in Variance
119	1127	1162	35	Increase in Variance
120	967.0545	1140.8	173.7455	Increase in Variance
121	1628.818	1875.564	246.7455	Increase in Variance
122	549.1	1114.667	565.5667	Increase in Variance
123	111.5714	1754.571	1643	Increase in Variance
124	119.1	1142.167	1023.067	Increase in Variance
125	1223.75	1708.111	484.3611	Increase in Variance
126	707.3778	1575.389	868.0111	Increase in Variance
127	1500.418	1165.873	-334.545	Decrease in Variance
128	68.5	1271.028	1202.528	Increase in Variance
129	1730.143	1517.143	-213	Decrease in Variance
130	1504.167	1380.167	-124	Decrease in Variance
131	1174.564	1327.833	153.2692	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
132	932.9333	1080.944	148.0111	Increase in Variance
133	1527.929	1522.214	-5.71429	Decrease in Variance
134	72.25714	975.7429	903.4857	Increase in Variance
135	1225.764	1340.891	115.1273	Increase in Variance
136	1400.8	1986.3	585.5	Increase in Variance
137	1737.611	672.4	-1065.21	Decrease in Variance
138	2133.2	1847	-286.2	Decrease in Variance
139	1089.733	833.5958	-256.138	Decrease in Variance
140	965.9	1130.267	164.3667	Increase in Variance
141	512.8182	1319.818	807	Increase in Variance
142	1378.473	1327.418	-51.0545	Decrease in Variance
143	1448.571	0	-1448.57	Decrease in Variance
144	1519.511	637.3444	-882.167	Decrease in Variance
145	1409.286	1743.571	334.2857	Increase in Variance
146	902.2143	1224.125	321.9107	Increase in Variance
147	2282.267	1053.6	-1228.67	Decrease in Variance
148	920.2667	1762.567	842.3	Increase in Variance
149	226.5682	973.4773	746.9091	Increase in Variance
150	798.2143	1334.411	536.1964	Increase in Variance
151	41.1	1906.567	1865.467	Increase in Variance
152	55.02917	1737.496	1682.467	Increase in Variance
153	1714.143	1757.286	43.14286	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
154	1093.75	1286.5	192.75	Increase in Variance
155	813.9444	1587	773.0556	Increase in Variance
156	1339.286	660.5714	-678.714	Decrease in Variance
157	89.3	1611.2	1521.9	Increase in Variance
158	1475	818.9048	-656.095	Decrease in Variance
159	1344.5	1392.8	48.3	Increase in Variance
160	1380.167	0	-1380.17	Decrease in Variance
161	1710.143	1800.238	90.09524	Increase in Variance
162	26.3	1036.8	1010.5	Increase in Variance
163	790.8791	1188.527	397.6484	Increase in Variance
164	1816.7	2105.5	288.8	Increase in Variance
165	62.75	1477.444	1414.694	Increase in Variance
166	1730.4	1915.9	185.5	Increase in Variance
167	472.5714	1009.341	536.7692	Increase in Variance
168	83.2	0	-83.2	Decrease in Variance
169	12.47619	1552.286	1539.81	Increase in Variance
170	755.2	1022.7	267.5	Increase in Variance
171	14	1513.8	1499.8	Increase in Variance
172	31.2	2218.7	2187.5	Increase in Variance
173	858.6667	1405.767	547.1	Increase in Variance
174	1326.3	1965.2	638.9	Increase in Variance
175	1051.028	0	-1051.03	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
176	496.9091	1583.606	1086.697	Increase in Variance
177	809.478	1089.341	279.8626	Increase in Variance
178	426.4412	1529.515	1103.074	Increase in Variance
179	1433.286	549.1429	-884.143	Decrease in Variance
180	942.4143	931.7905	-10.6238	Decrease in Variance
181	809.3235	1968.84	1159.516	Increase in Variance
182	114.1111	1088.861	974.75	Increase in Variance
183	1456.989	1312.5	-144.489	Decrease in Variance
184	868.0409	819.0058	-49.0351	Decrease in Variance
185	71.41071	1521.929	1450.518	Increase in Variance
186	1752.982	0	-1752.98	Decrease in Variance
187	956.4795	780.7602	-175.719	Decrease in Variance
188	29.14286	1498.786	1469.643	Increase in Variance
189	1531.839	0	-1531.84	Decrease in Variance
190	102.8	1592.3	1489.5	Increase in Variance
191	1407	1453.3	46.3	Increase in Variance
192	857.4	0	-857.4	Decrease in Variance
193	1134.286	1481.571	347.2857	Increase in Variance
194	75.11111	1150.361	1075.25	Increase in Variance
195	542.2045	1260.447	718.2424	Increase in Variance
196	1143.367	158.6667	-984.7	Decrease in Variance
197	938.9368	987.1462	48.20949	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
198	58.47619	1398.143	1339.667	Increase in Variance
199	1382.3	1070.8	-311.5	Decrease in Variance
200	1624.5	1344.8	-279.7	Decrease in Variance
201	999.3667	1377.767	378.4	Increase in Variance
202	1823.067	1542.567	-280.5	Decrease in Variance
203	1004.264	1283.451	279.1868	Increase in Variance
204	754.9444	1609.75	854.8056	Increase in Variance
205	1952.857	1531.839	-421.018	Decrease in Variance
206	821.6484	1086	264.3516	Increase in Variance
207	977.7889	0	-977.789	Decrease in Variance
208	117.1429	1343.429	1226.286	Increase in Variance
209	10.26667	1157.767	1147.5	Increase in Variance
210	1555.156	1215.289	-339.867	Decrease in Variance
211	1222.678	462.4	-760.278	Decrease in Variance
212	1377.7	2017.2	639.5	Increase in Variance
213	281.4107	1244.214	962.8036	Increase in Variance
214	614.4556	1059.6	445.1444	Increase in Variance
215	1405.767	1666.667	260.9	Increase in Variance
216	28.3	672.8	644.5	Increase in Variance
217	92	1175	1083	Increase in Variance
218	892.8393	1744.268	851.4286	Increase in Variance
219	901.3667	1752.167	850.8	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
220	672.9924	1113.97	440.9773	Increase in Variance
221	1324.455	1496.873	172.4182	Increase in Variance
222	36.7	1130.267	1093.567	Increase in Variance
223	24.80952	1538.143	1513.333	Increase in Variance
224	34.77778	1591	1556.222	Increase in Variance
225	1489.7	1359.5	-130.2	Decrease in Variance
226	50.3	2103.367	2053.067	Increase in Variance
227	666.1778	1462.178	796	Increase in Variance
228	1635.091	1720.873	85.78182	Increase in Variance
229	1420.257	1305.352	-114.905	Decrease in Variance
230	801.6	1271.1	469.5	Increase in Variance
231	1712	768.8	-943.2	Decrease in Variance
232	1655.6	844.2667	-811.333	Decrease in Variance
233	88.23333	429.4333	341.2	Increase in Variance
234	927.75	625	-302.75	Decrease in Variance
235	32.33333	1303.81	1271.476	Increase in Variance
236	6.3	1692	1685.7	Increase in Variance
237	1456.3	1920.2	463.9	Increase in Variance
238	1385.091	1578.333	193.2424	Increase in Variance
239	681.7879	1384.333	702.5455	Increase in Variance
240	188.7667	768.8444	580.0778	Increase in Variance
241	1705.476	1909.952	204.4762	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
242	1046.554	1575.929	529.375	Increase in Variance
243	78.99242	1466.152	1387.159	Increase in Variance
244	1675.071	0	-1675.07	Decrease in Variance
245	1272	1207.067	-64.9333	Decrease in Variance
246	732.6923	1372.09	639.3974	Increase in Variance
247	67.06667	2060.967	1993.9	Increase in Variance
248	715.8393	1186.125	470.2857	Increase in Variance
249	1910.567	1341.767	-568.8	Decrease in Variance
250	1392.818	1373.418	-19.4	Decrease in Variance
251	1720.167	0	-1720.17	Decrease in Variance
252	1881.9	1120.667	-761.233	Decrease in Variance
253	82.33333	1618.571	1536.238	Increase in Variance
254	69.98214	1792.571	1722.589	Increase in Variance
255	1920.8	104.2	-1816.6	Decrease in Variance
256	1265.781	1486.212	220.4314	Increase in Variance
257	1348.2	1825.2	477	Increase in Variance
258	80.66667	994.6667	914	Increase in Variance
259	1275.429	1277.643	2.214286	Increase in Variance
260	78.57143	2000.905	1922.333	Increase in Variance
261	1409.667	0	-1409.67	Decrease in Variance
262	1178.267	1568.267	390	Increase in Variance
263	28.7	1210.8	1182.1	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
264	834.3222	1103.567	269.2444	Increase in Variance
265	1198.083	1356.932	158.8485	Increase in Variance
266	1468.267	0	-1468.27	Decrease in Variance
267	1527.1	1458.267	-68.8333	Decrease in Variance
268	546.9636	1179.691	632.7273	Increase in Variance
269	1265.2	0	-1265.2	Decrease in Variance
270	1421.255	1296.364	-124.891	Decrease in Variance
271	979.5897	500.5897	-479	Decrease in Variance
272	749.2778	1121.194	371.9167	Increase in Variance
273	1540.839	1312.839	-228	Decrease in Variance
274	5.8	1386.7	1380.9	Increase in Variance
275	1396.411	0	-1396.41	Decrease in Variance
276	1012	480.5	-531.5	Decrease in Variance
277	70.56667	2242.167	2171.6	Increase in Variance
278	1096.967	1820.267	723.3	Increase in Variance
279	76.96667	1845.767	1768.8	Increase in Variance
280	784.6111	1240.778	456.1667	Increase in Variance
281	1312.396	1414.733	102.3375	Increase in Variance
282	148.5667	2024.167	1875.6	Increase in Variance
283	1753.81	660.5714	-1093.24	Decrease in Variance
284	594.6288	469.7197	-124.909	Decrease in Variance
285	71.2	1482.5	1411.3	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
286	1504.667	1588.167	83.5	Increase in Variance
287	67.7	1611.2	1543.5	Increase in Variance
288	952.807	104.0234	-848.784	Decrease in Variance
289	863.5641	1094.077	230.5128	Increase in Variance
290	1028.233	967.3333	-60.9	Decrease in Variance
291	587.4286	1323.982	736.5536	Increase in Variance
292	890.2667	1852.267	962	Increase in Variance
293	1326.891	1212.364	-114.527	Decrease in Variance
294	397.7778	835.1637	437.386	Increase in Variance
295	727.3667	1264.667	537.3	Increase in Variance
296	1256.167	1076.167	-180	Decrease in Variance
297	445.781	1156.21	710.4286	Increase in Variance
298	1399.286	1757.286	358	Increase in Variance
299	26.3	1981.8	1955.5	Increase in Variance
300	124.9444	1186.5	1061.556	Increase in Variance
301	193.3	1679.3	1486	Increase in Variance
302	1627.554	1416.214	-211.339	Decrease in Variance
303	1185.767	852.1667	-333.6	Decrease in Variance
304	1373.429	1443.839	70.41071	Increase in Variance
305	1233.6	0	-1233.6	Decrease in Variance
306	1481.708	891.0351	-590.673	Decrease in Variance
307	75.9697	1530.992	1455.023	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
308	777.9	1764	986.1	Increase in Variance
309	1266.667	999.7667	-266.9	Decrease in Variance
310	1419.667	480.5714	-939.095	Decrease in Variance
311	82	1421.643	1339.643	Increase in Variance
312	1120.667	1554.667	434	Increase in Variance
313	813.6	0	-813.6	Decrease in Variance
314	1248.81	1275.952	27.14286	Increase in Variance
315	1050.8	1641.2	590.4	Increase in Variance
316	43.86667	1844.167	1800.3	Increase in Variance
317	1062.622	1104.667	42.04444	Increase in Variance
318	47.36667	1691.1	1643.733	Increase in Variance
319	1464.214	1883.268	419.0536	Increase in Variance
320	1537.143	549.1429	-988	Decrease in Variance
321	974.2857	1008.952	34.66667	Increase in Variance
322	789.8676	1251.441	461.5735	Increase in Variance
323	721.8667	1230	508.1333	Increase in Variance
324	913.6923	511.859	-401.833	Decrease in Variance
325	1515.156	1259.733	-255.422	Decrease in Variance
326	49.2	2035.767	1986.567	Increase in Variance
327	71.69091	1519.364	1447.673	Increase in Variance
328	1358.238	1568.571	210.3333	Increase in Variance
329	1329.067	984.1667	-344.9	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
330	42.66667	1625.767	1583.1	Increase in Variance
331	40.7	2017.2	1976.5	Increase in Variance
332	1513.143	1396.411	-116.732	Decrease in Variance
333	1316.011	384.4	-931.611	Decrease in Variance
334	1309.194	373.7778	-935.417	Decrease in Variance
335	1270	648	-622	Decrease in Variance
336	1316.7	1873.2	556.5	Increase in Variance
337	1476.1	1677.378	201.2778	Increase in Variance
338	781.125	940.7857	159.6607	Increase in Variance
339	1172.141	708.0897	-464.051	Decrease in Variance
340	969.1	852.1667	-116.933	Decrease in Variance
341	544.8611	439.2778	-105.583	Decrease in Variance
342	517.1742	1200.932	683.7576	Increase in Variance
343	26.56667	1957.9	1931.333	Increase in Variance
344	824.5333	916.2	91.66667	Increase in Variance
345	63.65556	1445.789	1382.133	Increase in Variance
346	1139.174	1369.356	230.1818	Increase in Variance
347	51.64286	1843.982	1792.339	Increase in Variance
348	607.6381	1565.838	958.2	Increase in Variance
349	144.5	0	-144.5	Decrease in Variance
350	51.5	1891.2	1839.7	Increase in Variance
351	47.5	973.3667	925.8667	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
352	1127.867	937.5	-190.367	Decrease in Variance
353	70.47619	964.3333	893.8571	Increase in Variance
354	1427.2	1076.167	-351.033	Decrease in Variance
355	1681.767	1503.367	-178.4	Decrease in Variance
356	1900.75	1445.364	-455.386	Decrease in Variance
357	1159.194	957.9444	-201.25	Decrease in Variance
358	140.5667	1631.2	1490.633	Increase in Variance
359	26.54444	1344.722	1318.178	Increase in Variance
360	1028	1985.476	957.4762	Increase in Variance
361	1024.167	1508.667	484.5	Increase in Variance
362	1700	978.2143	-721.786	Decrease in Variance
363	134	1397.538	1263.538	Increase in Variance
364	774.2667	1644	869.7333	Increase in Variance
365	628.0182	1420.055	792.0364	Increase in Variance
366	1065.878	17.55556	-1048.32	Decrease in Variance
367	357.1292	1272.263	915.1333	Increase in Variance
368	1240.4	710.5667	-529.833	Decrease in Variance
369	95.61905	1022.286	926.6667	Increase in Variance
370	55.61111	1555.444	1499.833	Increase in Variance
371	5	2002.7	1997.7	Increase in Variance
372	99.2381	1256.81	1157.571	Increase in Variance
373	823.25	1315.861	492.6111	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
374	55.25	1387.444	1332.194	Increase in Variance
375	1321.231	274.5714	-1046.66	Decrease in Variance
376	1153.867	1989.767	835.9	Increase in Variance
377	1157.6	864	-293.6	Decrease in Variance
378	1698.167	1461.767	-236.4	Decrease in Variance
379	1373.923	1175.077	-198.846	Decrease in Variance
380	619.1111	1109.861	490.75	Increase in Variance
381	957.3667	1268.167	310.8	Increase in Variance
382	926.3	1011.2	84.9	Increase in Variance
383	1112.515	1340.265	227.75	Increase in Variance
384	121.85	1139.183	1017.333	Increase in Variance
385	422.7473	936.6429	513.8956	Increase in Variance
386	68.44444	1197.444	1129	Increase in Variance
387	1389.7	2344.7	955	Increase in Variance
388	75.90476	1115.143	1039.238	Increase in Variance
389	86.95238	1065.143	978.1905	Increase in Variance
390	990.1429	1170	179.8571	Increase in Variance
391	1596.8	1036.8	-560	Decrease in Variance
392	1752.619	1727.143	-25.4762	Decrease in Variance
393	801.5536	1699.411	897.8571	Increase in Variance
394	1135.3	1846	710.7	Increase in Variance
395	1450.611	1457.444	6.833333	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
396	1203.238	0	-1203.24	Decrease in Variance
397	920.8	0	-920.8	Decrease in Variance
398	869.4286	790	-79.4286	Decrease in Variance
399	814.2857	1588.905	774.619	Increase in Variance
400	1554.8	1422	-132.8	Decrease in Variance

Appendix L: Variance Calculations for the Graduate Group

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
1	601.4359	1385.692	784.2564	Increase in Variance
2	1483.265	421.2426	-1062.02	Decrease in Variance
3	931.5433	940.7233	9.18	Increase in Variance
4	1129.143	46.14286	-1083	Decrease in Variance
5	491.7333	506.5	14.76667	Increase in Variance
6	1432.603	1956.59	523.9872	Increase in Variance
7	1065.6	860.1667	-205.433	Decrease in Variance
8	1577.255	523.4727	-1053.78	Decrease in Variance
9	875.7143	1402.411	526.6964	Increase in Variance
10	1152.5	64.73077	-1087.77	Decrease in Variance
11	1105.473	60.89091	-1044.58	Decrease in Variance
12	1818.476	1819.286	0.809524	Increase in Variance
13	434.5147	466.9044	32.38971	Increase in Variance
14	735.5905	1364.39	628.8	Increase in Variance
15	509.5165	1325.956	816.4396	Increase in Variance
16	1581.618	1325.818	-255.8	Decrease in Variance
17	207.8667	1060.267	852.4	Increase in Variance
18	1186.143	1392.238	206.0952	Increase in Variance
19	972.7111	1255.067	282.3556	Increase in Variance
20	1057.067	1820.267	763.2	Increase in Variance
21	1794.2	18.2	-1776	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
22	450.4869	61.00654	-389.48	Decrease in Variance
23	1112.055	1911.455	799.4	Increase in Variance
24	1221.567	1138.5	-83.0667	Decrease in Variance
25	47.21111	1735.433	1688.222	Increase in Variance
26	1432.81	57.47619	-1375.33	Decrease in Variance
27	1022.267	1480.7	458.4333	Increase in Variance
28	58.3619	686.1143	627.7524	Increase in Variance
29	981.7636	1356.873	375.1091	Increase in Variance
30	714	1549.411	835.4107	Increase in Variance
31	635.6061	1072.697	437.0909	Increase in Variance
32	1053.143	2045.143	992	Increase in Variance
33	689.9821	1660.571	970.5893	Increase in Variance
34	127.1	1601.067	1473.967	Increase in Variance
35	42.82353	777.6732	734.8497	Increase in Variance
36	119.5714	319.619	200.0476	Increase in Variance
37	2206.839	1690.411	-516.429	Decrease in Variance
38	550.1813	618.5934	68.41209	Increase in Variance
39	1077.029	590.9238	-486.105	Decrease in Variance
40	25	1277.964	1252.964	Increase in Variance
41	688.8909	1361.255	672.3636	Increase in Variance
42	204.5667	112.9667	-91.6	Decrease in Variance
43	1236.124	432.2667	-803.857	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
44	42.09477	1410.536	1368.441	Increase in Variance
45	139.6111	905.75	766.1389	Increase in Variance
46	1553.152	653.1515	-900	Decrease in Variance
47	1226.7	1282.7	56	Increase in Variance
48	85.92857	1368.982	1283.054	Increase in Variance
49	1241.297	2017.566	776.2692	Increase in Variance
50	310.2395	1252.45	942.2105	Increase in Variance
51	1436	977.2857	-458.714	Decrease in Variance
52	1349.867	13.36667	-1336.5	Decrease in Variance
53	455.1144	883.634	428.5196	Increase in Variance
54	39.90476	2214.476	2174.571	Increase in Variance
55	82.55357	1424.411	1341.857	Increase in Variance
56	140.2198	1068.643	928.4231	Increase in Variance
57	1028.333	1273.952	245.619	Increase in Variance
58	849.6484	582.5714	-267.077	Decrease in Variance
59	71.5	1691.367	1619.867	Increase in Variance
60	1049.077	83.02564	-966.051	Decrease in Variance
61	55.85455	1057.291	1001.436	Increase in Variance
62	872.75	1165	292.25	Increase in Variance
63	259.4905	1248.733	989.2429	Increase in Variance
64	1159.164	82.49091	-1076.67	Decrease in Variance
65	40.08333	1062.242	1022.159	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
66	1444.255	1316	-128.255	Decrease in Variance
67	111.7	868.2	756.5	Increase in Variance
68	821.0667	733.1556	-87.9111	Decrease in Variance
69	1381.5	1305	-76.5	Decrease in Variance
70	1594.667	1029.9	-564.767	Decrease in Variance
71	809.4286	775.0714	-34.3571	Decrease in Variance
72	1411.433	1250.722	-160.711	Decrease in Variance
73	131.7667	1675.6	1543.833	Increase in Variance
74	678.1429	93	-585.143	Decrease in Variance
75	1489.263	943.7292	-545.533	Decrease in Variance
76	1229.75	111.0278	-1118.72	Decrease in Variance
77	576.9318	562.3333	-14.5985	Decrease in Variance
78	613.9524	1627.286	1013.333	Increase in Variance
79	578.6909	992.3636	413.6727	Increase in Variance
80	599.1739	1331.976	732.8024	Increase in Variance
81	783.6289	1058.555	274.9263	Increase in Variance
82	720.6964	1428.286	707.5893	Increase in Variance
83	592.5625	1086.429	493.8667	Increase in Variance
84	34.54545	1076.083	1041.538	Increase in Variance
85	845.0933	1031.917	186.8233	Increase in Variance
86	1082.685	118.5985	-964.086	Decrease in Variance
87	522.75	1189.97	667.2197	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
88	1893.6	120.0111	-1773.59	Decrease in Variance
89	1315	242.7879	-1072.21	Decrease in Variance
90	1428.81	1679.286	250.4762	Increase in Variance
91	1197.067	173.0667	-1024	Decrease in Variance
92	1006.81	1187.571	180.7619	Increase in Variance
93	810.5333	31.13333	-779.4	Decrease in Variance
94	1410.1	37.95556	-1372.14	Decrease in Variance
95	89.62917	698.9333	609.3042	Increase in Variance
96	368.2857	477.456	109.1703	Increase in Variance
97	1579.268	33.35714	-1545.91	Decrease in Variance
98	1097.563	1193.996	96.43333	Increase in Variance
99	604.7692	1690.564	1085.795	Increase in Variance
100	60.5	1254.75	1194.25	Increase in Variance
101	477.0571	73.84762	-403.21	Decrease in Variance
102	96.19048	745.0286	648.8381	Increase in Variance
103	66.19583	667.5958	601.4	Increase in Variance
104	985.1636	926.4909	-58.6727	Decrease in Variance
105	40.26667	1465.767	1425.5	Increase in Variance
106	1490.89	1766.362	275.4714	Increase in Variance
107	1192	771.4286	-420.571	Decrease in Variance
108	44.61905	1850.143	1805.524	Increase in Variance
109	63.25	1041.25	978	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
110	1408.7	1361.7	-47	Decrease in Variance
111	722.7473	444.4011	-278.346	Decrease in Variance
112	1485.042	41.56579	-1443.48	Decrease in Variance
113	51.52564	1815.5	1763.974	Increase in Variance
114	1203.767	2041.767	838	Increase in Variance
115	757.6667	937.619	179.9524	Increase in Variance
116	2488.667	63.2	-2425.47	Decrease in Variance
117	65.18382	1230.868	1165.684	Increase in Variance
118	1297.767	79.36667	-1218.4	Decrease in Variance
119	679.7056	943.1104	263.4048	Increase in Variance
120	1199.802	979.2308	-220.571	Decrease in Variance
121	1070.322	624.1	-446.222	Decrease in Variance
122	34.66667	1701.6	1666.933	Increase in Variance
123	1445.413	1528.618	83.20513	Increase in Variance
124	54.52778	1564.528	1510	Increase in Variance
125	754.6103	752.6912	-1.91912	Decrease in Variance
126	77.2381	794.781	717.5429	Increase in Variance
127	1160.952	1223.238	62.28571	Increase in Variance
128	1300.41	1092.756	-207.654	Decrease in Variance
129	1500.418	108.6182	-1391.8	Decrease in Variance
130	41.01818	1209.855	1168.836	Increase in Variance
131	1282.743	1679.029	396.2857	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
132	986.625	1150.507	163.8824	Increase in Variance
133	511.6923	444.6923	-67	Decrease in Variance
134	60.7	2043.8	1983.1	Increase in Variance
135	1366.286	1359.619	-6.66667	Decrease in Variance
136	1799.411	32.21429	-1767.2	Decrease in Variance
137	957.8667	999.4667	41.6	Increase in Variance
138	786.2647	53.9085	-732.356	Decrease in Variance
139	41.86667	1861.6	1819.733	Increase in Variance
140	1427.152	1323.444	-103.708	Decrease in Variance
141	1557.3	1363.2	-194.1	Decrease in Variance
142	74.66053	655.4184	580.7579	Increase in Variance
143	92.16364	871.4	779.2364	Increase in Variance
144	1969.091	1048.073	-921.018	Decrease in Variance
145	1337.767	120.3	-1217.47	Decrease in Variance
146	707.2857	1497.476	790.1905	Increase in Variance
147	636.3312	74.51299	-561.818	Decrease in Variance
148	987.5536	705.8393	-281.714	Decrease in Variance
149	762.1154	41.96154	-720.154	Decrease in Variance
150	655.0165	369.7637	-285.253	Decrease in Variance
151	977.0278	680.7778	-296.25	Decrease in Variance
152	1321.767	171.7667	-1150	Decrease in Variance
153	616.7778	440.3611	-176.417	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
154	105.8	2442.3	2336.5	Increase in Variance
155	841.8095	688.1429	-153.667	Decrease in Variance
156	468.75	564.0833	95.33333	Increase in Variance
157	477.7436	1205.974	728.2308	Increase in Variance
158	84.2	881.4545	797.2545	Increase in Variance
159	60.7	2127.6	2066.9	Increase in Variance
160	445.2955	1285.061	839.7652	Increase in Variance
161	1770.267	102.9667	-1667.3	Decrease in Variance
162	12	1685.867	1673.867	Increase in Variance
163	1090.132	441.8022	-648.33	Decrease in Variance
164	685.7143	571.4107	-114.304	Decrease in Variance
165	369.2026	1250.408	881.2059	Increase in Variance
166	542.8024	335.7036	-207.099	Decrease in Variance
167	92.69231	1136.474	1043.782	Increase in Variance
168	935.3778	861.1222	-74.2556	Decrease in Variance
169	1366.352	1170.781	-195.571	Decrease in Variance
170	1306.125	1909.143	603.0179	Increase in Variance
171	535.1571	1619.862	1084.705	Increase in Variance
172	1239.8	1337.3	97.5	Increase in Variance
173	1323.061	127.1818	-1195.88	Decrease in Variance
174	1072.982	1620.571	547.5893	Increase in Variance
175	367.9237	596.2395	228.3158	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
176	742.5714	1436.81	694.2381	Increase in Variance
177	1018.5	172.1	-846.4	Decrease in Variance
178	143.3	2344.7	2201.4	Increase in Variance
179	602.8444	1171.156	568.3111	Increase in Variance
180	59.01648	1269.148	1210.132	Increase in Variance
181	966.1912	67.52941	-898.662	Decrease in Variance
182	35.92308	1134.859	1098.936	Increase in Variance
183	1001.909	707.249	-294.66	Decrease in Variance
184	471.2353	281.875	-189.36	Decrease in Variance
185	1479.2	60.2	-1419	Decrease in Variance
186	916.4545	91.09091	-825.364	Decrease in Variance
187	1367.85	89.5625	-1278.29	Decrease in Variance
188	623.0958	963.4625	340.3667	Increase in Variance
189	1299.1	1105.767	-193.333	Decrease in Variance
190	1322.411	1303.554	-18.8571	Decrease in Variance
191	1672.143	1452.286	-219.857	Decrease in Variance
192	562.8105	599.0882	36.27778	Increase in Variance
193	1640.619	1585.476	-55.1429	Decrease in Variance
194	399.4619	372.2571	-27.2048	Decrease in Variance
195	1206.067	1076.352	-129.714	Decrease in Variance
196	1212.424	1252.265	39.84091	Increase in Variance
197	329.5368	629.9237	300.3868	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
198	1209.5	1036.7	-172.8	Decrease in Variance
199	1074.066	1148.901	74.83516	Increase in Variance
200	63.20588	1111.007	1047.801	Increase in Variance
201	1004.011	104.2333	-899.778	Decrease in Variance
202	795.8095	1576.571	780.7619	Increase in Variance
203	810.8407	735.6923	-75.1484	Decrease in Variance
204	731.0256	100.1923	-630.833	Decrease in Variance
205	589.2778	634	44.72222	Increase in Variance
206	1191.6	20.32222	-1171.28	Decrease in Variance
207	824.7789	887.4316	62.65263	Increase in Variance
208	762.4	665.0545	-97.3455	Decrease in Variance
209	11.86667	1663.6	1651.733	Increase in Variance
210	381.3524	1250.781	869.4286	Increase in Variance
211	34	1169.905	1135.905	Increase in Variance
212	1067.067	430.0952	-636.971	Decrease in Variance
213	838.7636	1048.018	209.2545	Increase in Variance
214	26.69643	1407.714	1381.018	Increase in Variance
215	862.3676	362	-500.368	Decrease in Variance
216	771.8	16.25	-755.55	Decrease in Variance
217	1818	2214.476	396.4762	Increase in Variance
218	31.11111	1424.989	1393.878	Increase in Variance
219	1160.444	1222.75	62.30556	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
220	975.8	57.01818	-918.782	Decrease in Variance
221	371.8286	861.8095	489.981	Increase in Variance
222	953.9048	1469.286	515.381	Increase in Variance
223	815.359	1370.359	555	Increase in Variance
224	774.5714	1367.714	593.1429	Increase in Variance
225	949.125	798.4107	-150.714	Decrease in Variance
226	319.875	915.8676	595.9926	Increase in Variance
227	490.1026	887.7308	397.6282	Increase in Variance
228	680.3399	1050.997	370.6569	Increase in Variance
229	1467.696	1187.696	-280	Decrease in Variance
230	38.26515	1739.061	1700.795	Increase in Variance
231	1296.105	84.88889	-1211.22	Decrease in Variance
232	97.66667	1147.026	1049.359	Increase in Variance
233	1538.238	28.90476	-1509.33	Decrease in Variance
234	138.8077	1377.936	1239.128	Increase in Variance
235	69.44444	1112.361	1042.917	Increase in Variance
236	1264.411	8.785714	-1255.63	Decrease in Variance
237	1635.861	1991.194	355.3333	Increase in Variance
238	649.45	29.8625	-619.588	Decrease in Variance
239	38.74359	1001.359	962.6154	Increase in Variance
240	1442.495	89.17143	-1353.32	Decrease in Variance
241	1691.867	1401.6	-290.267	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
242	831.2727	1090.242	258.9697	Increase in Variance
243	1254.2	1195.2	-59	Decrease in Variance
244	1243.364	1464.964	221.6	Increase in Variance
245	1341.5	1363.2	21.7	Increase in Variance
246	1654.192	610.4744	-1043.72	Decrease in Variance
247	152.5682	1336.75	1184.182	Increase in Variance
248	912.2652	538.2424	-374.023	Decrease in Variance
249	985.2088	1170	184.7912	Increase in Variance
250	1405.356	555.4773	-849.879	Decrease in Variance
251	652.0553	69.22134	-582.834	Decrease in Variance
252	1045.788	555.697	-490.091	Decrease in Variance
253	1187.455	180.0833	-1007.37	Decrease in Variance
254	1274.636	494.5152	-780.121	Decrease in Variance
255	954.0909	96.15152	-857.939	Decrease in Variance
256	693.3619	1018.062	324.7	Increase in Variance
257	1119.694	29.11111	-1090.58	Decrease in Variance
258	755.9447	722.3658	-33.5789	Decrease in Variance
259	313.8333	308.4143	-5.41905	Decrease in Variance
260	632.3026	715.8184	83.51579	Increase in Variance
261	932.8	1782.473	849.6727	Increase in Variance
262	1597.767	127.1	-1470.67	Decrease in Variance
263	1059.096	898.6544	-160.441	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
264	108.9103	754.141	645.2308	Increase in Variance
265	747.4459	316.6429	-430.803	Decrease in Variance
266	2344.7	40.7	-2304	Decrease in Variance
267	915.125	467.6964	-447.429	Decrease in Variance
268	472.859	559.6026	86.74359	Increase in Variance
269	724.5714	1075.143	350.5714	Increase in Variance
270	56.75	1171.028	1114.278	Increase in Variance
271	72.94589	904.3983	831.4524	Increase in Variance
272	721.8909	659.8182	-62.0727	Decrease in Variance
273	1409.411	27.26786	-1382.14	Decrease in Variance
274	687.9706	102.1103	-585.86	Decrease in Variance
275	1549.5	1551.8	2.3	Increase in Variance
276	335.4199	906.2186	570.7987	Increase in Variance
277	1373.788	80.08333	-1293.7	Decrease in Variance
278	1138.554	747.0714	-391.482	Decrease in Variance
279	1056.103	1071.577	15.47436	Increase in Variance
280	950.9231	495.8736	-455.049	Decrease in Variance
281	1804.333	20.2381	-1784.1	Decrease in Variance
282	644.8095	1273.81	629	Increase in Variance
283	670.5619	43.94762	-626.614	Decrease in Variance
284	527.2909	527.2182	-0.07273	Decrease in Variance
285	81	977.8545	896.8545	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
286	526.2647	538.8456	12.58088	Increase in Variance
287	921.5556	481.9883	-439.567	Decrease in Variance
288	790.3216	684.9825	-105.339	Decrease in Variance
289	70.04444	1047.433	977.3889	Increase in Variance
290	1101.964	113.2727	-988.691	Decrease in Variance
291	37.06667	601.8857	564.819	Increase in Variance
292	772.4926	54.63235	-717.86	Decrease in Variance
293	646.3743	841.0994	194.7251	Increase in Variance
294	63.92917	555.6958	491.7667	Increase in Variance
295	788.6103	314.4044	-474.206	Decrease in Variance
296	372.9338	643.2574	270.3235	Increase in Variance
297	1227.1	34.3	-1192.8	Decrease in Variance
298	44.99242	809.1742	764.1818	Increase in Variance
299	682.6838	808.25	125.5662	Increase in Variance
300	1127.2	1330.567	203.3667	Increase in Variance
301	136.6944	1132.861	996.1667	Increase in Variance
302	1325.878	1404.278	78.4	Increase in Variance
303	516.7778	1056.611	539.8333	Increase in Variance
304	743.6556	564.2778	-179.378	Decrease in Variance
305	540.0727	932.2182	392.1455	Increase in Variance
306	1194.967	1260.567	65.6	Increase in Variance
307	31.14286	985.4952	954.3524	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
308	821.8667	819.6	-2.26667	Decrease in Variance
309	1029.905	1063.333	33.42857	Increase in Variance
310	1343.952	1506.286	162.3333	Increase in Variance
311	922.5625	1587.396	664.8333	Increase in Variance
312	1080.233	700.9	-379.333	Decrease in Variance
313	1662.25	1487.611	-174.639	Decrease in Variance
314	1127.956	36.26667	-1091.69	Decrease in Variance
315	1370.857	115.2679	-1255.59	Decrease in Variance
316	1763.763	56.25	-1707.51	Decrease in Variance
317	966.7564	1347.423	380.6667	Increase in Variance
318	428.7692	513.3022	84.53297	Increase in Variance
319	1258.81	969.1429	-289.667	Decrease in Variance
320	1467.143	68.47619	-1398.67	Decrease in Variance
321	975.6061	1065.636	90.0303	Increase in Variance
322	62.98214	1484.786	1421.804	Increase in Variance
323	479.6286	899.4143	419.7857	Increase in Variance
324	1374.891	778.4727	-596.418	Decrease in Variance
325	1366.667	853.5	-513.167	Decrease in Variance
326	802.9821	1292.982	490	Increase in Variance
327	578.7967	502.4396	-76.3571	Decrease in Variance
328	2061.8	105.3	-1956.5	Decrease in Variance
329	35.28571	1899.476	1864.19	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
330	66.48889	939.0667	872.5778	Increase in Variance
331	916.9231	19.24359	-897.679	Decrease in Variance
332	823.25	1315.861	492.6111	Increase in Variance
333	2006.696	849.6429	-1157.05	Decrease in Variance
334	463.7	2052	1588.3	Increase in Variance
335	560.7581	720.9516	160.1935	Increase in Variance
336	158.5	485.4926	326.9926	Increase in Variance
337	630.8	1562	931.2	Increase in Variance
338	677.8184	1261.484	583.6658	Increase in Variance
339	1166.135	1748.333	582.197	Increase in Variance
340	1517.286	122.4762	-1394.81	Decrease in Variance
341	1099.474	94.04094	-1005.43	Decrease in Variance
342	48.93333	1185.378	1136.444	Increase in Variance
343	1526.181	1623.786	97.6044	Increase in Variance
344	970.5667	1031.867	61.3	Increase in Variance
345	1221.515	175.3561	-1046.16	Decrease in Variance
346	1087.767	1209.1	121.3333	Increase in Variance
347	1322.8	1631.655	308.8545	Increase in Variance
348	1103.381	1327.886	224.5048	Increase in Variance
349	512.9714	588.3524	75.38095	Increase in Variance
350	1397.429	55.71429	-1341.71	Decrease in Variance
351	1529.344	125.5556	-1403.79	Decrease in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
352	1196.905	800.1429	-396.762	Decrease in Variance
353	1671.268	1245.125	-426.143	Decrease in Variance
354	32.4	1472.967	1440.567	Increase in Variance
355	649.2778	1346.778	697.5	Increase in Variance
356	803.9238	1163.971	360.0476	Increase in Variance
357	1050.404	1021.86	-28.5441	Decrease in Variance
358	1685.333	1799.067	113.7333	Increase in Variance
359	1459	26.86111	-1432.14	Decrease in Variance
360	112.129	693.6613	581.5323	Increase in Variance
361	2254.5	1382.3	-872.2	Decrease in Variance
362	86.9	875.8222	788.9222	Increase in Variance
363	894.2778	27.21111	-867.067	Decrease in Variance
364	94.78571	624	529.2143	Increase in Variance
365	32.69091	1171.073	1138.382	Increase in Variance
366	1210.167	1272.567	62.4	Increase in Variance
367	1652.194	40.02778	-1612.17	Decrease in Variance
368	480.5256	1096.603	616.0769	Increase in Variance
369	915.125	567.2679	-347.857	Decrease in Variance
370	1201.361	1198.444	-2.91667	Decrease in Variance
371	1395.361	27.19444	-1368.17	Decrease in Variance
372	1423.077	48.73077	-1374.35	Decrease in Variance
373	757.619	1045.238	287.619	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
374	100.9476	950.4619	849.5143	Increase in Variance
375	1533	880.2778	-652.722	Decrease in Variance
376	156.9048	1815.476	1658.571	Increase in Variance
377	86.5	1381.554	1295.054	Increase in Variance
378	897.0625	495.1833	-401.879	Decrease in Variance
379	1314.267	1406.967	92.7	Increase in Variance
380	931.0897	84.19231	-846.897	Decrease in Variance
381	568.6778	504.9	-63.7778	Decrease in Variance
382	1690.411	2043.643	353.2321	Increase in Variance
383	955.3143	1195.686	240.3714	Increase in Variance
384	1719.714	1246.554	-473.161	Decrease in Variance
385	1004.41	1271.269	266.859	Increase in Variance
386	935.655	1334.041	398.386	Increase in Variance
387	351.7692	868.6923	516.9231	Increase in Variance
388	301.3897	359.0662	57.67647	Increase in Variance
389	1499.143	697.4286	-801.714	Decrease in Variance
390	994.8444	50.98889	-943.856	Decrease in Variance
391	47.89048	1411.748	1363.857	Increase in Variance
392	1342.214	51.98214	-1290.23	Decrease in Variance
393	1443.156	35.82222	-1407.33	Decrease in Variance
394	569.4121	1129.385	559.9725	Increase in Variance
395	348.6625	424.5292	75.86667	Increase in Variance

ID	Variance Prior to Midpoint of Course Completion	Variance Post Midpoint of Course Completion	Difference	Conclusion on Variance
396	807.6964	890.8571	83.16071	Increase in Variance
397	819.5524	545.6952	-273.857	Decrease in Variance
398	1241.2	66.66667	-1174.53	Decrease in Variance
399	48.26374	731.4505	683.1868	Increase in Variance
400	1079.278	1824.611	745.3333	Increase in Variance

Appendix M: Skewness Calculations for the Program Withdrawal Group

(There were 36 program withdrawal cases with undefined skewness due to the standard deviation being zero)

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
1	2.2361	-2.1162	-4.3523	Decrease in Skewness
2	1.0381	-2.9747	-4.0128	Decrease in Skewness
3	2.4495	-0.9276	-3.3771	Decrease in Skewness
4	2.2361	-0.5677	-2.8037	Decrease in Skewness
5	0.432	-2.1375	-2.5695	Decrease in Skewness
6	1.2967	-1.1927	-2.4894	Decrease in Skewness
7	1.1606	-1.3108	-2.4714	Decrease in Skewness
8	1.471	-0.9088	-2.3799	Decrease in Skewness
9	0.0515	-1.8823	-1.9338	Decrease in Skewness
10	0.733	-1.1026	-1.8356	Decrease in Skewness
11	0.6464	-1.179	-1.8253	Decrease in Skewness
12	0.3251	-1.3398	-1.665	Decrease in Skewness
13	-0.6803	-2.3281	-1.6477	Decrease in Skewness
14	1.0362	-0.5933	-1.6295	Decrease in Skewness
15	-0.5965	-2.1981	-1.6016	Decrease in Skewness
16	0.4211	-1.1461	-1.5672	Decrease in Skewness
17	0.4591	-1.0545	-1.5136	Decrease in Skewness
18	0.6689	-0.792	-1.4609	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
19	0.8756	-0.5768	-1.4524	Decrease in Skewness
20	2.4495	1.0036	-1.4458	Decrease in Skewness
21	-0.715	-2.1441	-1.4292	Decrease in Skewness
22	2.4495	1.0212	-1.4283	Decrease in Skewness
23	0.4619	-0.958	-1.4199	Decrease in Skewness
24	0.1759	-1.1889	-1.3648	Decrease in Skewness
25	-0.9432	-2.2879	-1.3447	Decrease in Skewness
26	-0.2859	-1.6217	-1.3358	Decrease in Skewness
27	1.6288	0.3333	-1.2955	Decrease in Skewness
28	1.035	-0.2574	-1.2924	Decrease in Skewness
29	-1.401	-2.6589	-1.2579	Decrease in Skewness
30	-0.407	-1.6336	-1.2266	Decrease in Skewness
31	0.6701	-0.5408	-1.2109	Decrease in Skewness
32	1.241	0.0326	-1.2084	Decrease in Skewness
33	0.3926	-0.8095	-1.2021	Decrease in Skewness
34	-0.4499	-1.6375	-1.1876	Decrease in Skewness
35	-0.1559	-1.3341	-1.1782	Decrease in Skewness
36	0.7965	-0.3654	-1.1619	Decrease in Skewness
37	0.288	-0.8739	-1.1619	Decrease in Skewness
38	0.3539	-0.7764	-1.1303	Decrease in Skewness
39	-0.7195	-1.8124	-1.0929	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
40	0.4996	-0.5602	-1.0598	Decrease in Skewness
41	0.5509	-0.5085	-1.0594	Decrease in Skewness
42	-0.4921	-1.521	-1.0289	Decrease in Skewness
43	0.0419	-0.9786	-1.0205	Decrease in Skewness
44	-0.2625	-1.2413	-0.9788	Decrease in Skewness
45	0.0145	-0.9619	-0.9763	Decrease in Skewness
46	0.4264	-0.5445	-0.9709	Decrease in Skewness
47	0.0137	-0.9455	-0.9592	Decrease in Skewness
48	1.3538	0.4112	-0.9426	Decrease in Skewness
49	-0.0256	-0.9442	-0.9186	Decrease in Skewness
50	0.1563	-0.7179	-0.8741	Decrease in Skewness
51	-1.7316	-2.5726	-0.841	Decrease in Skewness
52	0.4839	-0.3508	-0.8346	Decrease in Skewness
53	0.4457	-0.3617	-0.8073	Decrease in Skewness
54	0.5938	-0.2106	-0.8045	Decrease in Skewness
55	-0.5771	-1.3728	-0.7956	Decrease in Skewness
56	0.1609	-0.6324	-0.7933	Decrease in Skewness
57	1.2345	0.4553	-0.7792	Decrease in Skewness
58	1.623	0.8701	-0.7529	Decrease in Skewness
59	0.7298	0.0044	-0.7254	Decrease in Skewness
60	0.1165	-0.6043	-0.7207	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
61	-0.7556	-1.4655	-0.7099	Decrease in Skewness
62	0.3869	-0.3078	-0.6947	Decrease in Skewness
63	1.1302	0.4904	-0.6398	Decrease in Skewness
64	0.6989	0.0859	-0.613	Decrease in Skewness
65	0.2698	-0.3336	-0.6034	Decrease in Skewness
66	0.0812	-0.5196	-0.6008	Decrease in Skewness
67	-0.4456	-1.0402	-0.5946	Decrease in Skewness
68	0.9747	0.3993	-0.5754	Decrease in Skewness
69	0.9172	0.3479	-0.5693	Decrease in Skewness
70	-0.6112	-1.1755	-0.5643	Decrease in Skewness
71	1.0515	0.4933	-0.5582	Decrease in Skewness
72	0.7048	0.1689	-0.5359	Decrease in Skewness
73	0.1565	-0.367	-0.5234	Decrease in Skewness
74	-0.3045	-0.8251	-0.5207	Decrease in Skewness
75	0.3247	-0.1869	-0.5116	Decrease in Skewness
76	-0.0025	-0.5117	-0.5092	Decrease in Skewness
77	-0.7017	-1.1937	-0.492	Decrease in Skewness
78	-0.7282	-1.213	-0.4848	Decrease in Skewness
79	-0.1914	-0.6672	-0.4757	Decrease in Skewness
80	-0.4345	-0.9042	-0.4697	Decrease in Skewness
81	-0.1674	-0.5953	-0.4279	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
82	-0.3709	-0.7771	-0.4062	Decrease in Skewness
83	-2.3844	-2.7866	-0.4022	Decrease in Skewness
84	-0.1604	-0.5568	-0.3964	Decrease in Skewness
85	-0.926	-1.3119	-0.3859	Decrease in Skewness
86	-0.8275	-1.2097	-0.3822	Decrease in Skewness
87	0.3709	0.0066	-0.3643	Decrease in Skewness
88	-0.0948	-0.4353	-0.3404	Decrease in Skewness
89	-0.1671	-0.5058	-0.3386	Decrease in Skewness
90	-0.9254	-1.2582	-0.3328	Decrease in Skewness
91	-1.043	-1.3686	-0.3256	Decrease in Skewness
92	-1.8944	-2.1627	-0.2682	Decrease in Skewness
93	-0.4571	-0.7167	-0.2596	Decrease in Skewness
94	-2.2584	-2.495	-0.2366	Decrease in Skewness
95	-2.2545	-2.4304	-0.1758	Decrease in Skewness
96	-1.767	-1.9394	-0.1725	Decrease in Skewness
97	-1.918	-2.0799	-0.1619	Decrease in Skewness
98	-2.1933	-2.3538	-0.1605	Decrease in Skewness
99	-0.8394	-0.9674	-0.128	Decrease in Skewness
100	-0.4666	-0.5933	-0.1267	Decrease in Skewness
101	0.7698	0.6438	-0.1259	Decrease in Skewness
102	-1.7037	-1.8201	-0.1164	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
103	-1.1438	-1.2557	-0.1119	Decrease in Skewness
104	-2.4787	-2.5825	-0.1039	Decrease in Skewness
105	-1.0533	-1.145	-0.0917	Decrease in Skewness
106	-0.0623	-0.1479	-0.0856	Decrease in Skewness
107	-0.9192	-1.0013	-0.0821	Decrease in Skewness
108	-0.5122	-0.5925	-0.0803	Decrease in Skewness
109	-0.6391	-0.714	-0.0749	Decrease in Skewness
110	-2.4408	-2.5153	-0.0745	Decrease in Skewness
111	-0.5204	-0.5857	-0.0653	Decrease in Skewness
112	-2.4125	-2.4763	-0.0638	Decrease in Skewness
113	0.8647	0.8296	-0.0351	Decrease in Skewness
114	0.1671	0.1378	-0.0293	Decrease in Skewness
115	-0.324	-0.3495	-0.0255	Decrease in Skewness
116	-0.5439	-0.56	-0.0161	Decrease in Skewness
117	-0.847	-0.8622	-0.0152	Decrease in Skewness
118	0.9852	0.9719	-0.0133	Decrease in Skewness
119	-0.577	-0.5853	-0.0084	Decrease in Skewness
120	0.7112	0.7051	-0.0061	Decrease in Skewness
121	0.6459	0.6438	-0.0021	Decrease in Skewness
122	-0.9128	-0.907	0.0058	Increase in Skewness
123	-0.9504	-0.9309	0.0195	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
124	-1.1228	-1.098	0.0248	Increase in Skewness
125	-2.1626	-2.1282	0.0344	Increase in Skewness
126	-0.2614	-0.2039	0.0575	Increase in Skewness
127	0.3094	0.3742	0.0647	Increase in Skewness
128	-2.0919	-2.0154	0.0765	Increase in Skewness
129	-0.5641	-0.474	0.0901	Increase in Skewness
130	0.2779	0.3697	0.0918	Increase in Skewness
131	0.2302	0.3253	0.0951	Increase in Skewness
132	0.5122	0.6207	0.1085	Increase in Skewness
133	-0.5333	-0.4011	0.1323	Increase in Skewness
134	-2.038	-1.8933	0.1447	Increase in Skewness
135	-0.4725	-0.2799	0.1926	Increase in Skewness
136	-0.5339	-0.3217	0.2123	Increase in Skewness
137	-1.0433	-0.8262	0.2172	Increase in Skewness
138	-0.7066	-0.4567	0.2499	Increase in Skewness
139	-0.2503	0.011	0.2613	Increase in Skewness
140	-0.5885	-0.315	0.2735	Increase in Skewness
141	-1.106	-0.827	0.2791	Increase in Skewness
142	-0.437	-0.1521	0.2849	Increase in Skewness
143	-1.0422	-0.7404	0.3018	Increase in Skewness
144	0.4364	0.753	0.3166	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
145	0.2596	0.5814	0.3218	Increase in Skewness
146	-0.3185	0.0044	0.323	Increase in Skewness
147	-0.2714	0.0604	0.3318	Increase in Skewness
148	-1.1442	-0.791	0.3533	Increase in Skewness
149	0.3465	0.7347	0.3882	Increase in Skewness
150	-1.191	-0.7937	0.3972	Increase in Skewness
151	-0.1475	0.2555	0.403	Increase in Skewness
152	-0.8789	-0.4268	0.4521	Increase in Skewness
153	-1.0594	-0.6022	0.4572	Increase in Skewness
154	-0.4551	0.0087	0.4639	Increase in Skewness
155	0.5141	0.9821	0.468	Increase in Skewness
156	-0.8764	-0.3962	0.4802	Increase in Skewness
157	-1.2294	-0.7376	0.4918	Increase in Skewness
158	-0.7217	-0.2051	0.5166	Increase in Skewness
159	0.1776	0.7172	0.5396	Increase in Skewness
160	-1.1013	-0.4858	0.6154	Increase in Skewness
161	-0.5285	0.0898	0.6183	Increase in Skewness
162	-1.322	-0.6707	0.6514	Increase in Skewness
163	-2.5551	-1.8892	0.6658	Increase in Skewness
164	-1.9944	-1.3252	0.6692	Increase in Skewness
165	-0.4986	0.1986	0.6971	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
166	-1.4961	-0.7899	0.7062	Increase in Skewness
167	-0.8439	-0.1331	0.7108	Increase in Skewness
168	-0.3154	0.3962	0.7116	Increase in Skewness
169	-0.823	-0.0883	0.7347	Increase in Skewness
170	-0.2617	0.5225	0.7842	Increase in Skewness
171	-0.1277	0.6639	0.7916	Increase in Skewness
172	0.6487	1.4452	0.7965	Increase in Skewness
173	0.0784	0.8785	0.8001	Increase in Skewness
174	-0.4568	0.3566	0.8134	Increase in Skewness
175	-2.3304	-1.4944	0.8361	Increase in Skewness
176	0.662	1.5023	0.8403	Increase in Skewness
177	-0.8993	-0.0579	0.8415	Increase in Skewness
178	0.4545	1.2977	0.8432	Increase in Skewness
179	0.1135	0.9719	0.8584	Increase in Skewness
180	-0.7902	0.0725	0.8627	Increase in Skewness
181	-1.9888	-1.1231	0.8657	Increase in Skewness
182	-1.7246	-0.8537	0.8709	Increase in Skewness
183	-1.0411	-0.1459	0.8953	Increase in Skewness
184	-0.6295	0.2829	0.9124	Increase in Skewness
185	0.3284	1.26	0.9316	Increase in Skewness
186	-0.6994	0.2567	0.9561	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
187	0.0607	1.0351	0.9744	Increase in Skewness
188	-0.916	0.0593	0.9753	Increase in Skewness
189	-0.7992	0.1939	0.9931	Increase in Skewness
190	-1.7776	-0.7805	0.9972	Increase in Skewness
191	-1.867	-0.8672	0.9998	Increase in Skewness
192	-1.5089	-0.4781	1.0308	Increase in Skewness
193	-2.3542	-1.3201	1.0341	Increase in Skewness
194	-3.0974	-2.0295	1.0678	Increase in Skewness
195	-0.51	0.6086	1.1186	Increase in Skewness
196	-1.8615	-0.7331	1.1284	Increase in Skewness
197	-1.6409	-0.5076	1.1333	Increase in Skewness
198	-2.3255	-1.1918	1.1337	Increase in Skewness
199	1.102	2.2361	1.1341	Increase in Skewness
200	-0.8562	0.2798	1.1359	Increase in Skewness
201	-0.4479	0.6899	1.1377	Increase in Skewness
202	-0.476	0.6639	1.1399	Increase in Skewness
203	-3.009	-1.8639	1.1452	Increase in Skewness
204	-1.6192	-0.4498	1.1694	Increase in Skewness
205	-0.806	0.3638	1.1698	Increase in Skewness
206	-1.126	0.0473	1.1733	Increase in Skewness
207	-0.4969	0.6985	1.1954	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
208	-1.1256	0.0737	1.1993	Increase in Skewness
209	-1.4648	-0.2441	1.2207	Increase in Skewness
210	-0.5007	0.7385	1.2392	Increase in Skewness
211	-1.5756	-0.3309	1.2447	Increase in Skewness
212	-1.7885	-0.5426	1.2459	Increase in Skewness
213	-0.4244	0.8304	1.2548	Increase in Skewness
214	-2.1723	-0.9116	1.2607	Increase in Skewness
215	-0.264	1.0036	1.2676	Increase in Skewness
216	-0.6751	0.6086	1.2837	Increase in Skewness
217	-0.3213	0.9955	1.3168	Increase in Skewness
218	-1.914	-0.5956	1.3184	Increase in Skewness
219	-2.2756	-0.9235	1.352	Increase in Skewness
220	-0.1723	1.1894	1.3617	Increase in Skewness
221	-1.4452	-0.0803	1.3649	Increase in Skewness
222	-1.0784	0.3041	1.3825	Increase in Skewness
223	1.4428	2.8284	1.3857	Increase in Skewness
224	-2.608	-1.2057	1.4023	Increase in Skewness
225	1.2296	2.6458	1.4161	Increase in Skewness
226	-1.0437	0.3844	1.4281	Increase in Skewness
227	-2.0109	-0.5664	1.4445	Increase in Skewness
228	-1.7386	-0.2931	1.4456	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
229	-0.6084	0.8503	1.4587	Increase in Skewness
230	-0.9552	0.5121	1.4672	Increase in Skewness
231	-2.4063	-0.9318	1.4745	Increase in Skewness
232	-0.5055	0.974	1.4795	Increase in Skewness
233	-2.223	-0.7411	1.482	Increase in Skewness
234	0.0188	1.524	1.5051	Increase in Skewness
235	-2.0957	-0.5696	1.5261	Increase in Skewness
236	-2.071	-0.5304	1.5406	Increase in Skewness
237	-0.5744	0.9682	1.5427	Increase in Skewness
238	-2.1145	-0.5693	1.5452	Increase in Skewness
239	-0.6709	0.8772	1.5481	Increase in Skewness
240	-2.1249	-0.5727	1.5522	Increase in Skewness
241	-0.9222	0.6316	1.5538	Increase in Skewness
242	0.6734	2.2361	1.5627	Increase in Skewness
243	-1.1364	0.434	1.5705	Increase in Skewness
244	-1.2	0.3834	1.5834	Increase in Skewness
245	-0.7426	0.8418	1.5844	Increase in Skewness
246	-0.3633	1.251	1.6143	Increase in Skewness
247	-1.8521	-0.2118	1.6403	Increase in Skewness
248	-1.9535	-0.3048	1.6487	Increase in Skewness
249	-1.3671	0.3043	1.6714	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
250	-2.4542	-0.7388	1.7154	Increase in Skewness
251	-2.388	-0.668	1.72	Increase in Skewness
252	-2.1806	-0.4578	1.7228	Increase in Skewness
253	-0.6303	1.1365	1.7668	Increase in Skewness
254	-2.3501	-0.5695	1.7806	Increase in Skewness
255	-1.4256	0.3637	1.7893	Increase in Skewness
256	-1.2292	0.5621	1.7913	Increase in Skewness
257	-1.0715	0.7218	1.7933	Increase in Skewness
258	-2.3965	-0.5935	1.803	Increase in Skewness
259	-1.1665	0.6469	1.8134	Increase in Skewness
260	-0.8465	0.9728	1.8193	Increase in Skewness
261	-1.4128	0.4278	1.8406	Increase in Skewness
262	0.0385	1.8938	1.8553	Increase in Skewness
263	-0.8896	1.0031	1.8927	Increase in Skewness
264	-2.5224	-0.6207	1.9017	Increase in Skewness
265	-2.2153	-0.2862	1.9291	Increase in Skewness
266	-0.9599	1.0042	1.964	Increase in Skewness
267	-0.551	1.4714	2.0224	Increase in Skewness
268	-0.8999	1.1406	2.0405	Increase in Skewness
269	1.1174	3.1623	2.0448	Increase in Skewness
270	-1.2192	0.8641	2.0833	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
271	-1.4412	0.65	2.0913	Increase in Skewness
272	-1.4058	0.7221	2.1279	Increase in Skewness
273	0.2934	2.4351	2.1416	Increase in Skewness
274	-2.4043	-0.253	2.1514	Increase in Skewness
275	-1.6774	0.4755	2.1529	Increase in Skewness
276	-2.9322	-0.7679	2.1643	Increase in Skewness
277	-2.1717	0.003	2.1747	Increase in Skewness
278	-1.9177	0.267	2.1847	Increase in Skewness
279	0.4426	2.6458	2.2031	Increase in Skewness
280	-0.8701	1.3357	2.2058	Increase in Skewness
281	-2.4296	-0.215	2.2146	Increase in Skewness
282	-1.2163	1.0008	2.2171	Increase in Skewness
283	-0.9887	1.2424	2.2311	Increase in Skewness
284	-1.593	0.6497	2.2428	Increase in Skewness
285	-2.5648	-0.3028	2.262	Increase in Skewness
286	-2.2481	0.0145	2.2626	Increase in Skewness
287	-0.0477	2.2361	2.2838	Increase in Skewness
288	-1.2597	1.0299	2.2896	Increase in Skewness
289	-2.2015	0.1072	2.3087	Increase in Skewness
290	-2.3003	0.0116	2.3119	Increase in Skewness
291	-0.5209	1.7947	2.3156	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
292	-2.3443	0.004	2.3482	Increase in Skewness
293	-2.3238	0.0365	2.3603	Increase in Skewness
294	-1.3921	0.9693	2.3614	Increase in Skewness
295	-0.8232	1.5546	2.3778	Increase in Skewness
296	-2.327	0.0562	2.3832	Increase in Skewness
297	-0.3904	2.0041	2.3945	Increase in Skewness
298	-2.3679	0.0281	2.396	Increase in Skewness
299	-2.3712	0.0378	2.409	Increase in Skewness
300	-2.3943	0.0164	2.4107	Increase in Skewness
301	-1.81	0.6128	2.4229	Increase in Skewness
302	-2.0002	0.433	2.4332	Increase in Skewness
303	-2.0299	0.4327	2.4626	Increase in Skewness
304	-3.2713	-0.7898	2.4815	Increase in Skewness
305	-1.1336	1.3567	2.4903	Increase in Skewness
306	-3.1613	-0.627	2.5343	Increase in Skewness
307	-3.1332	-0.564	2.5692	Increase in Skewness
308	-2.2593	0.3742	2.6335	Increase in Skewness
309	-1.1698	1.4642	2.6341	Increase in Skewness
310	-2.0917	0.6086	2.7003	Increase in Skewness
311	-2.0264	0.6835	2.71	Increase in Skewness
312	-2.2885	0.4223	2.7108	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
313	-2.6883	0.029	2.7173	Increase in Skewness
314	-0.5049	2.2361	2.741	Increase in Skewness
315	-2.1403	0.6232	2.7635	Increase in Skewness
316	-1.8047	0.9728	2.7776	Increase in Skewness
317	0.041	2.8284	2.7874	Increase in Skewness
318	-0.5722	2.2361	2.8082	Increase in Skewness
319	-2.8006	0.01	2.8105	Increase in Skewness
320	-2.2027	0.6086	2.8113	Increase in Skewness
321	-0.219	2.6458	2.8648	Increase in Skewness
322	0.1005	3	2.8995	Increase in Skewness
323	0.5166	3.4641	2.9475	Increase in Skewness
324	-0.3189	2.6458	2.9647	Increase in Skewness
325	-1.9439	1.0259	2.9698	Increase in Skewness
326	-1.3516	1.6254	2.9771	Increase in Skewness
327	-1.3416	1.638	2.9796	Increase in Skewness
328	-1.909	1.0969	3.0059	Increase in Skewness
329	-2.2113	0.85	3.0613	Increase in Skewness
330	-0.1061	3	3.1061	Increase in Skewness
331	-2.127	0.9821	3.1091	Increase in Skewness
332	-2.4485	0.6689	3.1175	Increase in Skewness
333	-0.144	3	3.144	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
334	-1.9172	1.2291	3.1463	Increase in Skewness
335	0.0082	3.1623	3.1541	Increase in Skewness
336	-2.2794	0.8748	3.1543	Increase in Skewness
337	-0.775	2.4495	3.2245	Increase in Skewness
338	-2.2151	1.071	3.2861	Increase in Skewness
339	-0.4583	2.8284	3.2867	Increase in Skewness
340	-0.8953	2.4495	3.3448	Increase in Skewness
341	-2.3655	1.0036	3.3691	Increase in Skewness
342	-2.3912	1.0012	3.3924	Increase in Skewness
343	-0.3165	3.1623	3.4788	Increase in Skewness
344	-2.1894	1.3482	3.5377	Increase in Skewness
345	-2.3094	1.2296	3.539	Increase in Skewness
346	-0.9057	2.6458	3.5514	Increase in Skewness
347	-2.1581	1.4516	3.6097	Increase in Skewness
348	-1.4052	2.2169	3.6221	Increase in Skewness
349	-2.7709	0.8809	3.6519	Increase in Skewness
350	-2.4261	1.2296	3.6557	Increase in Skewness
351	-1.359	2.4584	3.8174	Increase in Skewness
352	-0.248	3.7417	3.9896	Increase in Skewness
353	-3.2254	0.82	4.0454	Increase in Skewness
354	-1.2533	2.8284	4.0817	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
355	-2.0734	2.2361	4.3095	Increase in Skewness
356	-3.4192	0.9392	4.3584	Increase in Skewness
357	-1.393	3	4.393	Increase in Skewness
358	-1.189	3.3052	4.4942	Increase in Skewness
359	-2.7111	1.802	4.5132	Increase in Skewness
360	-2.0684	2.4495	4.5179	Increase in Skewness
361	-2.2257	2.4138	4.6395	Increase in Skewness
362	-2.3099	2.4495	4.7594	Increase in Skewness
363	-2.8874	1.9532	4.8406	Increase in Skewness
364	-2.5646	2.8284	5.393	Increase in Skewness
365	0.2884	#DIV/0!	#DIV/0!	Undefined Skewness
366	0.9781	#DIV/0!	#DIV/0!	Undefined Skewness
367	-0.7983	#DIV/0!	#DIV/0!	Undefined Skewness
368	-1.773	#DIV/0!	#DIV/0!	Undefined Skewness
369	-0.6086	#DIV/0!	#DIV/0!	Undefined Skewness
370	-1.9901	#DIV/0!	#DIV/0!	Undefined Skewness
371	2.4495	#DIV/0!	#DIV/0!	Undefined Skewness
372	0.2327	#DIV/0!	#DIV/0!	Undefined Skewness
373	0.0029	#DIV/0!	#DIV/0!	Undefined Skewness
374	-0.9372	#DIV/0!	#DIV/0!	Undefined Skewness
375	0.3178	#DIV/0!	#DIV/0!	Undefined Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
376	0.1327	#DIV/0!	#DIV/0!	Undefined Skewness
377	0.7047	#DIV/0!	#DIV/0!	Undefined Skewness
378	-2.1736	#DIV/0!	#DIV/0!	Undefined Skewness
379	-0.8064	#DIV/0!	#DIV/0!	Undefined Skewness
380	-0.2759	#DIV/0!	#DIV/0!	Undefined Skewness
381	-2.459	#DIV/0!	#DIV/0!	Undefined Skewness
382	1.2296	#DIV/0!	#DIV/0!	Undefined Skewness
383	1.0212	#DIV/0!	#DIV/0!	Undefined Skewness
384	-0.0095	#DIV/0!	#DIV/0!	Undefined Skewness
385	-0.7372	#DIV/0!	#DIV/0!	Undefined Skewness
386	0.0076	#DIV/0!	#DIV/0!	Undefined Skewness
387	1.5451	#DIV/0!	#DIV/0!	Undefined Skewness
388	-1.7433	#DIV/0!	#DIV/0!	Undefined Skewness
389	-1.5593	#DIV/0!	#DIV/0!	Undefined Skewness
390	0.1941	#DIV/0!	#DIV/0!	Undefined Skewness
391	-0.9078	#DIV/0!	#DIV/0!	Undefined Skewness
392	-0.3473	#DIV/0!	#DIV/0!	Undefined Skewness
393	0.0738	#DIV/0!	#DIV/0!	Undefined Skewness
394	-0.7968	#DIV/0!	#DIV/0!	Undefined Skewness
395	0.6985	#DIV/0!	#DIV/0!	Undefined Skewness
396	0.0163	#DIV/0!	#DIV/0!	Undefined Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
397	-2.2158	#DIV/0!	#DIV/0!	Undefined Skewness
398	0.8376	#DIV/0!	#DIV/0!	Undefined Skewness
399	-1.1482	#DIV/0!	#DIV/0!	Undefined Skewness
400	-1.8827	#DIV/0!	#DIV/0!	Undefined Skewness

Appendix N: Skewness Calculations for the Graduate Group

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
1	3.464101615	-3.297686714	-6.7617883	Decrease in Skewness
2	1.119391805	-3.005031464	-4.1244233	Decrease in Skewness
3	0.505373486	-2.358721466	-2.864095	Decrease in Skewness
4	-0.103271915	-2.9585247	-2.8552528	Decrease in Skewness
5	0.125314615	-2.555010593	-2.6803252	Decrease in Skewness
6	0.542146531	-2.002447831	-2.5445944	Decrease in Skewness
7	0.489906212	-2.045235624	-2.5351418	Decrease in Skewness
8	1.620101003	-0.848457662	-2.4685587	Decrease in Skewness
9	0.092425196	-2.335968081	-2.4283933	Decrease in Skewness
10	0.245356467	-2.158197957	-2.4035544	Decrease in Skewness
11	1.10629007	-1.261330652	-2.3676207	Decrease in Skewness
12	1.08638396	-1.280887408	-2.3672714	Decrease in Skewness
13	0.766380195	-1.553897737	-2.3202779	Decrease in Skewness
14	0.238611005	-2.06110218	-2.2997132	Decrease in Skewness
15	0.020043456	-2.244300232	-2.2643437	Decrease in Skewness
16	1.357774067	-0.871829382	-2.2296034	Decrease in Skewness
17	-0.460250473	-2.602615832	-2.1423654	Decrease in Skewness
18	-0.577191839	-2.689447777	-2.1122559	Decrease in Skewness
19	1.239836242	-0.854943652	-2.0947799	Decrease in Skewness
20	0.04888101	-2.043691135	-2.0925721	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
21	0.238265745	-1.827918824	-2.0661846	Decrease in Skewness
22	-0.53186356	-2.59729224	-2.0654287	Decrease in Skewness
23	0.39407472	-1.670486857	-2.0645616	Decrease in Skewness
24	0.522030621	-1.525920325	-2.0479509	Decrease in Skewness
25	-1.573756471	-3.615652076	-2.0418956	Decrease in Skewness
26	0.598162388	-1.415277149	-2.0134395	Decrease in Skewness
27	-0.107681699	-2.113034433	-2.0053527	Decrease in Skewness
28	-0.952057141	-2.939646714	-1.9875896	Decrease in Skewness
29	-1.232646773	-3.21109872	-1.9784519	Decrease in Skewness
30	-1.262839824	-3.238198644	-1.9753588	Decrease in Skewness
31	0.655997665	-1.313231904	-1.9692296	Decrease in Skewness
32	-0.312986875	-2.272752718	-1.9597658	Decrease in Skewness
33	-0.761463871	-2.709030763	-1.9475669	Decrease in Skewness
34	-0.668573364	-2.550606342	-1.882033	Decrease in Skewness
35	-0.31606424	-2.121620758	-1.8055565	Decrease in Skewness
36	-1.244327034	-3.04096258	-1.7966355	Decrease in Skewness
37	0.425588571	-1.369437781	-1.7950264	Decrease in Skewness
38	0.547114891	-1.214032052	-1.7611469	Decrease in Skewness
39	0.627733333	-1.124917421	-1.7526508	Decrease in Skewness
40	-0.611490248	-2.352858045	-1.7413678	Decrease in Skewness
41	0.163155305	-1.532373965	-1.6955293	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
42	-0.554514974	-2.243454313	-1.6889393	Decrease in Skewness
43	0.216218182	-1.390856045	-1.6070742	Decrease in Skewness
44	-0.726405503	-2.318017403	-1.5916119	Decrease in Skewness
45	0.656176316	-0.925544359	-1.5817207	Decrease in Skewness
46	-0.245346693	-1.813621388	-1.5682747	Decrease in Skewness
47	-0.139715495	-1.696258571	-1.5565431	Decrease in Skewness
48	-1.413321222	-2.914344009	-1.5010228	Decrease in Skewness
49	1.516763239	0.020304166	-1.4964591	Decrease in Skewness
50	-0.606227841	-2.091942983	-1.4857151	Decrease in Skewness
51	0.073029381	-1.405458772	-1.4784882	Decrease in Skewness
52	-0.51122141	-1.962433416	-1.451212	Decrease in Skewness
53	-0.328107447	-1.772726795	-1.4446193	Decrease in Skewness
54	-0.685111698	-2.125455545	-1.4403438	Decrease in Skewness
55	-2.331561981	-3.755340053	-1.4237781	Decrease in Skewness
56	0.310715084	-1.085931845	-1.3966469	Decrease in Skewness
57	0.119123288	-1.248439657	-1.3675629	Decrease in Skewness
58	-0.389309734	-1.751256674	-1.3619469	Decrease in Skewness
59	-1.209157478	-2.560308604	-1.3511511	Decrease in Skewness
60	-1.050402423	-2.384081942	-1.3336795	Decrease in Skewness
61	-0.956774917	-2.277725295	-1.3209504	Decrease in Skewness
62	-0.224112762	-1.54489144	-1.3207787	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
63	-1.323767338	-2.636044589	-1.3122773	Decrease in Skewness
64	-1.003652704	-2.291814709	-1.288162	Decrease in Skewness
65	-0.22736934	-1.515176643	-1.2878073	Decrease in Skewness
66	-1.82084808	-3.098714472	-1.2778664	Decrease in Skewness
67	-0.483138225	-1.734467725	-1.2513295	Decrease in Skewness
68	0.144098277	-1.106806672	-1.2509049	Decrease in Skewness
69	-1.487309409	-2.720771278	-1.2334619	Decrease in Skewness
70	0.31844332	-0.914102412	-1.2325457	Decrease in Skewness
71	-1.23664455	-2.439532153	-1.2028876	Decrease in Skewness
72	-0.93342157	-2.12624336	-1.1928218	Decrease in Skewness
73	-0.173626437	-1.363764522	-1.1901381	Decrease in Skewness
74	-0.193862456	-1.37173893	-1.1778765	Decrease in Skewness
75	0.599504962	-0.56643791	-1.1659429	Decrease in Skewness
76	-2.01495051	-3.176219014	-1.1612685	Decrease in Skewness
77	-1.135583107	-2.28311479	-1.1475317	Decrease in Skewness
78	-0.111057906	-1.247040982	-1.1359831	Decrease in Skewness
79	-0.629839279	-1.748284102	-1.1184448	Decrease in Skewness
80	-2.404399732	-3.516268562	-1.1118688	Decrease in Skewness
81	-0.075618729	-1.156600354	-1.0809816	Decrease in Skewness
82	-1.43585319	-2.497724275	-1.0618711	Decrease in Skewness
83	-1.185434923	-2.236313305	-1.0508784	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
84	-1.162487643	-2.211696147	-1.0492085	Decrease in Skewness
85	0.636963189	-0.411327442	-1.0482906	Decrease in Skewness
86	-0.529069003	-1.57454338	-1.0454744	Decrease in Skewness
87	-0.000464418	-1.036213918	-1.0357495	Decrease in Skewness
88	0.193669153	-0.837893251	-1.0315624	Decrease in Skewness
89	-0.384180624	-1.410063756	-1.0258831	Decrease in Skewness
90	-1.389996811	-2.410187057	-1.0201902	Decrease in Skewness
91	-1.526675122	-2.528129206	-1.0014541	Decrease in Skewness
92	1.199899766	0.202877486	-0.9970223	Decrease in Skewness
93	-0.382788515	-1.37175144	-0.9889629	Decrease in Skewness
94	-1.332436769	-2.311965469	-0.9795287	Decrease in Skewness
95	0.133145996	-0.813703936	-0.9468499	Decrease in Skewness
96	-2.154473556	-3.078540735	-0.9240672	Decrease in Skewness
97	0.102736873	-0.816462387	-0.9191993	Decrease in Skewness
98	-1.019361818	-1.875526679	-0.8561649	Decrease in Skewness
99	0.21606323	-0.638016528	-0.8540798	Decrease in Skewness
100	-1.969532905	-2.790084944	-0.820552	Decrease in Skewness
101	-1.141193586	-1.935534279	-0.7943407	Decrease in Skewness
102	-0.710838212	-1.487291511	-0.7764533	Decrease in Skewness
103	0.828269865	0.056196434	-0.7720734	Decrease in Skewness
104	-0.621329167	-1.39028251	-0.7689533	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
105	0.4171024	-0.348167135	-0.7652695	Decrease in Skewness
106	0.209297431	-0.547392419	-0.7566898	Decrease in Skewness
107	-0.83793699	-1.568815619	-0.7308786	Decrease in Skewness
108	0.838852785	0.133909551	-0.7049432	Decrease in Skewness
109	-2.920598354	-3.613498793	-0.6929004	Decrease in Skewness
110	0.44110512	-0.247092878	-0.688198	Decrease in Skewness
111	-1.648331279	-2.330138479	-0.6818072	Decrease in Skewness
112	-0.130509588	-0.806169874	-0.6756603	Decrease in Skewness
113	-0.175682092	-0.849588136	-0.673906	Decrease in Skewness
114	0.382904135	-0.288749701	-0.6716538	Decrease in Skewness
115	-1.104475671	-1.766038136	-0.6615625	Decrease in Skewness
116	0.099924132	-0.553680434	-0.6536046	Decrease in Skewness
117	-0.488326439	-1.132322825	-0.6439964	Decrease in Skewness
118	-0.253414488	-0.894456692	-0.6410422	Decrease in Skewness
119	-0.272057214	-0.884829529	-0.6127723	Decrease in Skewness
120	-0.116104065	-0.728745677	-0.6126416	Decrease in Skewness
121	-0.605323626	-1.21275933	-0.6074357	Decrease in Skewness
122	-2.230942307	-2.833923931	-0.6029816	Decrease in Skewness
123	0.417622681	-0.179381673	-0.5970044	Decrease in Skewness
124	0.030666457	-0.55909042	-0.5897569	Decrease in Skewness
125	-1.246037409	-1.820556532	-0.5745191	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
126	-0.306053471	-0.877120608	-0.5710671	Decrease in Skewness
127	-0.766526698	-1.333667507	-0.5671408	Decrease in Skewness
128	0.720491412	0.154268337	-0.5662231	Decrease in Skewness
129	-0.400352744	-0.958178351	-0.5578256	Decrease in Skewness
130	-1.011587572	-1.545140962	-0.5335534	Decrease in Skewness
131	0.350051251	-0.139021623	-0.4890729	Decrease in Skewness
132	-0.960625959	-1.445044801	-0.4844188	Decrease in Skewness
133	-0.174180378	-0.652916177	-0.4787358	Decrease in Skewness
134	-2.649686922	-3.126458608	-0.4767717	Decrease in Skewness
135	-1.721857399	-2.194149371	-0.472292	Decrease in Skewness
136	-1.391755135	-1.859754053	-0.4679989	Decrease in Skewness
137	0.089440281	-0.351918666	-0.4413589	Decrease in Skewness
138	-1.645289958	-2.085939027	-0.4406491	Decrease in Skewness
139	-2.38261694	-2.816767211	-0.4341503	Decrease in Skewness
140	-0.666886202	-1.086709779	-0.4198236	Decrease in Skewness
141	-1.521821108	-1.941433723	-0.4196126	Decrease in Skewness
142	-1.183363524	-1.585591238	-0.4022277	Decrease in Skewness
143	-3.037525383	-3.423803275	-0.3862779	Decrease in Skewness
144	-1.430853562	-1.800045141	-0.3691916	Decrease in Skewness
145	-1.160699822	-1.502109544	-0.3414097	Decrease in Skewness
146	-0.988384631	-1.327348637	-0.338964	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
147	-1.119126112	-1.441359705	-0.3222336	Decrease in Skewness
148	-1.83736385	-2.132049181	-0.2946853	Decrease in Skewness
149	-1.927344085	-2.219358244	-0.2920142	Decrease in Skewness
150	-1.974007996	-2.259357208	-0.2853492	Decrease in Skewness
151	-0.817867547	-1.081423974	-0.2635564	Decrease in Skewness
152	-1.931873262	-2.194149371	-0.2622761	Decrease in Skewness
153	-2.271649272	-2.525865303	-0.254216	Decrease in Skewness
154	-1.079201224	-1.320488193	-0.241287	Decrease in Skewness
155	-2.056178875	-2.288318239	-0.2321394	Decrease in Skewness
156	-0.76059751	-0.971997323	-0.2113998	Decrease in Skewness
157	-2.414984584	-2.614337136	-0.1993526	Decrease in Skewness
158	-2.038489706	-2.228281231	-0.1897915	Decrease in Skewness
159	-0.990557385	-1.173456963	-0.1828996	Decrease in Skewness
160	-1.408321902	-1.590255281	-0.1819334	Decrease in Skewness
161	-2.168796749	-2.349390711	-0.180594	Decrease in Skewness
162	-0.569796438	-0.744424669	-0.1746282	Decrease in Skewness
163	-0.914526148	-1.088329213	-0.1738031	Decrease in Skewness
164	-3.205219161	-3.373863987	-0.1686448	Decrease in Skewness
165	-1.03259859	-1.194418396	-0.1618198	Decrease in Skewness
166	-0.783477291	-0.936614702	-0.1531374	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
167	-2.96771963	-3.113363601	-0.145644	Decrease in Skewness
168	-1.127328225	-1.267824576	-0.1404964	Decrease in Skewness
169	-2.111163482	-2.241886567	-0.1307231	Decrease in Skewness
170	-0.350330971	-0.468338988	-0.118008	Decrease in Skewness
171	-1.32493842	-1.438794257	-0.1138558	Decrease in Skewness
172	-0.939422481	-1.038522409	-0.0990999	Decrease in Skewness
173	-0.247856151	-0.344138914	-0.0962828	Decrease in Skewness
174	-3.003516873	-3.096376245	-0.0928594	Decrease in Skewness
175	-1.830738768	-1.92013582	-0.0893971	Decrease in Skewness
176	-0.335169607	-0.422785833	-0.0876162	Decrease in Skewness
177	-1.287126868	-1.368380727	-0.0812539	Decrease in Skewness
178	-1.840792829	-1.920735346	-0.0799425	Decrease in Skewness
179	-2.294354925	-2.36675282	-0.0723979	Decrease in Skewness
180	-1.062814359	-1.123665889	-0.0608515	Decrease in Skewness
181	-1.450464474	-1.506657294	-0.0561928	Decrease in Skewness
182	-1.188085284	-1.241880956	-0.0537957	Decrease in Skewness
183	-1.623198232	-1.674401829	-0.0512036	Decrease in Skewness
184	0.129753747	0.080517081	-0.0492367	Decrease in Skewness
185	-2.34737811	-2.39249017	-0.0451121	Decrease in Skewness
186	-1.103780523	-1.145560117	-0.0417796	Decrease in Skewness
187	-2.681880929	-2.723393345	-0.0415124	Decrease in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
188	-2.112784251	-2.148866369	-0.0360821	Decrease in Skewness
189	0.035846144	-1.9984E-16	-0.0358461	Decrease in Skewness
190	-1.653277201	-1.66674012	-0.0134629	Decrease in Skewness
191	-2.484613507	-2.497785962	-0.0131725	Decrease in Skewness
192	-1.132261176	-1.144269377	-0.0120082	Decrease in Skewness
193	-2.14879294	-2.157403994	-0.0086111	Decrease in Skewness
194	-3.095571747	-3.097616322	-0.0020446	Decrease in Skewness
195	-0.329071344	-0.32498923	0.0040821	Increase in Skewness
196	-1.56823087	-1.563116285	0.0051146	Increase in Skewness
197	-1.951973024	-1.93504886	0.0169242	Increase in Skewness
198	-2.233384846	-2.204326174	0.0290587	Increase in Skewness
199	-0.724666496	-0.680478337	0.0441882	Increase in Skewness
200	-0.957263585	-0.906689241	0.0505743	Increase in Skewness
201	-1.741817956	-1.681729709	0.0600882	Increase in Skewness
202	-0.833648027	-0.763181932	0.0704661	Increase in Skewness
203	-1.309553965	-1.231057971	0.078496	Increase in Skewness
204	-1.101964445	-1.022983972	0.0789805	Increase in Skewness
205	0.5377707	0.616836956	0.0790663	Increase in Skewness
206	-2.197434256	-2.091365323	0.1060689	Increase in Skewness
207	-1.656529733	-1.550275019	0.1062547	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
208	-2.209820159	-2.09087035	0.1189498	Increase in Skewness
209	-1.824599317	-1.704595124	0.1200042	Increase in Skewness
210	-1.037097106	-0.911643372	0.1254537	Increase in Skewness
211	0.010215741	0.149232209	0.1390165	Increase in Skewness
212	-0.461725101	-0.320373199	0.1413519	Increase in Skewness
213	-1.040287524	-0.898241236	0.1420463	Increase in Skewness
214	-0.546360421	-0.400168711	0.1461917	Increase in Skewness
215	-0.677704767	-0.510841056	0.1668637	Increase in Skewness
216	-2.526463086	-2.350242426	0.1762207	Increase in Skewness
217	-0.89708282	-0.715670523	0.1814123	Increase in Skewness
218	-0.16808682	0.013804896	0.1818917	Increase in Skewness
219	0.244906519	0.441076308	0.1961698	Increase in Skewness
220	-2.461410942	-2.258770987	0.20264	Increase in Skewness
221	-1.3124505	-1.10776183	0.2046887	Increase in Skewness
222	-2.393500388	-2.172880232	0.2206202	Increase in Skewness
223	-2.611196921	-2.387736801	0.2234601	Increase in Skewness
224	-0.224442465	0.002734617	0.2271771	Increase in Skewness
225	-2.713381449	-2.473940867	0.2394406	Increase in Skewness
226	-2.394366253	-2.152656992	0.2417093	Increase in Skewness
227	-1.33764509	-1.0880522	0.2495929	Increase in Skewness
228	0.378140626	0.631040909	0.2529003	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
229	-3.21447046	-2.941355322	0.2731151	Increase in Skewness
230	-1.467574975	-1.171933864	0.2956411	Increase in Skewness
231	-1.100526199	-0.790411903	0.3101143	Increase in Skewness
232	0.270343843	0.581794	0.3114502	Increase in Skewness
233	-1.751311184	-1.400815863	0.3504953	Increase in Skewness
234	-1.171812585	-0.814136297	0.3576763	Increase in Skewness
235	-1.392909346	-1.034478256	0.3584311	Increase in Skewness
236	-0.346410162	0.031397242	0.3778074	Increase in Skewness
237	-0.334325488	0.052312569	0.3866381	Increase in Skewness
238	-1.411232685	-1.017459038	0.3937736	Increase in Skewness
239	-2.180382061	-1.772769216	0.4076128	Increase in Skewness
240	-1.010015632	-0.59836807	0.4116476	Increase in Skewness
241	-2.389431657	-1.972463633	0.416968	Increase in Skewness
242	-1.411064239	-0.975424854	0.4356394	Increase in Skewness
243	-2.475667241	-2.038893364	0.4367739	Increase in Skewness
244	-0.334772037	0.105668621	0.4404407	Increase in Skewness
245	-1.264628839	-0.823152498	0.4414763	Increase in Skewness
246	-0.73263448	-0.284675182	0.4479593	Increase in Skewness
247	-0.984461024	-0.530136722	0.4543243	Increase in Skewness
248	-2.628637134	-2.172871353	0.4557658	Increase in Skewness
249	-2.415934028	-1.954847123	0.4610869	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
250	-0.304012329	0.163660408	0.4676727	Increase in Skewness
251	-1.154064204	-0.683555195	0.470509	Increase in Skewness
252	-0.827984989	-0.356140701	0.4718443	Increase in Skewness
253	-1.246622355	-0.773589023	0.4730333	Increase in Skewness
254	-0.803076485	-0.298486008	0.5045905	Increase in Skewness
255	-1.329565534	-0.815081292	0.5144842	Increase in Skewness
256	-0.641382811	-0.084257068	0.5571257	Increase in Skewness
257	-1.903270277	-1.333007971	0.5702623	Increase in Skewness
258	-2.187543869	-1.592955143	0.5945887	Increase in Skewness
259	-1.421673209	-0.824466955	0.5972063	Increase in Skewness
260	-1.388240193	-0.770916556	0.6173236	Increase in Skewness
261	-1.39821129	-0.778356854	0.6198544	Increase in Skewness
262	-0.951565692	-0.319437952	0.6321277	Increase in Skewness
263	-1.988545742	-1.353998851	0.6345469	Increase in Skewness
264	-0.388883296	0.269349902	0.6582332	Increase in Skewness
265	-2.222002922	-1.558183744	0.6638192	Increase in Skewness
266	-1.10443477	-0.439178143	0.6652566	Increase in Skewness
267	-1.798511698	-1.132777287	0.6657344	Increase in Skewness
268	-1.387874602	-0.714240539	0.6736341	Increase in Skewness
269	-2.308746919	-1.614486212	0.6942607	Increase in Skewness
270	-3.230269589	-2.532967596	0.697302	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
271	-3.530237184	-2.806183389	0.7240538	Increase in Skewness
272	1.189373387	1.92617578	0.7368024	Increase in Skewness
273	-1.476841066	-0.730261345	0.7465797	Increase in Skewness
274	-1.152115892	-0.372466093	0.7796498	Increase in Skewness
275	-0.577358848	0.212256813	0.7896157	Increase in Skewness
276	-2.831569871	-2.029262996	0.8023069	Increase in Skewness
277	-2.165975805	-1.362030326	0.8039455	Increase in Skewness
278	-1.173194078	-0.348167135	0.8250269	Increase in Skewness
279	-0.906116263	-0.079153884	0.8269624	Increase in Skewness
280	-2.913940223	-2.077194426	0.8367458	Increase in Skewness
281	-2.057819765	-1.203665848	0.8541539	Increase in Skewness
282	-0.157342521	0.703653614	0.8609961	Increase in Skewness
283	-2.662691543	-1.781149519	0.881542	Increase in Skewness
284	-1.891914596	-1.000912356	0.8910022	Increase in Skewness
285	-2.250801792	-1.353756022	0.8970458	Increase in Skewness
286	-2.364808488	-1.44608729	0.9187212	Increase in Skewness
287	-2.614074456	-1.682523296	0.9315512	Increase in Skewness
288	-0.832282252	0.120966494	0.9532487	Increase in Skewness
289	-1.242952485	-0.280061109	0.9628914	Increase in Skewness
290	-1.833970852	-0.868115022	0.9658558	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
291	-0.56643791	0.405542858	0.9719808	Increase in Skewness
292	-1.947200848	-0.96755024	0.9796506	Increase in Skewness
293	-1.777641589	-0.780484214	0.9971574	Increase in Skewness
294	-3.393139548	-2.3908189	1.0023206	Increase in Skewness
295	-1.972105392	-0.949403715	1.0227017	Increase in Skewness
296	-1.386735958	-0.345801891	1.0409341	Increase in Skewness
297	-1.578543647	-0.530623688	1.04792	Increase in Skewness
298	-2.503859102	-1.453340959	1.0505181	Increase in Skewness
299	-1.358639965	-0.297706315	1.0609337	Increase in Skewness
300	-0.221047089	0.847599362	1.0686465	Increase in Skewness
301	-2.714284698	-1.641361805	1.0729229	Increase in Skewness
302	-1.196039707	-0.120610118	1.0754296	Increase in Skewness
303	-1.520590493	-0.441077792	1.0795127	Increase in Skewness
304	-1.681697761	-0.585835413	1.0958623	Increase in Skewness
305	-2.82359202	-1.694444482	1.1291475	Increase in Skewness
306	-2.320849537	-1.174539517	1.14631	Increase in Skewness
307	-1.370629204	-0.195017885	1.1756113	Increase in Skewness
308	-0.897084386	0.31844332	1.2155277	Increase in Skewness
309	-2.568610737	-1.32712048	1.2414903	Increase in Skewness
310	-3.291585011	-2.027308163	1.2642768	Increase in Skewness
311	-2.887319097	-1.607566522	1.2797526	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
312	-1.043664414	0.239868495	1.2835329	Increase in Skewness
313	-2.51848327	-1.233662844	1.2848204	Increase in Skewness
314	-2.118116063	-0.832933048	1.285183	Increase in Skewness
315	-0.687614728	0.607345344	1.2949601	Increase in Skewness
316	-2.015943305	-0.709762335	1.306181	Increase in Skewness
317	-1.755481508	-0.430387021	1.3250945	Increase in Skewness
318	-2.794693199	-1.468481342	1.3262119	Increase in Skewness
319	-1.119858883	0.237397959	1.3572568	Increase in Skewness
320	-2.528927186	-1.167470025	1.3614572	Increase in Skewness
321	-2.133168676	-0.768861041	1.3643076	Increase in Skewness
322	-1.687548182	-0.310971845	1.3765763	Increase in Skewness
323	-1.378609747	0.006533128	1.3851429	Increase in Skewness
324	-1.678731478	-0.293438394	1.3852931	Increase in Skewness
325	-0.793187202	0.594785748	1.3879729	Increase in Skewness
326	-0.165923457	1.227911563	1.393835	Increase in Skewness
327	-2.514177157	-1.113811162	1.400366	Increase in Skewness
328	-2.459755796	-1.053244	1.4065118	Increase in Skewness
329	-1.3747621	0.063111047	1.4378731	Increase in Skewness
330	-1.974782764	-0.532958217	1.4418245	Increase in Skewness
331	-1.252048595	0.189825706	1.4418743	Increase in Skewness
332	0.322614669	1.782065722	1.4594511	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
333	-1.195738182	0.323659499	1.5193977	Increase in Skewness
334	-1.41944616	0.105378328	1.5248245	Increase in Skewness
335	-3.72458235	-2.173280355	1.551302	Increase in Skewness
336	-0.997685525	0.575303459	1.572989	Increase in Skewness
337	-2.883273211	-1.288383233	1.59489	Increase in Skewness
338	-1.183954978	0.428963259	1.6129182	Increase in Skewness
339	-2.709015148	-1.095428921	1.6135862	Increase in Skewness
340	-1.583155552	0.038225239	1.6213808	Increase in Skewness
341	-1.62119427	0.003974543	1.6251688	Increase in Skewness
342	-1.577803694	0.055802625	1.6336063	Increase in Skewness
343	-1.757972238	-0.121983636	1.6359886	Increase in Skewness
344	-1.133938295	0.505627443	1.6395657	Increase in Skewness
345	-1.871781369	-0.230253969	1.6415274	Increase in Skewness
346	-0.539697451	1.102157858	1.6418553	Increase in Skewness
347	-1.287718509	0.358035032	1.6457535	Increase in Skewness
348	-1.815558039	-0.165480314	1.6500777	Increase in Skewness
349	-2.649380335	-0.993646447	1.6557339	Increase in Skewness
350	-2.769400705	-1.065225503	1.7041752	Increase in Skewness
351	-3.080084749	-1.374622499	1.7054623	Increase in Skewness
352	-2.236067977	-0.523134822	1.7129332	Increase in Skewness
353	-0.881717217	0.839072711	1.7207899	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
354	-1.207199071	0.547021565	1.7542206	Increase in Skewness
355	-1.218037243	0.579920416	1.7979577	Increase in Skewness
356	-2.093441058	-0.292007462	1.8014336	Increase in Skewness
357	-3.131194064	-1.318088818	1.8131052	Increase in Skewness
358	-1.723893687	0.092592483	1.8164862	Increase in Skewness
359	-2.170474571	-0.344726018	1.8257486	Increase in Skewness
360	-1.506900648	0.335617878	1.8425185	Increase in Skewness
361	-3.123171444	-1.273799642	1.8493718	Increase in Skewness
362	-1.624006908	0.227224101	1.851231	Increase in Skewness
363	-3.46687091	-1.599924328	1.8669466	Increase in Skewness
364	-1.560498373	0.318087539	1.8785859	Increase in Skewness
365	-0.224109172	1.691656841	1.915766	Increase in Skewness
366	-2.469350238	-0.545611766	1.9237385	Increase in Skewness
367	-1.826176056	0.134166468	1.9603425	Increase in Skewness
368	-0.921100842	1.044537678	1.9656385	Increase in Skewness
369	-1.289416184	0.686503538	1.9759197	Increase in Skewness
370	-2.253810866	-0.27753303	1.9762778	Increase in Skewness
371	-1.255782118	0.744598217	2.0003803	Increase in Skewness
372	-0.788189092	1.229100696	2.0172898	Increase in Skewness
373	-2.019606741	0.016396939	2.0360037	Increase in Skewness
374	-1.813579522	0.272768744	2.0863483	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
375	-0.629718625	1.470879804	2.1005984	Increase in Skewness
376	-1.671297993	0.488000821	2.1592988	Increase in Skewness
377	-1.755827783	0.412682009	2.1685098	Increase in Skewness
378	-1.962701105	0.213020676	2.1757218	Increase in Skewness
379	-2.312807504	-0.109867688	2.2029398	Increase in Skewness
380	-1.832154844	0.382646751	2.2148016	Increase in Skewness
381	-3.096004435	-0.875775732	2.2202287	Increase in Skewness
382	-2.533912947	-0.294396435	2.2395165	Increase in Skewness
383	-2.560314694	-0.311400193	2.2489145	Increase in Skewness
384	-2.220059766	0.032998186	2.253058	Increase in Skewness
385	-2.606171288	-0.349004698	2.2571666	Increase in Skewness
386	-0.959561453	1.308912524	2.268474	Increase in Skewness
387	-1.282407651	1.005673984	2.2880816	Increase in Skewness
388	-1.924732192	0.416993883	2.3417261	Increase in Skewness
389	-2.433268848	-0.087682809	2.345586	Increase in Skewness
390	-2.020595979	0.390365309	2.4109613	Increase in Skewness
391	-1.874056082	0.591012836	2.4650689	Increase in Skewness
392	-2.806949892	-0.341162418	2.4657875	Increase in Skewness
393	-2.555028396	0.023374466	2.5784029	Increase in Skewness
394	-3.22263723	-0.642978952	2.5796583	Increase in Skewness
395	-2.575086781	0.038286619	2.6133734	Increase in Skewness

ID	Skewness Prior to Midpoint of Course Completion	Skewness Post Midpoint of Course Completion	Difference	Conclusion on Skewness
396	-2.307050878	0.322904712	2.6299556	Increase in Skewness
397	-1.507879303	1.208055965	2.7159353	Increase in Skewness
398	-2.661855422	0.150778308	2.8126337	Increase in Skewness
399	-2.313910628	0.731668632	3.0455793	Increase in Skewness
400	-2.494265702	1.247440961	3.7417067	Increase in Skewness

Appendix O: Withdrawal Rate for the Program Withdrawal Group

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
1	8	10	2	20	10%
2	10	24	0	34	0%
3	3	9	0	12	0%
4	8	14	0	22	0%
5	3	7	0	10	0%
6	5	7	0	12	0%
7	13	13	0	26	0%
8	16	3	3	22	14%
9	15	3	0	18	0%
10	3	7	0	10	0%
11	4	6	0	10	0%
12	2	9	0	11	0%
13	5	8	1	14	7%
14	5	6	1	12	8%
15	2	10	0	12	0%
16	5	5	1	11	9%
17	4	8	0	12	0%
18	12	5	2	19	11%
19	9	2	0	11	0%
20	4	6	0	10	0%
21	2	9	0	11	0%
22	4	9	0	13	0%
23	5	6	2	13	15%
24	10	12	0	22	0%
25	2	8	0	10	0%
26	11	16	0	27	0%
27	8	17	0	25	0%
28	9	3	0	12	0%
29	9	12	0	21	0%
30	5	8	0	13	0%
31	4	9	0	13	0%
32	7	5	0	12	0%
33	7	3	3	13	23%
34	3	7	0	10	0%
35	6	13	3	22	14%
36	6	7	0	13	0%
37	2	8	0	10	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
38	2	9	0	11	0%
39	5	16	2	23	9%
40	4	7	0	11	0%
41	2	10	0	12	0%
42	2	8	0	10	0%
43	28	28	0	56	0%
44	6	4	0	10	0%
45	35	18	0	53	0%
46	9	18	4	31	13%
47	9	3	0	12	0%
48	3	21	1	25	4%
49	3	7	0	10	0%
50	3	7	1	11	9%
51	2	14	0	16	0%
52	10	5	0	15	0%
53	4	9	0	13	0%
54	17	13	0	30	0%
55	9	4	0	13	0%
56	11	1	0	12	0%
57	2	23	1	26	4%
58	10	2	0	12	0%
59	13	11	0	24	0%
60	14	5	0	19	0%
61	8	3	0	11	0%
62	2	9	0	11	0%
63	9	24	1	34	3%
64	11	19	1	31	3%
65	12	3	0	15	0%
66	3	9	0	12	0%
67	4	10	0	14	0%
68	2	8	0	10	0%
69	5	6	1	12	8%
70	15	14	0	29	0%
71	7	4	0	11	0%
72	8	2	0	10	0%
73	3	8	0	11	0%
74	12	15	0	27	0%
75	3	28	5	36	14%
76	14	24	0	38	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
77	3	9	0	12	0%
78	7	39	0	46	0%
79	12	19	0	31	0%
80	4	20	2	26	8%
81	2	13	0	15	0%
82	6	5	0	11	0%
83	7	13	0	20	0%
84	9	2	0	11	0%
85	20	10	0	30	0%
86	20	9	0	29	0%
87	3	13	4	20	20%
88	12	3	0	15	0%
89	8	8	0	16	0%
90	2	26	1	29	3%
91	2	13	0	15	0%
92	8	8	3	19	16%
93	4	7	0	11	0%
94	8	8	1	17	6%
95	7	6	1	14	7%
96	4	13	1	18	6%
97	6	9	1	16	6%
98	4	12	1	17	6%
99	5	9	7	21	33%
100	14	17	0	31	0%
101	21	15	0	36	0%
102	3	10	2	15	13%
103	2	19	0	21	0%
104	14	12	0	26	0%
105	6	8	0	14	0%
106	4	6	1	11	9%
107	3	9	0	12	0%
108	3	11	0	14	0%
109	12	6	0	18	0%
110	4	8	0	12	0%
111	19	5	1	25	4%
112	4	6	1	11	9%
113	2	18	0	20	0%
114	7	3	1	11	9%
115	8	6	0	14	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
116	5	21	0	26	0%
117	17	6	0	23	0%
118	12	20	0	32	0%
119	7	11	0	18	0%
120	7	14	0	21	0%
121	10	11	0	21	0%
122	4	7	0	11	0%
123	2	11	0	13	0%
124	2	10	0	12	0%
125	7	11	0	18	0%
126	6	14	0	20	0%
127	13	8	0	21	0%
128	2	15	0	17	0%
129	7	7	0	14	0%
130	9	3	0	12	0%
131	11	14	0	25	0%
132	5	14	0	19	0%
133	5	10	0	15	0%
134	13	17	1	31	3%
135	11	11	0	22	0%
136	4	6	0	10	0%
137	14	6	0	20	0%
138	4	6	0	10	0%
139	12	19	0	31	0%
140	5	7	0	12	0%
141	12	10	0	22	0%
142	13	9	0	22	0%
143	11	2	0	13	0%
144	8	11	0	19	0%
145	5	8	0	13	0%
146	2	14	0	16	0%
147	4	7	3	14	21%
148	3	9	0	12	0%
149	9	15	1	25	4%
150	5	11	0	16	0%
151	4	7	0	11	0%
152	5	26	0	31	0%
153	7	7	0	14	0%
154	6	11	0	17	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
155	5	13	0	18	0%
156	11	3	0	14	0%
157	3	7	0	10	0%
158	8	6	0	14	0%
159	3	7	0	10	0%
160	10	2	0	12	0%
161	7	7	0	14	0%
162	4	6	0	10	0%
163	11	16	0	27	0%
164	5	6	0	11	0%
165	3	14	0	17	0%
166	4	7	0	11	0%
167	5	23	0	28	0%
168	5	5	0	10	0%
169	2	11	0	13	0%
170	3	8	0	11	0%
171	4	6	0	10	0%
172	2	8	0	10	0%
173	4	7	1	12	8%
174	3	7	3	13	23%
175	12	6	0	18	0%
176	7	16	0	23	0%
177	16	12	0	28	0%
178	7	26	0	33	0%
179	7	6	1	14	7%
180	22	20	0	42	0%
181	15	21	1	37	3%
182	8	9	3	20	15%
183	12	7	0	19	0%
184	9	29	0	38	0%
185	2	13	0	15	0%
186	11	4	0	15	0%
187	12	26	0	38	0%
188	5	11	0	16	0%
189	13	2	0	15	0%
190	2	8	0	10	0%
191	4	6	0	10	0%
192	13	9	0	22	0%
193	9	4	0	13	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
194	2	16	0	18	0%
195	5	18	0	23	0%
196	2	10	1	13	8%
197	17	28	0	45	0%
198	2	11	0	13	0%
199	2	8	0	10	0%
200	5	5	0	10	0%
201	2	9	0	11	0%
202	6	5	0	11	0%
203	10	17	0	27	0%
204	7	10	0	17	0%
205	11	4	0	15	0%
206	11	16	0	27	0%
207	11	8	0	19	0%
208	2	13	0	15	0%
209	3	9	1	13	8%
210	11	8	0	19	0%
211	13	6	0	19	0%
212	4	6	0	10	0%
213	4	12	0	16	0%
214	9	11	0	20	0%
215	5	7	0	12	0%
216	4	6	0	10	0%
217	5	9	0	14	0%
218	6	9	0	15	0%
219	5	7	0	12	0%
220	3	20	0	23	0%
221	11	11	0	22	0%
222	4	8	0	12	0%
223	2	11	1	14	7%
224	2	15	4	21	19%
225	2	8	0	10	0%
226	3	9	0	12	0%
227	9	10	0	19	0%
228	8	13	0	21	0%
229	15	14	0	29	0%
230	4	7	3	14	21%
231	7	3	0	10	0%
232	13	7	0	20	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
233	3	16	1	20	5%
234	9	8	0	17	0%
235	4	9	0	13	0%
236	3	7	0	10	0%
237	3	7	0	10	0%
238	16	8	0	24	0%
239	5	19	3	27	11%
240	3	17	1	21	5%
241	5	8	0	13	0%
242	6	10	1	17	6%
243	4	20	1	25	4%
244	11	4	0	15	0%
245	6	6	3	15	20%
246	7	19	0	26	0%
247	2	10	0	12	0%
248	6	10	0	16	0%
249	5	7	0	12	0%
250	9	13	0	22	0%
251	8	4	2	14	14%
252	6	5	0	11	0%
253	2	11	0	13	0%
254	5	10	1	16	6%
255	2	8	0	10	0%
256	15	20	0	35	0%
257	5	5	0	10	0%
258	2	9	0	11	0%
259	8	8	0	16	0%
260	3	10	0	13	0%
261	9	4	0	13	0%
262	3	9	0	12	0%
263	3	7	0	10	0%
264	13	6	0	19	0%
265	11	12	0	23	0%
266	8	3	0	11	0%
267	6	5	0	11	0%
268	5	16	0	21	0%
269	7	4	0	11	0%
270	11	10	1	22	5%
271	14	11	3	28	11%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
272	3	14	0	17	0%
273	10	5	0	15	0%
274	6	4	0	10	0%
275	12	3	0	15	0%
276	8	7	0	15	0%
277	3	8	0	11	0%
278	4	7	0	11	0%
279	3	9	0	12	0%
280	12	5	0	17	0%
281	21	11	0	32	0%
282	4	8	0	12	0%
283	8	5	0	13	0%
284	2	22	0	24	0%
285	3	7	1	11	9%
286	4	7	0	11	0%
287	3	7	0	10	0%
288	3	34	8	45	18%
289	9	16	0	25	0%
290	6	13	0	19	0%
291	6	9	1	16	6%
292	2	9	0	11	0%
293	13	9	1	23	4%
294	13	24	0	37	0%
295	3	8	0	11	0%
296	8	4	6	18	33%
297	9	21	0	30	0%
298	6	7	0	13	0%
299	2	8	0	10	0%
300	5	13	2	20	10%
301	2	8	0	10	0%
302	8	7	2	17	12%
303	5	6	0	11	0%
304	7	9	0	16	0%
305	9	3	0	12	0%
306	22	16	0	38	0%
307	4	19	0	23	0%
308	5	7	0	12	0%
309	2	10	1	13	8%
310	9	5	0	14	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
311	5	10	4	19	21%
312	7	4	0	11	0%
313	7	5	0	12	0%
314	5	8	0	13	0%
315	3	7	0	10	0%
316	4	7	0	11	0%
317	8	12	0	20	0%
318	3	9	0	12	0%
319	7	9	0	16	0%
320	10	3	0	13	0%
321	6	7	1	14	7%
322	16	17	0	33	0%
323	4	7	0	11	0%
324	13	12	0	25	0%
325	6	13	0	19	0%
326	2	10	0	12	0%
327	5	16	0	21	0%
328	5	8	0	13	0%
329	3	8	0	11	0%
330	3	9	0	12	0%
331	3	7	0	10	0%
332	8	8	0	16	0%
333	16	4	2	22	9%
334	12	6	0	18	0%
335	10	5	0	15	0%
336	3	7	1	11	9%
337	9	11	0	20	0%
338	9	6	0	15	0%
339	7	19	0	26	0%
340	5	6	0	11	0%
341	12	6	4	22	18%
342	10	14	0	24	0%
343	2	9	1	12	8%
344	13	19	0	32	0%
345	6	14	0	20	0%
346	12	11	1	24	4%
347	2	13	0	15	0%
348	12	18	0	30	0%
349	5	5	0	10	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
350	2	8	0	10	0%
351	2	10	0	12	0%
352	6	5	0	11	0%
353	2	12	0	14	0%
354	7	5	0	12	0%
355	4	7	0	11	0%
356	13	10	0	23	0%
357	4	13	1	18	6%
358	2	9	0	11	0%
359	3	17	0	20	0%
360	4	9	0	13	0%
361	4	7	0	11	0%
362	3	12	1	16	6%
363	4	19	1	24	4%
364	4	7	1	12	8%
365	13	9	3	25	12%
366	2	18	1	21	5%
367	6	25	0	31	0%
368	2	9	0	11	0%
369	5	9	0	14	0%
370	6	11	0	17	0%
371	2	8	0	10	0%
372	2	12	2	16	13%
373	6	12	0	18	0%
374	3	15	0	18	0%
375	19	9	0	28	0%
376	4	7	0	11	0%
377	6	6	0	12	0%
378	4	8	0	12	0%
379	18	8	0	26	0%
380	3	14	0	17	0%
381	5	6	0	11	0%
382	2	10	0	12	0%
383	6	17	0	23	0%
384	7	24	0	31	0%
385	3	24	0	27	0%
386	3	15	0	18	0%
387	3	7	0	10	0%
388	2	11	0	13	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
389	3	11	0	14	0%
390	2	12	0	14	0%
391	6	4	0	10	0%
392	5	8	0	13	0%
393	4	12	0	16	0%
394	3	7	1	11	9%
395	8	9	3	20	15%
396	9	5	0	14	0%
397	6	4	1	11	9%
398	2	13	0	15	0%
399	4	9	0	13	0%
400	5	5	1	11	9%

Appendix P: Withdrawal Rate for the Graduate Group

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
1	4	21	1	26	4%
2	9	25	0	34	0%
3	10	40	1	51	2%
4	4	9	0	13	0%
5	6	14	1	21	5%
6	14	11	1	26	4%
7	2	9	0	11	0%
8	5	16	0	21	0%
9	3	12	0	15	0%
10	2	24	0	26	0%
11	2	20	0	22	0%
12	5	8	0	13	0%
13	2	31	0	33	0%
14	15	27	0	42	0%
15	3	24	1	28	4%
16	5	16	1	22	5%
17	3	8	0	11	0%
18	6	8	0	14	0%
19	8	11	0	19	0%
20	8	4	0	12	0%
21	2	8	0	10	0%
22	2	34	0	36	0%
23	7	15	0	22	0%
24	6	13	4	23	17%
25	4	16	0	20	0%
26	2	11	0	13	0%
27	3	8	1	12	8%
28	2	40	0	42	0%
29	9	12	0	21	0%
30	4	11	0	15	0%
31	3	20	0	23	0%
32	4	10	0	14	0%
33	5	10	3	18	17%
34	2	9	0	11	0%
35	2	33	0	35	0%
36	3	11	0	14	0%
37	9	7	0	16	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
38	2	25	0	27	0%
39	3	27	0	30	0%
40	3	18	0	21	0%
41	4	17	0	21	0%
42	2	10	0	12	0%
43	5	24	3	32	9%
44	5	31	0	36	0%
45	2	15	0	17	0%
46	4	20	0	24	0%
47	2	8	3	13	23%
48	2	13	0	15	0%
49	9	18	10	37	27%
50	10	30	1	41	2%
51	2	11	0	13	0%
52	2	10	0	12	0%
53	5	30	0	35	0%
54	3	10	0	13	0%
55	3	12	0	15	0%
56	3	24	0	27	0%
57	4	10	0	14	0%
58	3	24	0	27	0%
59	3	8	0	11	0%
60	3	23	0	26	0%
61	3	18	0	21	0%
62	5	12	4	21	19%
63	9	32	0	41	0%
64	3	19	0	22	0%
65	2	21	0	23	0%
66	11	10	0	21	0%
67	2	8	0	10	0%
68	3	16	0	19	0%
69	7	10	0	17	0%
70	3	8	2	13	15%
71	2	13	0	15	0%
72	5	15	0	20	0%
73	2	10	2	14	14%
74	4	10	0	14	0%
75	6	26	0	32	0%
76	2	15	0	17	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
77	2	21	0	23	0%
78	6	8	0	14	0%
79	12	9	0	21	0%
80	8	38	0	46	0%
81	9	30	0	39	0%
82	4	11	1	16	6%
83	13	18	0	31	0%
84	3	20	6	29	21%
85	9	40	2	51	4%
86	8	44	2	54	4%
87	4	20	0	24	0%
88	4	16	0	20	0%
89	2	21	0	23	0%
90	7	7	0	14	0%
91	3	16	0	19	0%
92	2	12	0	14	0%
93	2	30	0	32	0%
94	4	16	0	20	0%
95	2	30	0	32	0%
96	2	25	0	27	0%
97	2	14	0	16	0%
98	8	24	0	32	0%
99	5	20	0	25	0%
100	2	15	0	17	0%
101	2	39	0	41	0%
102	2	39	9	50	18%
103	2	30	0	32	0%
104	4	18	0	22	0%
105	2	10	0	12	0%
106	21	21	0	42	0%
107	3	13	0	16	0%
108	3	11	0	14	0%
109	2	15	0	17	0%
110	2	8	0	10	0%
111	2	25	0	27	0%
112	5	35	1	41	2%
113	4	21	0	25	0%
114	3	8	0	11	0%
115	2	12	0	14	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
116	3	8	0	11	0%
117	4	29	1	34	3%
118	2	10	0	12	0%
119	4	39	0	43	0%
120	5	22	0	27	0%
121	7	12	1	20	5%
122	2	10	2	14	14%
123	25	29	0	54	0%
124	3	15	1	19	5%
125	6	27	1	34	3%
126	2	28	0	30	0%
127	4	10	1	15	7%
128	5	20	1	26	4%
129	4	17	0	21	0%
130	2	20	0	22	0%
131	10	19	0	29	0%
132	9	24	0	33	0%
133	2	23	0	25	0%
134	2	8	0	10	0%
135	4	10	0	14	0%
136	4	12	0	16	0%
137	2	10	0	12	0%
138	2	33	1	36	3%
139	2	9	1	12	8%
140	20	18	0	38	0%
141	2	8	0	10	0%
142	2	38	0	40	0%
143	2	20	1	23	4%
144	17	5	0	22	0%
145	2	10	0	12	0%
146	3	10	0	13	0%
147	3	41	0	44	0%
148	6	10	0	16	0%
149	2	26	0	28	0%
150	3	25	0	28	0%
151	3	14	0	17	0%
152	2	9	0	11	0%
153	2	15	0	17	0%
154	2	8	0	10	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
155	3	10	0	13	0%
156	12	12	0	24	0%
157	4	22	0	26	0%
158	2	19	0	21	0%
159	3	9	0	12	0%
160	4	20	0	24	0%
161	2	10	0	12	0%
162	3	8	0	11	0%
163	5	22	0	27	0%
164	2	13	0	15	0%
165	8	28	0	36	0%
166	3	42	0	45	0%
167	2	24	0	26	0%
168	4	16	0	20	0%
169	13	17	0	30	0%
170	6	10	0	16	0%
171	13	28	2	43	5%
172	2	8	0	10	0%
173	3	20	0	23	0%
174	7	9	0	16	0%
175	3	36	0	39	0%
176	3	10	0	13	0%
177	2	18	0	20	0%
178	2	8	0	10	0%
179	3	17	0	20	0%
180	4	23	0	27	0%
181	3	31	0	34	0%
182	2	23	2	27	7%
183	14	31	0	45	0%
184	3	30	0	33	0%
185	2	8	0	10	0%
186	2	21	0	23	0%
187	9	22	0	31	0%
188	9	22	0	31	0%
189	4	7	0	11	0%
190	7	9	0	16	0%
191	4	9	0	13	0%
192	6	30	0	36	0%
193	3	10	0	13	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
194	2	40	0	42	0%
195	8	22	0	30	0%
196	8	16	0	24	0%
197	3	36	3	42	7%
198	2	8	0	10	0%
199	6	22	0	28	0%
200	3	33	0	36	0%
201	2	17	0	19	0%
202	4	10	0	14	0%
203	4	24	0	28	0%
204	2	24	0	26	0%
205	2	15	0	17	0%
206	2	17	0	19	0%
207	9	30	0	39	0%
208	2	20	0	22	0%
209	3	8	1	12	8%
210	5	24	0	29	0%
211	2	11	0	13	0%
212	5	25	1	31	3%
213	4	18	1	23	4%
214	2	14	0	16	0%
215	4	29	0	33	0%
216	2	29	1	32	3%
217	4	9	0	13	0%
218	2	18	0	20	0%
219	3	14	0	17	0%
220	2	20	0	22	0%
221	4	26	0	30	0%
222	4	10	0	14	0%
223	6	19	1	26	4%
224	2	13	0	15	0%
225	3	13	0	16	0%
226	4	29	0	33	0%
227	3	22	0	25	0%
228	6	29	1	36	3%
229	5	11	0	16	0%
230	5	19	0	24	0%
231	4	32	0	36	0%
232	3	22	0	25	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
233	4	10	0	14	0%
234	4	21	0	25	0%
235	2	16	0	18	0%
236	2	13	0	15	0%
237	5	12	0	17	0%
238	2	30	0	32	0%
239	3	23	0	26	0%
240	4	26	0	30	0%
241	4	7	0	11	0%
242	5	19	0	24	0%
243	2	8	0	10	0%
244	8	13	0	21	0%
245	2	8	0	10	0%
246	6	19	1	26	4%
247	3	21	0	24	0%
248	3	20	0	23	0%
249	8	20	0	28	0%
250	5	19	0	24	0%
251	3	42	0	45	0%
252	4	20	1	25	4%
253	2	21	1	24	4%
254	3	20	0	23	0%
255	2	22	0	24	0%
256	11	30	0	41	0%
257	2	15	0	17	0%
258	7	32	1	40	3%
259	2	39	0	41	0%
260	4	36	0	40	0%
261	8	14	0	22	0%
262	2	9	0	11	0%
263	5	27	0	32	0%
264	2	23	0	25	0%
265	4	40	0	44	0%
266	2	8	0	10	0%
267	3	12	0	15	0%
268	2	24	0	26	0%
269	3	11	0	14	0%
270	3	14	0	17	0%
271	3	40	0	43	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
272	2	20	0	22	0%
273	2	13	0	15	0%
274	3	30	0	33	0%
275	3	7	0	10	0%
276	5	39	0	44	0%
277	4	19	1	24	4%
278	3	12	1	16	6%
279	7	19	0	26	0%
280	4	24	1	29	3%
281	3	11	7	21	33%
282	4	10	0	14	0%
283	2	40	0	42	0%
284	2	20	0	22	0%
285	2	20	0	22	0%
286	4	30	0	34	0%
287	7	30	0	37	0%
288	8	30	0	38	0%
289	2	17	0	19	0%
290	3	19	0	22	0%
291	2	28	0	30	0%
292	4	30	0	34	0%
293	7	30	0	37	0%
294	2	30	0	32	0%
295	4	30	0	34	0%
296	3	30	0	33	0%
297	2	9	0	11	0%
298	2	22	2	26	8%
299	4	29	1	34	3%
300	3	8	0	11	0%
301	2	16	0	18	0%
302	5	15	1	21	5%
303	3	14	0	17	0%
304	9	10	0	19	0%
305	2	19	0	21	0%
306	2	10	2	14	14%
307	2	28	1	31	3%
308	2	10	0	12	0%
309	2	11	0	13	0%
310	3	10	1	14	7%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
311	11	21	2	34	6%
312	2	17	0	19	0%
313	9	9	2	20	10%
314	3	17	2	22	9%
315	2	13	0	15	0%
316	6	26	0	32	0%
317	5	20	0	25	0%
318	3	25	0	28	0%
319	4	9	2	15	13%
320	2	12	2	16	13%
321	5	18	5	28	18%
322	2	13	0	15	0%
323	5	35	3	43	7%
324	3	18	0	21	0%
325	4	8	0	12	0%
326	7	9	0	16	0%
327	5	23	3	31	10%
328	2	8	0	10	0%
329	3	11	0	14	0%
330	2	17	0	19	0%
331	2	24	3	29	10%
332	6	12	0	18	0%
333	4	11	1	16	6%
334	6	4	5	15	33%
335	20	44	3	67	4%
336	2	32	1	35	3%
337	6	4	0	10	0%
338	5	34	8	47	17%
339	38	19	0	57	0%
340	3	10	0	13	0%
341	8	30	0	38	0%
342	2	18	0	20	0%
343	15	13	0	28	0%
344	2	9	0	11	0%
345	3	20	0	23	0%
346	2	10	1	13	8%
347	9	13	5	27	19%
348	17	12	1	30	3%
349	2	27	0	29	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
350	2	13	0	15	0%
351	3	16	1	20	5%
352	4	10	7	21	33%
353	5	11	0	16	0%
354	2	10	0	12	0%
355	7	11	0	18	0%
356	15	14	3	32	9%
357	16	17	1	34	3%
358	10	9	0	19	0%
359	4	14	2	20	10%
360	9	54	0	63	0%
361	3	7	0	10	0%
362	2	18	0	20	0%
363	3	17	0	20	0%
364	2	13	3	18	17%
365	3	19	0	22	0%
366	2	10	3	15	20%
367	4	14	0	18	0%
368	3	22	2	27	7%
369	3	12	0	15	0%
370	4	14	0	18	0%
371	2	16	0	18	0%
372	5	20	0	25	0%
373	2	11	0	13	0%
374	4	37	1	42	2%
375	3	15	0	18	0%
376	4	9	0	13	0%
377	2	14	0	16	0%
378	3	28	3	34	9%
379	2	10	0	12	0%
380	2	23	0	25	0%
381	2	17	2	21	10%
382	6	10	0	16	0%
383	20	10	0	30	0%
384	7	9	0	16	0%
385	8	18	0	26	0%
386	16	22	3	41	7%
387	4	21	1	26	4%
388	2	31	0	33	0%

ID	Fails	Passes	Withdrawals	Total	Withdrawal rate (Self Similarity rate)
389	3	12	1	16	6%
390	2	18	0	20	0%
391	7	35	6	48	13%
392	2	13	0	15	0%
393	5	14	0	19	0%
394	7	21	0	28	0%
395	2	30	1	33	3%
396	2	14	1	17	6%
397	4	25	0	29	0%
398	2	10	0	12	0%
399	2	26	1	29	3%
400	10	8	0	18	0%

Appendix Q: 'Withdrawals and Fails with Zero' Rate for the Program Withdrawal Group

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
1	0	8	10	2	20	50%
2	2	8	24	0	34	24%
3	0	3	9	0	12	25%
4	4	4	14	0	22	18%
5	0	3	7	0	10	30%
6	0	5	7	0	12	42%
7	2	11	13	0	26	42%
8	2	14	3	3	22	77%
9	4	11	3	0	18	61%
10	0	3	7	0	10	30%
11	0	4	6	0	10	40%
12	0	2	9	0	11	18%
13	0	5	8	1	14	43%
14	0	5	6	1	12	50%
15	0	2	10	0	12	17%
16	0	5	5	1	11	55%
17	4	0	8	0	12	0%
18	0	12	5	2	19	74%
19	0	9	2	0	11	82%
20	0	4	6	0	10	40%
21	0	2	9	0	11	18%
22	0	4	9	0	13	31%
23	1	4	6	2	13	46%
24	0	10	12	0	22	45%
25	0	2	8	0	10	20%
26	0	11	16	0	27	41%
27	1	7	17	0	25	28%
28	2	7	3	0	12	58%
29	2	7	12	0	21	33%
30	0	5	8	0	13	38%
31	0	4	9	0	13	31%
32	0	7	5	0	12	58%
33	0	7	3	3	13	77%
34	0	3	7	0	10	30%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
35	2	4	13	3	22	32%
36	1	5	7	0	13	38%
37	0	2	8	0	10	20%
38	0	2	9	0	11	18%
39	0	5	16	2	23	30%
40	0	4	7	0	11	36%
41	0	2	10	0	12	17%
42	0	2	8	0	10	20%
43	2	26	28	0	56	46%
44	0	6	4	0	10	60%
45	3	32	18	0	53	60%
46	2	7	18	4	31	35%
47	0	9	3	0	12	75%
48	0	3	21	1	25	16%
49	1	2	7	0	10	20%
50	0	3	7	1	11	36%
51	0	2	14	0	16	13%
52	0	10	5	0	15	67%
53	0	4	9	0	13	31%
54	4	13	13	0	30	43%
55	0	9	4	0	13	69%
56	0	11	1	0	12	92%
57	0	2	23	1	26	12%
58	1	9	2	0	12	75%
59	1	12	11	0	24	50%
60	6	8	5	0	19	42%
61	0	8	3	0	11	73%
62	0	2	9	0	11	18%
63	2	7	24	1	34	24%
64	0	11	19	1	31	39%
65	0	12	3	0	15	80%
66	0	3	9	0	12	25%
67	0	4	10	0	14	29%
68	0	2	8	0	10	20%
69	0	5	6	1	12	50%
70	0	15	14	0	29	52%
71	0	7	4	0	11	64%
72	1	7	2	0	10	70%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
73	0	3	8	0	11	27%
74	0	12	15	0	27	44%
75	0	3	28	5	36	22%
76	9	5	24	0	38	13%
77	0	3	9	0	12	25%
78	0	7	39	0	46	15%
79	0	12	19	0	31	39%
80	0	4	20	2	26	23%
81	0	2	13	0	15	13%
82	2	4	5	0	11	36%
83	0	7	13	0	20	35%
84	1	8	2	0	11	73%
85	3	17	10	0	30	57%
86	2	18	9	0	29	62%
87	0	3	13	4	20	35%
88	0	12	3	0	15	80%
89	5	3	8	0	16	19%
90	0	2	26	1	29	10%
91	0	2	13	0	15	13%
92	0	8	8	3	19	58%
93	0	4	7	0	11	36%
94	0	8	8	1	17	53%
95	0	7	6	1	14	57%
96	0	4	13	1	18	28%
97	0	6	9	1	16	44%
98	0	4	12	1	17	29%
99	0	5	9	7	21	57%
100	1	13	17	0	31	42%
101	0	21	15	0	36	58%
102	0	3	10	2	15	33%
103	0	2	19	0	21	10%
104	0	14	12	0	26	54%
105	0	6	8	0	14	43%
106	0	4	6	1	11	45%
107	0	3	9	0	12	25%
108	0	3	11	0	14	21%
109	0	12	6	0	18	67%
110	0	4	8	0	12	33%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
111	15	4	5	1	25	20%
112	0	4	6	1	11	45%
113	0	2	18	0	20	10%
114	0	7	3	1	11	73%
115	0	8	6	0	14	57%
116	0	5	21	0	26	19%
117	0	17	6	0	23	74%
118	0	12	20	0	32	38%
119	0	7	11	0	18	39%
120	0	7	14	0	21	33%
121	0	10	11	0	21	48%
122	0	4	7	0	11	36%
123	0	2	11	0	13	15%
124	0	2	10	0	12	17%
125	0	7	11	0	18	39%
126	0	7	13	0	20	35%
127	0	13	8	0	21	62%
128	0	2	15	0	17	12%
129	0	7	7	0	14	50%
130	0	9	3	0	12	75%
131	0	11	14	0	25	44%
132	0	5	14	0	19	26%
133	0	5	10	0	15	33%
134	0	13	17	1	31	45%
135	0	11	11	0	22	50%
136	0	4	6	0	10	40%
137	0	14	6	0	20	70%
138	0	4	6	0	10	40%
139	0	12	19	0	31	39%
140	0	5	7	0	12	42%
141	7	5	10	0	22	23%
142	0	13	9	0	22	59%
143	0	11	2	0	13	85%
144	0	8	11	0	19	42%
145	0	5	8	0	13	38%
146	0	2	14	0	16	13%
147	0	4	7	3	14	50%
148	0	3	9	0	12	25%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
149	6	3	15	1	25	16%
150	0	5	11	0	16	31%
151	0	4	7	0	11	36%
152	0	5	26	0	31	16%
153	0	7	7	0	14	50%
154	0	6	11	0	17	35%
155	0	5	13	0	18	28%
156	0	11	3	0	14	79%
157	0	3	7	0	10	30%
158	0	8	6	0	14	57%
159	0	3	7	0	10	30%
160	0	10	2	0	12	83%
161	0	7	7	0	14	50%
162	0	4	6	0	10	40%
163	0	11	16	0	27	41%
164	0	5	6	0	11	45%
165	0	3	14	0	17	18%
166	0	4	7	0	11	36%
167	0	5	23	0	28	18%
168	0	5	5	0	10	50%
169	0	2	11	0	13	15%
170	1	2	8	0	11	18%
171	0	4	6	0	10	40%
172	0	2	8	0	10	20%
173	0	4	7	1	12	42%
174	0	3	7	3	13	46%
175	0	12	6	0	18	67%
176	3	4	16	0	23	17%
177	0	16	12	0	28	57%
178	0	7	26	0	33	21%
179	0	7	6	1	14	57%
180	0	22	20	0	42	52%
181	3	12	21	1	37	35%
182	6	2	9	3	20	25%
183	0	12	7	0	19	63%
184	0	9	29	0	38	24%
185	0	2	13	0	15	13%
186	0	11	4	0	15	73%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
187	0	12	26	0	38	32%
188	0	5	11	0	16	31%
189	0	13	2	0	15	87%
190	0	2	8	0	10	20%
191	0	4	6	0	10	40%
192	0	13	9	0	22	59%
193	0	9	4	0	13	69%
194	0	2	16	0	18	11%
195	0	5	18	0	23	22%
196	0	2	10	1	13	23%
197	0	17	28	0	45	38%
198	0	2	11	0	13	15%
199	0	2	8	0	10	20%
200	0	5	5	0	10	50%
201	0	2	9	0	11	18%
202	0	6	5	0	11	55%
203	0	10	17	0	27	37%
204	0	7	10	0	17	41%
205	0	11	4	0	15	73%
206	0	11	16	0	27	41%
207	0	11	8	0	19	58%
208	0	2	13	0	15	13%
209	0	3	9	1	13	31%
210	0	11	8	0	19	58%
211	0	13	6	0	19	68%
212	0	4	6	0	10	40%
213	1	3	12	0	16	19%
214	0	9	11	0	20	45%
215	0	5	7	0	12	42%
216	0	4	6	0	10	40%
217	0	5	9	0	14	36%
218	0	6	9	0	15	40%
219	0	5	7	0	12	42%
220	0	3	20	0	23	13%
221	0	11	11	0	22	50%
222	0	4	8	0	12	33%
223	0	2	11	1	14	21%
224	0	2	15	4	21	29%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
225	0	2	8	0	10	20%
226	0	3	9	0	12	25%
227	2	7	10	0	19	37%
228	0	8	13	0	21	38%
229	0	15	14	0	29	52%
230	0	4	7	3	14	50%
231	0	7	3	0	10	70%
232	0	13	7	0	20	65%
233	3	0	16	1	20	5%
234	0	9	8	0	17	53%
235	0	4	9	0	13	31%
236	0	3	7	0	10	30%
237	0	3	7	0	10	30%
238	0	16	8	0	24	67%
239	0	5	19	3	27	30%
240	1	2	17	1	21	14%
241	0	5	8	0	13	38%
242	0	6	10	1	17	41%
243	0	4	20	1	25	20%
244	0	11	4	0	15	73%
245	0	6	6	3	15	60%
246	0	7	19	0	26	27%
247	0	2	10	0	12	17%
248	0	6	10	0	16	38%
249	0	5	7	0	12	42%
250	0	9	13	0	22	41%
251	0	8	4	2	14	71%
252	0	6	5	0	11	55%
253	0	2	11	0	13	15%
254	0	5	10	1	16	38%
255	0	2	8	0	10	20%
256	0	15	20	0	35	43%
257	0	5	5	0	10	50%
258	0	2	9	0	11	18%
259	0	8	8	0	16	50%
260	0	3	10	0	13	23%
261	0	9	4	0	13	69%
262	0	3	9	0	12	25%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
263	0	3	7	0	10	30%
264	0	13	6	0	19	68%
265	0	11	12	0	23	48%
266	0	8	3	0	11	73%
267	0	6	5	0	11	55%
268	0	5	16	0	21	24%
269	0	7	4	0	11	64%
270	1	10	10	1	22	50%
271	2	12	11	3	28	54%
272	0	3	14	0	17	18%
273	0	10	5	0	15	67%
274	4	2	4	0	10	20%
275	0	12	3	0	15	80%
276	0	8	7	0	15	53%
277	0	3	8	0	11	27%
278	0	4	7	0	11	36%
279	0	3	9	0	12	25%
280	0	12	5	0	17	71%
281	3	18	11	0	32	56%
282	0	4	8	0	12	33%
283	0	8	5	0	13	62%
284	0	2	22	0	24	8%
285	0	3	7	1	11	36%
286	0	4	7	0	11	36%
287	0	3	7	0	10	30%
288	0	3	34	8	45	24%
289	0	9	16	0	25	36%
290	0	6	13	0	19	32%
291	0	6	9	1	16	44%
292	0	2	9	0	11	18%
293	0	13	9	1	23	61%
294	6	7	24	0	37	19%
295	0	3	8	0	11	27%
296	0	8	4	6	18	78%
297	5	4	21	0	30	13%
298	0	6	7	0	13	46%
299	0	2	8	0	10	20%
300	0	5	13	2	20	35%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
301	0	2	8	0	10	20%
302	0	8	7	2	17	59%
303	0	5	6	0	11	45%
304	0	7	9	0	16	44%
305	0	9	3	0	12	75%
306	0	22	16	0	38	58%
307	0	4	19	0	23	17%
308	0	5	7	0	12	42%
309	0	2	10	1	13	23%
310	0	9	5	0	14	64%
311	0	5	10	4	19	47%
312	0	7	4	0	11	64%
313	0	7	5	0	12	58%
314	0	5	8	0	13	38%
315	0	3	7	0	10	30%
316	0	4	7	0	11	36%
317	3	5	12	0	20	25%
318	0	3	9	0	12	25%
319	0	7	9	0	16	44%
320	0	10	3	0	13	77%
321	0	6	7	1	14	50%
322	6	10	17	0	33	30%
323	0	4	7	0	11	36%
324	0	13	12	0	25	52%
325	0	6	13	0	19	32%
326	0	2	10	0	12	17%
327	0	5	16	0	21	24%
328	0	5	8	0	13	38%
329	0	3	8	0	11	27%
330	0	3	9	0	12	25%
331	0	3	7	0	10	30%
332	0	8	8	0	16	50%
333	0	16	4	2	22	82%
334	0	12	6	0	18	67%
335	0	10	5	0	15	67%
336	0	3	7	1	11	36%
337	0	9	11	0	20	45%
338	5	4	6	0	15	27%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
339	0	7	19	0	26	27%
340	0	5	6	0	11	45%
341	4	8	6	4	22	55%
342	1	9	14	0	24	38%
343	0	2	9	1	12	25%
344	0	13	19	0	32	41%
345	0	6	14	0	20	30%
346	4	8	11	1	24	38%
347	0	2	13	0	15	13%
348	4	8	18	0	30	27%
349	0	5	5	0	10	50%
350	0	2	8	0	10	20%
351	1	1	10	0	12	8%
352	0	6	5	0	11	55%
353	0	2	12	0	14	14%
354	0	7	5	0	12	58%
355	0	4	7	0	11	36%
356	0	13	10	0	23	57%
357	1	3	13	1	18	22%
358	0	2	9	0	11	18%
359	0	3	17	0	20	15%
360	0	4	9	0	13	31%
361	0	4	7	0	11	36%
362	0	3	12	1	16	25%
363	1	3	19	1	24	17%
364	0	4	7	1	12	42%
365	2	11	9	3	25	56%
366	0	2	18	1	21	14%
367	0	6	25	0	31	19%
368	0	2	9	0	11	18%
369	0	5	9	0	14	36%
370	0	6	11	0	17	35%
371	0	2	8	0	10	20%
372	0	2	12	2	16	25%
373	2	4	12	0	18	22%
374	0	3	15	0	18	17%
375	0	19	9	0	28	68%
376	0	4	7	0	11	36%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
377	0	6	6	0	12	50%
378	0	4	8	0	12	33%
379	0	18	8	0	26	69%
380	0	3	14	0	17	18%
381	0	5	6	0	11	45%
382	0	2	10	0	12	17%
383	0	6	17	0	23	26%
384	0	7	24	0	31	23%
385	0	3	24	0	27	11%
386	0	3	15	0	18	17%
387	0	3	7	0	10	30%
388	0	2	11	0	13	15%
389	0	3	11	0	14	21%
390	0	2	12	0	14	14%
391	0	6	4	0	10	60%
392	1	4	8	0	13	31%
393	0	4	12	0	16	25%
394	0	3	7	1	11	36%
395	0	8	9	3	20	55%
396	0	9	5	0	14	64%
397	0	6	4	1	11	64%
398	0	2	13	0	15	13%
399	0	4	9	0	13	31%
400	0	5	5	1	11	55%

Appendix R: 'Withdrawals and Fails with Zero' Rate for the Graduate Group

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
1	0	4	21	1	26	19%
2	0	9	25	0	34	26%
3	0	10	40	1	51	22%
4	1	3	9	0	13	23%
5	5	1	14	1	21	10%
6	1	13	11	1	26	54%
7	0	2	9	0	11	18%
8	0	5	16	0	21	24%
9	0	3	12	0	15	20%
10	0	2	24	0	26	8%
11	0	2	20	0	22	9%
12	0	5	8	0	13	38%
13	0	2	31	0	33	6%
14	4	11	27	0	42	26%
15	0	3	24	1	28	14%
16	0	5	16	1	22	27%
17	1	2	8	0	11	18%
18	0	6	8	0	14	43%
19	0	8	11	0	19	42%
20	2	6	4	0	12	50%
21	0	2	8	0	10	20%
22	1	1	34	0	36	3%
23	0	7	15	0	22	32%
24	1	5	13	4	23	39%
25	0	4	16	0	20	20%
26	0	2	11	0	13	15%
27	0	3	8	1	12	33%
28	0	2	40	0	42	5%
29	0	9	12	0	21	43%
30	0	4	11	0	15	27%
31	0	3	20	0	23	13%
32	0	4	10	0	14	29%
33	0	5	10	3	18	44%
34	0	2	9	0	11	18%
35	0	2	33	0	35	6%
36	3	0	11	0	14	0%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
37	0	9	7	0	16	56%
38	0	2	25	0	27	7%
39	0	3	27	0	30	10%
40	0	3	18	0	21	14%
41	0	4	17	0	21	19%
42	2	0	10	0	12	0%
43	0	5	24	3	32	25%
44	0	5	31	0	36	14%
45	0	2	15	0	17	12%
46	0	4	20	0	24	17%
47	0	2	8	3	13	38%
48	0	2	13	0	15	13%
49	0	9	18	10	37	51%
50	1	9	30	1	41	24%
51	0	2	11	0	13	15%
52	0	2	10	0	12	17%
53	1	4	30	0	35	11%
54	0	3	10	0	13	23%
55	0	3	12	0	15	20%
56	0	3	24	0	27	11%
57	0	4	10	0	14	29%
58	0	3	24	0	27	11%
59	0	3	8	0	11	27%
60	0	3	23	0	26	12%
61	0	3	18	0	21	14%
62	0	5	12	4	21	43%
63	4	5	32	0	41	12%
64	0	3	19	0	22	14%
65	0	2	21	0	23	9%
66	0	11	10	0	21	52%
67	1	1	8	0	10	10%
68	1	2	16	0	19	11%
69	0	7	10	0	17	41%
70	0	3	8	2	13	38%
71	0	2	13	0	15	13%
72	0	5	15	0	20	25%
73	0	2	10	2	14	29%
74	3	1	10	0	14	7%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
75	0	6	26	0	32	19%
76	0	2	15	0	17	12%
77	0	2	21	0	23	9%
78	0	6	8	0	14	43%
79	4	8	9	0	21	38%
80	0	8	38	0	46	17%
81	0	9	30	0	39	23%
82	0	4	11	1	16	31%
83	2	11	18	0	31	35%
84	0	3	20	6	29	31%
85	0	9	40	2	51	22%
86	0	8	44	2	54	19%
87	0	4	20	0	24	17%
88	0	4	16	0	20	20%
89	0	2	21	0	23	9%
90	0	7	7	0	14	50%
91	1	2	16	0	19	11%
92	0	2	12	0	14	14%
93	0	2	30	0	32	6%
94	0	4	16	0	20	20%
95	0	2	30	0	32	6%
96	0	2	25	0	27	7%
97	0	2	14	0	16	13%
98	0	8	24	0	32	25%
99	0	5	20	0	25	20%
100	0	2	15	0	17	12%
101	0	2	39	0	41	5%
102	0	2	39	9	50	22%
103	0	2	30	0	32	6%
104	0	4	18	0	22	18%
105	0	2	10	0	12	17%
106	0	21	21	0	42	50%
107	0	3	13	0	16	19%
108	0	3	11	0	14	21%
109	0	2	15	0	17	12%
110	0	2	8	0	10	20%
111	0	2	25	0	27	7%
112	0	5	35	1	41	15%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
113	0	4	21	0	25	16%
114	0	3	8	0	11	27%
115	0	2	12	0	14	14%
116	0	3	8	0	11	27%
117	0	4	29	1	34	15%
118	0	2	10	0	12	17%
119	0	4	39	0	43	9%
120	0	5	22	0	27	19%
121	0	7	12	1	20	40%
122	0	2	10	2	14	29%
123	0	25	29	0	54	46%
124	0	3	15	1	19	21%
125	0	6	27	1	34	21%
126	0	2	28	0	30	7%
127	0	4	10	1	15	33%
128	0	5	20	1	26	23%
129	0	4	17	0	21	19%
130	0	2	20	0	22	9%
131	0	10	19	0	29	34%
132	0	9	24	0	33	27%
133	0	2	23	0	25	8%
134	0	2	8	0	10	20%
135	0	4	10	0	14	29%
136	0	4	12	0	16	25%
137	0	2	10	0	12	17%
138	0	2	33	1	36	8%
139	0	2	9	1	12	25%
140	0	20	18	0	38	53%
141	0	2	8	0	10	20%
142	0	2	38	0	40	5%
143	0	2	20	1	23	13%
144	0	17	5	0	22	77%
145	0	2	10	0	12	17%
146	0	3	10	0	13	23%
147	0	3	41	0	44	7%
148	0	6	10	0	16	38%
149	0	2	26	0	28	7%
150	0	3	25	0	28	11%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
151	0	3	14	0	17	18%
152	0	2	9	0	11	18%
153	0	2	15	0	17	12%
154	0	2	8	0	10	20%
155	0	3	10	0	13	23%
156	0	12	12	0	24	50%
157	0	4	22	0	26	15%
158	0	2	19	0	21	10%
159	0	3	9	0	12	25%
160	0	4	20	0	24	17%
161	0	2	10	0	12	17%
162	0	3	8	0	11	27%
163	0	5	22	0	27	19%
164	0	2	13	0	15	13%
165	0	8	28	0	36	22%
166	0	3	42	0	45	7%
167	0	2	24	0	26	8%
168	0	4	16	0	20	20%
169	0	13	17	0	30	43%
170	0	6	10	0	16	38%
171	0	13	28	2	43	35%
172	0	2	8	0	10	20%
173	0	3	20	0	23	13%
174	0	7	9	0	16	44%
175	0	3	36	0	39	8%
176	0	3	10	0	13	23%
177	0	2	18	0	20	10%
178	0	2	8	0	10	20%
179	0	3	17	0	20	15%
180	0	4	23	0	27	15%
181	0	3	31	0	34	9%
182	0	2	23	2	27	15%
183	0	14	31	0	45	31%
184	0	3	30	0	33	9%
185	0	2	8	0	10	20%
186	0	2	21	0	23	9%
187	0	9	22	0	31	29%
188	0	9	22	0	31	29%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
189	0	4	7	0	11	36%
190	0	7	9	0	16	44%
191	0	4	9	0	13	31%
192	0	6	30	0	36	17%
193	0	3	10	0	13	23%
194	0	2	40	0	42	5%
195	0	8	22	0	30	27%
196	0	8	16	0	24	33%
197	0	3	36	3	42	14%
198	0	2	8	0	10	20%
199	0	6	22	0	28	21%
200	0	3	33	0	36	8%
201	0	2	17	0	19	11%
202	0	4	10	0	14	29%
203	0	4	24	0	28	14%
204	0	2	24	0	26	8%
205	0	2	15	0	17	12%
206	0	2	17	0	19	11%
207	0	9	30	0	39	23%
208	0	2	20	0	22	9%
209	0	3	8	1	12	33%
210	0	5	24	0	29	17%
211	0	2	11	0	13	15%
212	0	5	25	1	31	19%
213	0	4	18	1	23	22%
214	0	2	14	0	16	13%
215	0	4	29	0	33	12%
216	0	2	29	1	32	9%
217	0	4	9	0	13	31%
218	0	2	18	0	20	10%
219	0	3	14	0	17	18%
220	0	2	20	0	22	9%
221	0	4	26	0	30	13%
222	0	4	10	0	14	29%
223	0	6	19	1	26	27%
224	0	2	13	0	15	13%
225	0	3	13	0	16	19%
226	0	4	29	0	33	12%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
227	0	3	22	0	25	12%
228	0	6	29	1	36	19%
229	0	5	11	0	16	31%
230	0	5	19	0	24	21%
231	0	4	32	0	36	11%
232	0	3	22	0	25	12%
233	0	4	10	0	14	29%
234	0	4	21	0	25	16%
235	0	2	16	0	18	11%
236	0	2	13	0	15	13%
237	0	5	12	0	17	29%
238	0	2	30	0	32	6%
239	0	3	23	0	26	12%
240	0	4	26	0	30	13%
241	0	4	7	0	11	36%
242	0	5	19	0	24	21%
243	0	2	8	0	10	20%
244	0	8	13	0	21	38%
245	0	2	8	0	10	20%
246	0	6	19	1	26	27%
247	0	3	21	0	24	13%
248	0	3	20	0	23	13%
249	0	8	20	0	28	29%
250	0	5	19	0	24	21%
251	0	3	42	0	45	7%
252	0	4	20	1	25	20%
253	0	2	21	1	24	13%
254	0	3	20	0	23	13%
255	0	2	22	0	24	8%
256	0	11	30	0	41	27%
257	0	2	15	0	17	12%
258	0	7	32	1	40	20%
259	0	2	39	0	41	5%
260	0	4	36	0	40	10%
261	0	8	14	0	22	36%
262	0	2	9	0	11	18%
263	0	6	27	0	33	18%
264	0	2	23	0	25	8%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
265	0	4	40	0	44	9%
266	0	2	8	0	10	20%
267	0	3	12	0	15	20%
268	0	2	24	0	26	8%
269	0	3	11	0	14	21%
270	0	3	14	0	17	18%
271	0	3	40	0	43	7%
272	0	2	20	0	22	9%
273	0	2	13	0	15	13%
274	0	3	30	0	33	9%
275	0	3	7	0	10	30%
276	0	5	39	0	44	11%
277	0	4	19	1	24	21%
278	0	3	12	1	16	25%
279	0	7	19	0	26	27%
280	0	4	24	1	29	17%
281	0	3	11	7	21	48%
282	0	4	10	0	14	29%
283	0	2	40	0	42	5%
284	0	2	20	0	22	9%
285	0	2	20	0	22	9%
286	0	4	30	0	34	12%
287	0	7	30	0	37	19%
288	0	8	30	0	38	21%
289	0	2	17	0	19	11%
290	0	3	19	0	22	14%
291	0	2	28	0	30	7%
292	0	4	30	0	34	12%
293	0	7	30	0	37	19%
294	0	2	30	0	32	6%
295	0	4	30	0	34	12%
296	0	3	30	0	33	9%
297	0	2	9	0	11	18%
298	0	2	22	2	26	15%
299	0	4	29	1	34	15%
300	0	3	8	0	11	27%
301	0	2	16	0	18	11%
302	0	5	15	1	21	29%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
303	0	3	14	0	17	18%
304	0	9	10	0	19	47%
305	0	2	19	0	21	10%
306	0	2	10	2	14	29%
307	0	2	28	1	31	10%
308	0	2	10	0	12	17%
309	0	2	11	0	13	15%
310	0	3	10	1	14	29%
311	1	10	21	2	34	35%
312	0	2	17	0	19	11%
313	0	9	9	2	20	55%
314	0	3	17	2	22	23%
315	0	2	13	0	15	13%
316	0	6	26	0	32	19%
317	0	5	20	0	25	20%
318	0	3	25	0	28	11%
319	0	4	9	2	15	40%
320	0	2	12	2	16	25%
321	0	5	18	5	28	36%
322	0	2	13	0	15	13%
323	0	5	35	3	43	19%
324	0	3	18	0	21	14%
325	0	4	8	0	12	33%
326	3	4	9	0	16	25%
327	3	2	23	3	31	16%
328	0	2	8	0	10	20%
329	0	3	11	0	14	21%
330	0	2	17	0	19	11%
331	0	2	24	3	29	17%
332	2	4	12	0	18	22%
333	0	4	11	1	16	31%
334	3	3	4	5	15	53%
335	11	9	44	3	67	18%
336	1	1	32	1	35	6%
337	3	3	4	0	10	30%
338	0	5	34	8	47	28%
339	3	35	19	0	57	61%
340	0	3	10	0	13	23%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
341	2	6	30	0	38	16%
342	0	2	18	0	20	10%
343	1	14	13	0	28	50%
344	0	2	9	0	11	18%
345	0	3	20	0	23	13%
346	0	2	10	1	13	23%
347	2	7	13	5	27	44%
348	7	10	12	1	30	37%
349	0	2	27	0	29	7%
350	0	2	13	0	15	13%
351	0	3	16	1	20	20%
352	0	4	10	7	21	52%
353	0	5	11	0	16	31%
354	0	2	10	0	12	17%
355	1	6	11	0	18	33%
356	3	12	14	3	32	47%
357	6	10	17	1	34	32%
358	0	10	9	0	19	53%
359	0	4	14	2	20	30%
360	4	5	54	0	63	8%
361	0	3	7	0	10	30%
362	0	2	18	0	20	10%
363	2	1	17	0	20	5%
364	2	0	13	3	18	17%
365	0	3	19	0	22	14%
366	0	2	10	3	15	33%
367	0	4	14	0	18	22%
368	0	3	22	2	27	19%
369	0	3	12	0	15	20%
370	0	4	14	0	18	22%
371	0	2	16	0	18	11%
372	1	4	20	0	25	16%
373	0	2	11	0	13	15%
374	0	4	37	1	42	12%
375	0	3	15	0	18	17%
376	0	4	9	0	13	31%
377	0	2	14	0	16	13%
378	0	3	28	3	34	18%

ID	Fails	Fails with Zero	Passes	Withdrawals	Total	'Withdrawals & Fails with Zero' Rate
379	0	2	10	0	12	17%
380	0	2	23	0	25	8%
381	0	2	17	2	21	19%
382	0	6	10	0	16	38%
383	9	11	10	0	30	37%
384	0	7	9	0	16	44%
385	1	7	18	0	26	27%
386	3	17	18	3	41	49%
387	1	3	21	1	26	15%
388	0	2	31	0	33	6%
389	0	3	12	1	16	25%
390	0	2	18	0	20	10%
391	1	6	35	6	48	25%
392	0	2	13	0	15	13%
393	0	5	14	0	19	26%
394	3	4	21	0	28	14%
395	0	2	30	1	33	9%
396	0	2	14	1	17	18%
397	1	3	25	0	29	10%
398	0	2	10	0	12	17%
399	0	2	26	1	29	10%
400	0	10	8	0	18	56%