Summer 7-29-2016

Evaluation of an Experimental Data Management System for Program Data at the College Level

Hema Nair
Clark Atlanta University, hema.nair@students.cau.edu

Follow this and additional works at: http://digitalcommons.auctr.edu/cauetds

Part of the Curriculum and Instruction Commons, and the Educational Assessment, Evaluation, and Research Commons

Recommended Citation
Nair, Hema, "Evaluation of an Experimental Data Management System for Program Data at the College Level" (2016). Electronic Theses & Dissertations Collection for Atlanta University & Clark Atlanta University. Paper 45.

This Dissertation is brought to you for free and open access by the Clark Atlanta University at DigitalCommons@Robert W. Woodruff Library, Atlanta University Center. It has been accepted for inclusion in Electronic Theses & Dissertations Collection for Atlanta University & Clark Atlanta University by an authorized administrator of DigitalCommons@Robert W. Woodruff Library, Atlanta University Center. For more information, please contact cwiseman@auctr.edu.
ABSTRACT

EDUCATIONAL LEADERSHIP

NAIR, HEMA

B.TECH. UNIVERSITY OF CALICUT, 1986
M.S.C. NATIONAL UNIVERSITY OF SINGAPORE, 1993
M.S. CLARK ATLANTA UNIVERSITY, 1996

EVALUATION OF AN EXPERIMENTAL DATA MANAGEMENT SYSTEM FOR PROGRAM DATA AT THE COLLEGE LEVEL

Committee Chair: Trevor Turner, Ph. D.

Dissertation dated July 2016

An experimental data management system has been designed, developed, and implemented in this dissertation. The system satisfies the requirements specifications of the Department of Curriculum and Instruction in the School of Education. The university in this study has installed some learning management systems and assessment systems, such as Banner®, Canvas®, TracDat®, and Taskstream® (university’s name is omitted for anonymity purposes). These systems individually do not perform the necessary data analysis and data management to generate appropriate reports. The system developed in this study can generate more metrics and quantitative measures for reporting purposes within a shorter time. These metrics provide credible evidence for accreditation.

Leadership is concerned with improving the effectiveness, efficiency, accountability, and performance of educational programs. The continuity, sustainability,
and financial support of programs depend on demonstrating the evidence that they are effective and efficient, that they meet their objectives, and that they contribute to the mission and the vision of the educational institution. Leadership has to employ all means at its disposal in order to collect such evidence. The data management system provides comprehensive data analysis that can be utilized as evidence by the leadership to accomplish its goals.

The pilot system developed in this research is web-based and platform independent. It leverages the power of Java® at the front-end and combines the reliability and stability of Oracle® as the back-end database. It has been tested on-site by some members of the departmental faculty and one administrator from the Dean’s Office in the School of Education.

This research is a mixed methods study with quasi-experimental treatment. It is a single case experimental study. There is no control group. The sample chosen is a convenient sample.

The results of this study indicate that the system is highly usable for assessment work. The data analysis results generated by the system are also actionable. These results assist by identifying gaps in student performance and in curriculum and instruction practices.

In the future, the system developed in this dissertation can be extended to other departments in the School of Education. Some implications are provided in the concluding chapter of this dissertation.
EVALUATION OF AN EXPERIMENTAL DATA MANAGEMENT SYSTEM FOR
PROGRAM DATA AT THE COLLEGE LEVEL

A DISSERTATION

SUBMITTED TO THE FACULTY OF CLARK ATLANTA UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF DOCTOR OF EDUCATION

BY

HEMA NAIR

DEPARTMENT OF EDUCATIONAL LEADERSHIP

ATLANTA, GEORGIA

JULY 2016
ACKNOWLEDGEMENTS

I am grateful to God and to my parents for all the blessings bestowed upon me.

I express sincere gratitude to the dean, Dr. Moses Norman, for his guidance, advice, and support during the most difficult moments in this educational journey. He was my advisor for the major part of my program. I sincerely thank the chair of my dissertation committee, Dr. Trevor Turner, for the many hours he spent evaluating my work and providing valuable comments for improvement. I am deeply grateful to Dr. Felicia Mayfield for motivating me to choose this topic for my dissertation. This work could not have been completed without her continued support. I thank Dr. Darrell Groves for providing encouragement and valuable feedback to improve my dissertation work. I thank Dr. Barbara Hill for her help in my dissertation work. I am indebted to all the professors who taught me and molded me to become a better individual. I am deeply grateful to my professor Dr. Kenneth Perry, faculty of the department of Computer Science, Morehouse College, for reviewing the technical specifications and the design of the data management system built in this dissertation. I thank Curriculum and Instruction department chair, Dr. James Young, and the faculty for their assistance and cooperation. I sincerely thank Dr. Ruby Thompson for all the help and support that she gave me.

I thank staff assistant Mrs. Betty Cooke for the help she gave me to progress in the program. I also thank the many administrative leaders and staff in CAU’s administration for their timely help during this long journey.
TABLE OF CONTENTS

ACKNOWLEDGEMENTS...........................................................................................................iv
 LIST OF FIGURES................................................................................................................vii
 LIST OF TABLES..................................................................................................................viii

CHAPTER

I. INTRODUCTION............................................................................................................... 1
   Purpose of the Study ........................................................................................................ 10
   Statement of the Problem .............................................................................................. 11
   Significance of the Study ............................................................................................... 12
   Research Questions ....................................................................................................... 13
   Summary ....................................................................................................................... 13

II. REVIEW OF RESEARCH LITERATURE......................................................................... 15
   Summary ....................................................................................................................... 24

III. THEORETICAL FRAMEWORK....................................................................................... 26
   Theoretical Framework Description ............................................................................ 26
   Variables ...................................................................................................................... 29
   Dependent Variables .................................................................................................. 29
   Independent Variables ............................................................................................... 30
CHAPTER

Theoretical Framework Chart .......................................................... 31

Limitations of This Study ..................................................................... 32

Summary ................................................................................................ 33

IV. RESEARCH METHODOLOGY .......................................................... 34

Research Design .................................................................................. 34

Description of the Setting ..................................................................... 37

Sampling .............................................................................................. 38

Working with Human Subjects ............................................................ 38

Instrumentation ................................................................................... 38

Data Collection Procedures ................................................................. 39

Statistical Applications ......................................................................... 39

Summary ............................................................................................... 40

V. DATA PRESENTATION AND ANALYSIS ............................................. 41

Data Collection .................................................................................... 41

Surveys .................................................................................................. 43

Observations ........................................................................................ 43

Interviews ............................................................................................. 44

Data Analysis ......................................................................................... 45
CHAPTER

Summary of Interviews ................................................................. 55
Data Analysis Results ................................................................. 57
Validity ....................................................................................... 58
Research Questions ................................................................. 59
Summary ..................................................................................... 66

VI. DISCUSSION OF RESULTS ......................................................... 67
Pilot System Implementation ..................................................... 67
Conclusion .................................................................................... 68
Implications ................................................................................. 74
Recommendations ........................................................................ 75
Summary ..................................................................................... 76

APPENDIX

A. INSTRUMENTS ................................................................. 77
B. OBSERVATIONS ................................................................. 85
C. INTERVIEWS ................................................................. 121

REFERENCES ........................................................................ 142
LIST OF FIGURES

FIGURE

1. Theoretical framework chart ................................................................. 32
2. Welcome page ......................................................................................... 69
3. Forms Menu page .................................................................................... 69
4. Top section of Intern Keys form ............................................................... 70
5. Lower section of Intern Keys form ........................................................... 70
6. Generate Report interface ....................................................................... 71
7. Intern Keys table report .......................................................................... 71
8. Oracle Data Miner (ODM) canvas set up for regression ....................... 72
9. ODM display of regression coefficients for GLM ................................... 72
10. ODM display of regression residual plots comparing GLM and SVMM .... 73
11. Sketch of the room where the observation was conducted .................... 93
LIST OF TABLES

TABLE

1. Statistical Parameters ........................................................................................................... 36
2. Calculated Statistical Parameters .......................................................................................... 47
3. Coding Matrix for Surveys ...................................................................................................... 48
4. Coding Matrix for Observations ............................................................................................ 49
5. Coding Matrix for Interviews ................................................................................................ 50
6. Data Analysis Matrix 1 ............................................................................................................ 51
7. Data Analysis Matrix 2 ............................................................................................................ 52
8. Alignment of Variables with Instrument items ...................................................................... 53
9. Research Questions and Instrument Matrix ........................................................................... 54
B1. Observation Protocol with Professor T ................................................................................ 89
B2. Observation Protocol with Dr. M ........................................................................................... 97
B3. Observation Protocol with Dr. DM ....................................................................................... 104
B4. Observation Protocol with Dr. Y ......................................................................................... 111
B5. Observation Protocol with Dr. T ........................................................................................... 118
CHAPTER I
INTRODUCTION

No Child Left Behind Act (NCLB) of 2001 initiated every educational program to include an accountability component (The White House, 2014), (U.S. Department of Education, 2014) for data collection and reporting. The National Center for Education Statistics (NCES) is responsible for working with other components of the U.S. Department of Education (U.S. Department of Education, 2010) and with state and local educational institutions to improve the quality of education data (Sagebrush Corporation, 2004). NCES has a grant program that provides funding to states for the development of high-quality longitudinal student information systems needed to compute program outcomes. At the postsecondary level, NCES has provided an integrated computerized postsecondary education data system (IPEDS) that can show comparative graduation statistics across states and universities disaggregated by ethnicity, gender, duration of programs, and other variables.

The education community has witnessed an increased interest in data-driven decision making (Marsh, Pane, & Hamilton, 2006). It is popular among educators from the central office, to the school, to the classroom. Data-driven decision making involves teachers, principals, and administrators systematically collecting, analyzing and interpreting various types of data, including input, process, and outcome data, to guide a
range of decisions that could help improve the success of students and schools. In particular, achievement test data play a prominent role in federal and state accountability policies. Implicit in these policies is the belief that data are important sources of information to guide improvement at all levels of the education system and to hold individuals and groups accountable. New state and local test results are adding to the data on student performance that teachers regularly collect through classroom assessments, observations, and assignments.

In the absence of a formal data analysis system, districts often fail to uncover and address critical issues that occur at the school level. This puts them at risk for missing important opportunities to improve student achievement and attain greater operational efficiencies. Generating reports from a multitude of data sources without an integrated analysis tool also can be costly for school districts. The costs to maintain all the different data sources can be high and it usually requires extra staff and resources to support all the sources. The assessment results must be reported in aggregated form as well as disaggregated form. Disaggregation by subgroups of students, such as by ethnicity, socio-economic status (SES), or disability is crucial in order to target appropriate instructional practices to improve student achievement in weaker subgroups.

The benefits of an integrated computerized data system (U.S. Department of Education, 2005) are as follows:

- It helps to narrow the achievement gap.
- It helps to improve teacher quality by providing feedback to teacher preparation programs (National Comprehensive Center for Teacher Quality, 2012), (NCATE,
(2015) as well as by targeting appropriate professional development to teachers based on their needs.

- It improves curriculum development by helping administrators to design and plan the curriculum to meet the goals set by state standards.
- It helps to share best practices. Success in problem areas can become a part of the lessons learned. Continued failure in a program may indicate that it is inappropriate in the curriculum, or that pre-requisite courses are required, or that program delivery has serious problems.

Program evaluation is the systematic method of collecting, analyzing, and using information to answer questions about projects, policies and programs, particularly about their effectiveness and efficiency. Stakeholders often want to know whether the programs they are funding or supporting are achieving the intended goals. Important considerations in program evaluation include how the program could be improved, whether the program is worthwhile, whether there are better alternatives, whether there are unintended outcomes, whether funding allows the program to be sustainable and whether program improvements are sustainable, whether there are gaps that need to be addressed, and whether the program goals are appropriate and useful. Program evaluation implemented as a collaborative project between evaluators and stakeholders would be more successful in achieving its goals.

Assessment is a critical component of program improvement. Evaluation uses information based on the evidence generated through assessment to make judgments about the program. The results of program assessment help to inform policy and to ensure
fiscally responsible decision making and accountability (GaPSC, 2014), (GaPSC, 2015). Almost all programs report conducting evaluations, but in reality the availability of empirical data, along with appropriate use and reporting of data, are major problems for programs.

There are many approaches to making decisions and solving problems. A critical initial step is to identify the problem, isolate its probable causes, and fully understand the context where the problem occurs. In all cases that involve problem-solving, it is necessary to collect and analyze the relevant data that can assist to specify and understand the problem. When strategic education leaders compile, evaluate, and utilize school and community data, they contribute significantly to problem-solving within school communities (Guthrie & Schuermann, 2010). Some problems present themselves clearly, while others are not explicit. Data related to the problem need to be carefully analyzed in order to understand the problem and its underlying phenomena.

The systematic collection, analysis, and utilization of data can promote organizational learning. Organizational learning is expected to promote organizational resilience and organizational development. Organizational resilience builds adaptive capacity to respond to changes in the environment. Data can provide educational leaders continuous feedback regarding mechanisms that are critical to individual and collective learning for both students and faculty in the educational organization. Data are also required in order to verify whether the organization/institution meets accountability requirements that are specified by benchmarks and standards at the state level and at the national level.
Leadership is concerned with improving the effectiveness, efficiency, accountability, and performance of educational programs. The continuity of programs, sustainability and financial support for programs depend on demonstrating the evidence that they are effective and efficient, that they meet their objectives, and that they contribute to the mission and the vision of the educational institution. Leadership has to employ all means at its disposal in order to collect such evidence. A data management system provides comprehensive data and data analysis that can be utilized as evidence by the leadership to accomplish its goals.

The systems that are installed and utilized by the university (located in southeast USA) in this study are described briefly as follows:

- **Banner**: Banner integration technologies platform (Ellucian, 2015) improves information services for students, faculty, administrators, and other constituents. It provides data services for grading purposes, attendance, and other faculty requirements. It does not support course-level rubric assessments. It provides limited data analysis for grading purposes.

- **Canvas**: Canvas is a Learning Management System (LMS). It allows faculty and students to deliver course materials, submit assignments and tests, view grades, and create learning activities (Instructure, 2015). The Speedgrader tool allows two-way communication between students and faculty. It does not support course-level rubric assessments. It provides limited data analysis for grading purposes.
• Microsoft Windows SharePoint®: SharePoint is a web application framework and platform developed by Microsoft (Microsoft, 2015). SharePoint integrates Intranet, content management and document management, and includes a database. It includes data analysis that is provided in Microsoft Excel. It integrates with all Microsoft Office tools.

• TracDat®: TracDat (Nuventive, 2015) is planning and outcomes assessment software that provides a flexible framework to help institutions organize, align, document, report, and take effective actions that improve performance. It provides only program-level assessment. It does not provide assessments at the granularity of course-level. It does not support course-level rubric assessments. It provides limited data analysis.

• Taskstream®: Taskstream (Taskstream, 2015) provides a central online system to manage the institution’s assessment, accreditation, and e-portfolio activities. It includes a LMS. It is a recognized platform for uploading the teacher candidate’s authentic teaching materials for Teacher Performance Assessments (edTPA) by the state. It supports only limited course-level assessments. It provides limited data analysis.

The express need for a data management system in the Department of Curriculum and Instruction became evident to the researcher as the researcher worked in the department for two semesters during internship as part of the researcher’s doctoral program in Educational Leadership. The researcher was made aware of this need through discussions with the director of assessment at that time and the administrative leaders in
the School of Education (SOE). The internship involved examining student performance rubrics assessment data in practicum courses, internships, pre-service teaching, and other undergraduate courses. All data were recorded on paper forms and needed to be converted to electronic format for analysis. Under the advisement of the director of assessment, the researcher initially entered the data in Excel spreadsheets. But Excel has limited data analysis capabilities. Administrative leaders in the School of Education also indicated the need for integrating data in different formats that are stored in Banner, Canvas, Windows SharePoint, TracDat, and Taskstream. With the researcher’s academic background in Computer Science, the researcher found that the logical solution to these multiple needs that were expressed was to build a comprehensive data management system that would fulfill these requirements. As indicated in earlier paragraphs, Banner, Canvas, Windows SharePoint, TracDat, and Taskstream are not data management systems. Each of the vendors of these systems has its own file format to store data. These file formats are not interoperable and are not compatible. The data need to be extracted from each vendor’s format and converted to a common file format in order to integrate all the data. Integrated data provides integrated evidence (CAEP, 2015). The researcher presented the idea of building the data management system to the program advisor and the faculty in the Department of Educational Leadership. The program advisor and the faculty in the Department of Educational Leadership agreed that the researcher could build such a system on a pilot basis for dissertation. The pilot system would be implemented on a standalone machine, such as a laptop.
Data analysis for program accreditation involves evaluations of correlations of GACE® and GRE® scores for undergraduate and graduate students respectively with course grades. Likewise, scores on the program comprehensive exams are correlated with course grades. Predictability of the performance of students in the field needs to be evaluated based on performance in the various courses and historical data. Student perception of the program is evaluated as well in order to generate descriptive statistics. Regression can highlight factors that impact student performance and achievement. Systems that are already installed, such as Banner, Canvas, Windows SharePoint, TracDat, and Taskstream do not perform these data analyses as required for accreditation. These data analyses and the metrics evaluated are also emphasized by the Council for the Accreditation of Educator Preparation (CAEP), Georgia Professional Standards Commission (GaPSC), National Association for the Education of Young Children (NAEYC), Council for Exceptional Children (CEC), and other organizations that promulgate Specialized Professional Associations’ (SPA) Standards (NCATE, 2015).

According to CAEP (2015), good evidence has the following characteristics:

- It is intentional and purposeful.
- It entails interpretation and reflection.
- It is integrated and holistic.
- It can be both quantitative and qualitative.
- It can be either direct or indirect.
The data management system built in this study is web-based and platform independent. It can run on Microsoft Windows®, Mac®, Linux®, and any other platform. It is accessible by all web-browsers, such as Microsoft Internet Explorer®, Mozilla Firefox®, Google Chrome®, and so on. It leverages the power of Java® at the front-end and combines the reliability and stability of Oracle® as the back-end database. Oracle can evaluate all the correlations and statistics mentioned earlier for accreditation purposes. Oracle’s Data Miner® tool provides powerful data mining and analysis capabilities as it utilizes a variety of machine learning algorithms, such as Naïve Bayes Classifier, Association Analysis, and so on. Oracle Data Mining (ODM) embeds data mining within the Oracle database (Oracle, 2015). ODM algorithms operate natively on relational tables or views, thus eliminating the need to extract and transfer data into standalone tools or specialized analytic servers. ODM’s integrated architecture results in a simpler, more reliable, and more efficient data management and analysis environment. Data analysts can mine the data in the database, build models and methodologies, and analyze the results.

Oracle Data Mining supports the following data mining functions:

- Supervised data mining:
  - Classification: Grouping items into discrete classes and predicting which class an item belongs to.
  - Regression: Approximating and forecasting continuous values.
  - Attribute Importance: Identifying the attributes that are most important in predicting results.
o Anomaly Detection: Identifying items that do not satisfy the characteristics of ‘normal’ data (outliers).

- Unsupervised data mining:
  o Clustering: Finding natural groupings in the data.
  o Association models: Analyzing associations among items or ‘market baskets analysis’.
  o Feature extraction: Creating new derived attributes (features) as a combination of the original attributes.

The system that has been built can be evaluated for effectiveness by analyzing the strength and usability of the data analysis results that are generated. The system would be a reliable environment to store longitudinal data, perform analysis on the data, and generate reports. Reports can be customized to meet the needs and demands set by the State, which change frequently.

This chapter explains briefly the purpose of this study, the statement of the problem and its significance. Some research questions that are relevant to the study are also formulated.

**Purpose of the Study**

The purpose of this study is to understand and assess the usability and actionability of the data management system (ECAR, 2009) built in this project. This experimental study has been conducted in Spring 2016. Usability is measured by the utility of the system in order to assist faculty and administrators in the task of managing and analyzing longitudinal data. Actionability of the system is measured by the influence
of the system and its analysis results in decision-making, planning, modifying or improving the curriculum or course syllabi. The quality of data analysis is measured by its influence on curriculum development, and its positive impact on the field experience component of the program. Data related to outcomes and course-level rubric assessments need to be analyzed more efficiently. The Department of Curriculum and Instruction has been using the traditional paper and pencil document system to record student data. It will be possible to perform better aggregate data analysis or longitudinal data analysis with the proposed system. More metrics can be calculated in shorter time with the proposed system. A comprehensive computerized data management system is required to store and analyze the data.

**Statement of the Problem**

In every educational institution, it is necessary to frequently evaluate the effectiveness of the various educational programs. Outcomes provide a reliable measure of program effectiveness. The Department of Curriculum and Instruction has been using the traditional paper and pencil document system to record student data. It will be possible to perform better aggregate data analysis or longitudinal data analysis on outcome data and rubric assessment data with the proposed system. More metrics can be calculated in shorter time. A comprehensive computerized data management system is required to store and analyze the data.
Significance of the Study

The present demand for accountability has created an urgent need for data analysis of student performance data and program data in educational programs. All postsecondary institutions employ some method or system for data management. The institution in this study has installed some software tools and systems for learning management and assessment that were discussed earlier in this chapter. But these tools have limited data analysis capabilities. The system proposed in this project is intended to address this gap in data management and data analysis. The system also provides a central repository of data which can save time for data access and reporting.

This system can help to assess deficiencies in the skills of teacher candidates. For example, some candidates may have weak classroom management skills that are assessed during their P-12 field experience. The data analysis generated by the system would indicate this problem. Consequently, the teacher preparation program can be enhanced to address these specific deficiencies by providing intensive training in classroom management to such candidates.

Leadership is concerned with improving the effectiveness, efficiency, accountability, and performance of educational programs. The continuity of programs, sustainability and financial support for programs depend on demonstrating the evidence that they are effective and efficient, that they meet their objectives, and that they contribute to the mission and the vision of the educational institution. Leadership has to employ all means at its disposal in order to collect such evidence. A data management
system provides comprehensive data and data analysis that can be utilized as evidence by the leadership to accomplish its goals.

**Research Questions**

The following are the research questions posed in this study.

RQ1. Is there a relationship between usability of the data management system and user perception of functionality of the system?

RQ2. Is there a relationship between usability of the data management system and user perception of response time of the system?

RQ3. Is there a relationship between usability of the data management system and training of the user?

RQ4. Is there a relationship between actionability of the data management system and user perception of functionality of the system?

RQ5. Is there a relationship between actionability of the data management system and user perception of response time of the system?

RQ6. Is there a relationship between actionability of the data management system and training of the user?

**Summary**

Data-driven decision making is necessary at all levels of the school system, from administration to the classroom. Data-driven decision making involves teachers, principals, and administrators systematically collecting, analyzing and interpreting various types of data, including input, process, and outcome data, to guide a range of decisions that could help improve the success of students and schools.
In the absence of a formal data analysis system, districts often fail to uncover and address critical issues that occur at the school level. This puts them at risk for missing important opportunities to improve student achievement and attain greater operational efficiencies.

This chapter provided an introduction to the study. The purpose of the study was explained. The motivation for the study and its significance were also explained. The need for a comprehensive, computerized system for data analysis and data management was explained in some detail. The research questions posed in this study were also formulated.
CHAPTER II
REVIEW OF RESEARCH LITERATURE

Assessment is a process of determining the state of the problem or issue. According to ETS (2006), (2007), (2008), assessment provides faculty members, administrators, and other stakeholders with evidence, numerical or otherwise, from which they can develop conclusions about their students, institution, programs, courses, and also about themselves. This information can help them make decisions about student learning and development, professional effectiveness, and program quality. Program evaluation uses information based on the credible evidence generated through assessment to make judgments about the program. Effective assessment is aimed at detecting the achievement of goals, the mission, and the vision. An effective assessment program helps a university's administrators and faculty members understand the outcomes or the results that their efforts produce and the ways in which these efforts impact the outcomes. This chapter reviews the literature which supports the emergent themes and variables in this study.

In the work by Hinze-Pifer and Ramsey (2011), the authors describe the experiences of six districts as they adopted education information systems. They discuss emergent themes based on their cases and explore the implications for policymakers and school leaders. Education information systems can be used to support ongoing
student assessment, especially by facilitating formative and summative assessments. Such assessments can inform teachers about the progress of their class and individual students in meeting learning objectives. Teachers can use education information systems to systematically track student performance, informing their decisions about their classes and individual students. Additionally, teachers indicate that they use education information systems to identify gaps in student learning. Consequently, teachers may be able to adapt lesson plans, adjust the instructional pace, target activities to specific groups of students, or arrange for remediation with individual students. These data can also assist in student placement through the course of their academic career, either in specialized programs or through the normal process of advisement and placement at the middle and high school level. Teachers may also be able to use education information systems to evaluate their own instructional practice. Analyses of class performance may help teachers better understand their own strengths and weaknesses, and request or plan for appropriate professional development activities. Teachers may also evaluate their own instructional practice and identify promising methods to pursue further.

Inadequate training, professional development, or support systems can hinder the use of education information systems. The central research question in this study by Hinze-Pifer and Ramsey (2011) is:

*How do the users of currently functioning education information systems perceive the information and features provided by those systems?*
In order to address this central issue, a few of the research questions formulated in the study are as follows:

1) How did school districts train teachers about the system?

2) What features do teachers feel are most useful in the adopted education information system?

3) Are there any they would like to add to the system?

4) What features do teachers not use? Why?

The researchers combined information from the academic literature with studies of six school districts to address the research questions. The team based its conclusions on a review of academic and government publications, interviews of district staff at six districts that have adopted education information systems, and surveys of teachers at two of those districts regarding their use of the systems. The surveys asked teachers questions about their background, the training and support they received in using the system, their opinions of the usability of the system, and their usage patterns.

Survey results indicated two factors that discouraged teacher use of the system in the districts studied: time constraints and inadequate training. Teachers reported that school leaders strongly encouraged the use of data, but often did not follow through with the time, training, or administrative support. Many survey respondents also reported that their use was limited because the systems were difficult to navigate or time consuming to use.

The emergent themes in the paper by Hinze-Pifer and Ramsey (2011) are training of the user to use the education information system, user perception of functionality and
features of the system, user perception of response time of the system, and ease of use. These factors impact the usability of the system as well as its actionability (the ability to use the system results to impact action and decisions).

In the paper by Mandinach, Honey, Light, Heinze, and Rivas (2005), the authors describe their project that has two goals: (a) to build a knowledge base about how schools use data and technology tools to make informed decisions about instruction and assessment; and (b) to develop an evaluation framework to examine the complexities of dynamic phenomena that will inform the field and serve as a knowledge building enterprise. The purpose of this work is to examine technology-based, data-driven instructional decision-making tools, their implementation, and impact on different levels of school systems (administrative and classroom). The project focuses on three tools – a test reporting system, data warehouses, and diagnostic assessments delivered via handhelds. In the study, the district understands that administrators and teachers need support not only in accessing, but also in interpreting information in order to make informed decisions regarding their students (actionability).

Research was conducted through interviews with administrators across all levels of the school districts and through interviews and focus groups with teachers and students. Additionally, surveys were given to teachers and administrators.

The structural functionality framework developed in this study by Mandinach and others (2005) identifies six characteristics of technology-based tools that influence how they are used and by whom. The first characteristic is accessibility. Accessibility deals with how accessible the tools are, and how the tools support access to the data or
information. The second characteristic is the length of the feedback loop. Feedback focuses on how much time elapses between the time the data are generated and when results are reported to the end-user. The third characteristic is comprehensibility. It deals with how understandable the functioning of the tool is; how clear the presentation of the data is; and how easy it is to make reasonable inferences from the information presented. Comprehensibility deals with the understandability of the information generated by the tool or system. The more understandable the information, the more likely the tool will be used. Flexibility is the fourth component. This component focuses on whether there are multiple ways to use the tool and the extent to which the tool allows the user to manipulate the data. The more flexibility the tool possesses, the more useful the tool will be. However, the more options a user has, the more the opportunities for confusion. Alignment is the fifth functionality. It focuses on the extent to which the data align with what is happening in the classroom, the alignment with the standards, and to the curriculum. The final component is the link to instruction. It focuses on how the tool bridges information (either physically or conceptually) and practice.

In terms of structural functionality, the handhelds were easily accessible, even with minimal training. Teachers accessed data on the devices. The data could be downloaded online and data mining techniques could be easily applied. In contrast, the interface of the data warehouses was much more difficult to navigate and therefore fewer teachers made effective use of the tool. If the interfaces were more user-friendly, more practitioners could have taken advantage of the wealth of data that resided in the
warehouses. The feedback loop (time factor) was perhaps one of the biggest motivators for or impediments to use.

The paper by Mandinach et al. (2005) indicates that the significant factors in the choice of a data system or tool are ease of use, feedback loop (time elapsed to get response from the system), accessibility, comprehensibility, flexibility, alignment, and link to instruction (actionability). The paper also emphasizes that training of the user is necessary to ease the usage and adoption of the system.

States employ longitudinal data systems to assist with evaluation and assessment of programs. For example, in Georgia, the Statewide Longitudinal Data System (SLDS) (Georgia Department of Education, 2015) is utilized by districts, schools, and teachers to make informed, data-driven decisions that improve student learning. SLDS is an application that is accessed through a link in the district’s Student Information System (SIS). It provides districts, schools, and teachers with access to historical data, including assessments, attendance, enrollment, courses, and grades beginning with the 2006-2007 school year.

Georgia's SLDS helps educators:

- Make more informed, data-driven decisions designed to improve student learning.
- Identify students’ academic strengths and weaknesses.
- Increase student achievement and reduce achievement gaps.
- Identify and address potential recurring impediments to student learning, such as, problems with attendance or difficulty in mastering prerequisite knowledge or skills, before they negatively affect student success.
Quickly create targeted differentiation groups and cohorts.

For higher education assessments, Georgia uses the statewide longitudinal data system called GA AWARDS (Georgia's Academic and Workforce Analysis and Research Data System). This data system (Governor's Office of Student Achievement, 2015) has been made available to researchers with high-levels of analytical skills and research training. These researchers can mine the data and answer critical educational policy and evaluation questions.

Key research topics and advocacy areas include:

(1) Effectiveness of educator preparation programs.

(2) Effectiveness of strategies and interventions implemented within the State’s RT3 (Race to the Top) proposal.

(3) Educational background of students who experience the least difficulty in transitioning to college.

The RT3 SLDS is created by combining data sets from each of the following seven state educational agencies and the Department of Labor:

- Bright from the Start: Department of Early Care & Learning – DECAL
- Department of Education – GaDOE
- Georgia Student Finance Commission – GSFC
- Governor’s Office of Student Achievement – GOSA
- Georgia Professional Standards Commission – GaPSC
- Technical College System of Georgia – TCSG
- University System of Georgia – USG
This RT3 SLDS is managed by the Governor’s Office of Student Achievement (GOSA) and the Alliance of Education Agency Heads Data Management Committee. The Data Management Committee provides input and oversight of the activities of the SLDS. A key area of oversight is access to this data system. Presently, only researchers from the listed agencies are allowed access to the system.

In addition to GOSA and the Data Management Committee, the SLDS is supported by data, tools, and research persons at each of the participating agencies. The GOSA personnel are responsible for building the SLDS data environment and the education agency personnel are responsible for providing the input data.

The Council for Accreditation of Educator Programs (CAEP) and the Southern Association of Colleges and Schools (SACS) also emphasize the need for usable and actionable data systems (Teacher Preparation Analytics, 2014), (Council of Regional Accrediting Commissions, 2004) that provide the functionality necessary to assess, evaluate, and correlate student outcome data, student persistence data, program effectiveness data, and employment data of program completers.

Good assessment measures should provide programs with specific guidance for action (actionability) and program improvement (CAEP, 2015), (Council of Regional Accrediting Commissions, 2004). Many promising measures fail because they are too expensive, too complex, too time consuming, or too politically costly to implement. The intent of the evidence data presented should be clear and the evidence should directly suggest program improvements.
Actionability also depends on the evidence having clear standards of comparison. Without clear standards of comparison, the interpretation of any measure is subject to considerable doubt. Measures can be compared across programs, against peers, against established ‘best practices’, against established goals, against national or state norms, or over time. For every measure, an appropriate CAEP benchmark can be found against which a given program’s performance can be judged. This principle also suggests that it should be possible for any measure to be disaggregated to reveal underlying patterns of strength and weakness or to uncover populations who could be served more effectively. Finally, the measures provided should be reflectively analyzed and interpreted to reveal specific implications for the program.

Institutional effectiveness (Council of Regional Accrediting Commissions, 2004) includes institutional processes for evaluating educational effectiveness. Evaluation and assessment data are crucial to trigger departmental and institutional change.

System features is a theme that is supported in literature (Hinze-Pifer & Ramsey, 2011), (Tun, Trew, Jackson, Laney, & Nuseibeh, 2009), (Classen, Heymans, & Schobbens, 2008). These are the design features of the system that implement the functionality of the system. The user’s perception of the functionality of the system is influenced by the system features that are available to the user.

The response time of the system is supported as a theme in literature (Hinze-Pifer & Ramsey, 2011), (Mandinach et al., 2005), (Nielson, 2015), (Business Dictionary, 2015). It is the time taken by the system to issue the first response to a user input. The
user’s perception of response time of the system is influenced by the time that the system takes to issue its first response to user input.

Training of the user is supported as a theme in literature (Hinze-Pifer & Ramsey, 2011), (Mandinach et al., 2005), (Kowalski & Lasley, 2009). It refers to the formal training given to the users of the system.

Usability is described as the extent to which the system satisfies stated user needs when used under stated conditions. It is supported in literature (Hinze-Pifer & Ramsey, 2011), (Mandinach et al., 2005), (Teacher Preparation Analytics, 2014), (Bevan, 1995), (CAEP, 2015), (Bevan & Curson, 1997).

Actionability indicates the influence of the results of data analysis from the system in making decisions, planning, or modifying curriculum and instruction practices. It is supported in literature (Hinze-Pifer & Ramsey, 2011), (Mandinach et al., 2005), (Teacher Preparation Analytics, 2014), (CAEP, 2015), (Council of Regional Accrediting Commissions, 2004), (Bevan, 1995), (Kowalski & Lasley, 2009).

**Summary**

This chapter reviewed literature related to earlier work in the area of education information systems. In the work by Hinze-Pifer and Ramsey, the authors describe the experiences of six districts as they adopted education information systems. They discuss emergent themes based on their cases and explore the implications for policymakers and school leaders. In the paper by Mandinach and others, the authors describe their project that has two goals: (a) to build a knowledge base about how schools use data and technology tools to make informed decisions about instruction and assessment; and (b) to
develop an evaluation framework to examine the complexities of dynamic phenomena that will inform the field and serve as a knowledge building enterprise. The purpose of their work is to examine technology-based, data-driven instructional decision-making tools, their implementation, and impact on different levels of school systems (i.e., administrative and classroom). Usability and actionability of data systems in higher education are also emphasized by the CAEP and SACS.

This chapter gave a brief description of the variables in this study. The literature supporting these variables was reviewed and cited.
CHAPTER III
THEORETICAL FRAMEWORK

The theoretical framework used in this research is described in this chapter. The dependent and independent variables are defined. Some limitations of this study are also enumerated.

**Theoretical Framework Description**

The adaptation of an organization or an institution to environmental changes has been an important concern for leadership and management. In the absence of an appropriate response, changes in the contextual forces surrounding an organization may cause the organization to lose a cost advantage in its operating process, or an important customer segment, and if ignored for too long, can even threaten the survival of the organization. The organization or educational institution should seek, retain, and promote a unique and sustainable advantage among its competitors through achievement, innovation, and change.

The systematic collection, analysis, and utilization of data can promote organizational learning. Organizational learning is expected to promote organizational
resilience and organizational development. Organizational resilience builds adaptive capacity to respond to changes in the environment. Data can provide educational leaders continuous feedback regarding mechanisms that are critical to individual and collective learning for both students and faculty in the educational organization. Data are also required in order to verify whether the organization/institution meets accountability requirements that are specified by benchmarks and standards at the state level and at the national level. An effective data management system provides continuous feedback on student performance and program performance to the leadership and administration. Improvement in performance is necessitated by accountability and accreditation requirements.

Change theories describe how change can be successfully implemented in organizations and institutions. Three theories are described in this section. They are Kurt Lewin’s three-step change strategy (Unfreeze-Moving-Freeze), Runkel and Schmuck’s research theory on organizational development, and Steinhoff and Owens socio-technical model of organizational change.

According to Lewin (as cited in Owens, 1987), the first step in implementing process change is to unfreeze the existing situation or status quo. The status quo is considered the equilibrium state. Unfreezing is necessary to overcome the strains of individual resistance and group conformity. This can be achieved by motivating staff/participants to welcome change, preparing them for change through staff development and training, building trust and identifying the need to change, and actively inviting their participation in recognizing the urgent need for adopting change. When this
step is successful, the change can be introduced to move the organization to a new level (the moving step). Educational administrators are aware that the change can be temporary and the organization can slip back into its old process routine. Therefore, the third step in the change process is refreezing. This is an institutionalizing process that serves to protect and insure the long-term retention of the change. As the change is adopted by more departments, it gains widespread acceptance. In order to successfully institutionalize the change, a path of least resistance should be followed, whereby change is first implemented in those departments of the organization that are more receptive to the change. Successful implementation in such departments would set an example and set the tone for the rest of the organization to follow.

Runkel and Schmuck (as cited in Owens, 1987) at the Center for Educational Policy and Management (CEPM) at the University of Oregon conducted comprehensive research and development work in the area of organizational change and organizational development. Their findings are summarized as follows.

- Success is more likely when the staff sense a readiness to change and welcome it.
- A skilled and experienced trainer/consultant should guide the change process.
- Open, active support from administrators is critical to success.
- Success is more likely when staff is in substantial agreement on goals.
- After institutionalizing the change, there should be sufficient support to maintain, retain, and sustain the change for the long term.

The four subsystems of people, technology, structure, and task provide a socio-technical model (Steinhoff & Owens, 1989) for understanding the essential elements of
schools as organizations. Schools can be managed by understanding their organizational culture. Effective schools focus on a task-oriented organizational culture that meaningfully involves all participants in the key elements of the decision-making process. It is by the creative management of these four interactive sub-systems that organizational change is accomplished. A change in one subsystem will affect all other subsystems.

In the socio-technical view of organizational change, the effective educational organization or institution relies on the use of appropriate technology and data systems in order to achieve its goals and improve its performance. When a new data system is introduced, adjustments must be made with regard to the expectations of the effectiveness of the use of the system to meet accountability requirements (people subsystem), administrator and program performance (task subsystem), and the work flow process (structure subsystem). In order to successfully implement organizational change, all subsystems have to be synchronized to achieve the goals of the change.

Variables

For this study, the variables are defined as follows:

**Dependent Variables**

1. **Usability**: Usability is defined as the extent to which the data management system satisfies stated user needs when used under stated conditions. Usability is measured by the effectiveness, efficiency, and satisfaction with which users can achieve specified goals in specified environments. Usability
also indicates the ease with which a novice user can navigate the system and thereby gets encouraged to reuse the system frequently.

2. **Actionability**: Actionability is defined as the extent to which the data analysis results from the data management system can prompt action to modify and improve curriculum and instruction practices. Actionability indicates the influence of the results of data analysis from the data management system in making decisions or modifying curriculum and instruction practices. A possible action is modification of the course syllabus.

**Independent Variables**

1. **User perception of functionality of the data management system** is the extent to which the user perceives the system features to provide the functionality stated in the requirements of the system. System features of the data management system are those design features of the system that implement the functionality of the system. These include data entry using web forms, data display using table reports, display of the catalogs of rubrics in the programs, display of the partnerships table with the School of Education for field experience, and data analysis using the Oracle Data Miner tool.

2. **User perception of response time of the data management system** is the extent to which the user perceives the time elapsed between user action or user input to the system and the system’s first response to such user action or user input. Response time of the data management system is defined as the time taken by the system to issue the first response to a user input. User inputs
include mouse clicks, button clicks in the graphical user interface, and user entry via the keyboard.

3. **Training of the user of the data management system** is the extent to which the user has been formally trained to use the system and its features in order to be prepared to use the system as part of regular assessment and data management.

**Theoretical Framework Chart**

Figure 1 shows the theoretical framework chart. The dependent variables are usability of the data management system and actionability of the data management system to assist in decision-making. The independent variables are user perception of functionality of the system, user perception of response time of the system, and the training given to the user. Kurt Lewin’s change theory described earlier was found to be the most appropriate while conducting this study.
Limitations of This Study

The limitations of this study are as follows:

1. The pilot is implemented on a stand-alone system, such as a laptop. There may be factors, such as network delays and lag which impact the performance of the system when it is integrated into a network.

2. The performance and state of the server in the network would also impact the performance of the data management system on a network.
3. The sample size of the population used in this study is small and does not allow generalization.

4. This study was conducted within the limited time of one semester. Data collection and analysis were completed within this duration. More data and information relevant to the study could be collected over a longer period of time.

5. Actual data related to program outcomes were not available for access in this study. The researcher used data from an exercise where data were collected using surveys from earlier coursework in order to demonstrate how the system analyzed program outcomes.

**Summary**

This chapter described the theoretical framework used in this study. Change theories describe how change can be successfully implemented in organizations and institutions. Three theories were described in this chapter. They are Kurt Lewin’s three-step change strategy (*Unfreeze-Moving-Freeze*), Runkel and Schmuck’s research theory on organizational development, and Steinhoff and Owens socio-technical model of organizational change.

This project is a mixed methods study with quasi-experimental treatment. It is a single case experimental study. There is no control group. The sample chosen is a convenient sample. The dependent and independent variables in the study were also defined in this chapter.
CHAPTER IV

RESEARCH METHODOLOGY

This chapter describes the framework for the conducted study. The design, setting, and participants in the study are described. The instruments that have been used for data collection as well as the methods of data analysis are described.

**Research Design**

This project is a mixed methods study with quasi-experimental treatment. It is a single case experimental study. There is no control group. The sample chosen is a convenient sample.

There are six different models (Creswell, 2009) in the mixed methods approach to design. These are the sequential explanatory design, sequential exploratory design, sequential transformative design, concurrent triangulation design, concurrent embedded design, and concurrent transformative design. The sequential explanatory design model (used in this project) consists of a first phase of quantitative data collection and analysis followed by qualitative data collection and analysis. The process ends with interpretation of the entire analysis. In sequential exploratory design, the first phase is qualitative data collection and analysis followed by quantitative data collection and analysis. The process ends with interpretation of the entire analysis. Sequential transformative strategy is a two-
phase strategy with a theoretical lens (gender, race, social science theory, and so on) overlaying the sequential procedures. It has an initial phase (qualitative or quantitative) followed by a second phase (quantitative or qualitative) that builds on the earlier phase. In the concurrent triangulation approach, the researcher collects both quantitative and qualitative data concurrently and then compares the two databases to determine if there is convergence, differences, or some combination. In concurrent embedded strategy, both quantitative and qualitative data are collected in one phase. But one method (quantitative or qualitative) is chosen as a primary method that guides the project and the secondary supportive method (qualitative or quantitative) is nested or embedded in the primary method. The concurrent transformative strategy uses a specific theoretical perspective to guide the research. There is concurrent collection of qualitative and quantitative data.

In experimental research (Hoy, 2010) the researcher applies a treatment, introduces changes, notes the effects, and has full control over the design of the study. The independent variables are manipulated and the treatment is applied to the experimental group. Pre and post data before and after the treatment is applied are recorded and analyzed. In this study, the data management system is the treatment that is applied.

Some members of the faculty of the Department of Curriculum and Instruction and one administrator in the School of Education at the institution form the sample. The statistical parameters (Stat Trek, 2015) that are calculated are as shown in Table 1.
Table 1

*Statistical Parameters*

<table>
<thead>
<tr>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample mean $= \bar{X} = \left( \sum X_i \right) / n$</td>
</tr>
<tr>
<td>Sample standard deviation $= s = \sqrt{\left[ \sum \left( X_i - \bar{X} \right)^2 / (n-1) \right]}$</td>
</tr>
<tr>
<td>Sample variance $= s^2 = \sum \left( X_i - \bar{X} \right)^2 / (n-1)$</td>
</tr>
</tbody>
</table>

The express need for a data management system in the Department of Curriculum and Instruction became evident to the researcher as the researcher worked in the department for two semesters during internship as part of the researcher’s doctoral program in Educational Leadership. The researcher was made aware of this need through discussions with the director of assessment at that time and the administrative leaders in the School of Education. The internship involved examining student performance rubrics assessment data in practicum courses, internships, pre-service teaching, and other undergraduate courses. All data were recorded on paper forms and needed to be converted to electronic format for analysis. Under the advisement of the director of assessment, the researcher initially entered the data in Excel spreadsheets. But Excel has limited data analysis capabilities. Administrative leaders in the School of Education also indicated the need for integrating data in different formats that are stored in Banner,
Canvas, Windows SharePoint, TracDat, and Taskstream. The researcher interacted with members of the faculty in the department who expressed their need for such a system and its possible features. With the researcher’s academic background in Computer Science, the researcher found that the logical solution to these multiple needs that were expressed was to build a comprehensive data management system that would fulfill these requirements. As indicated in Chapter 1, existing systems in the university, such as Banner, Canvas, Windows SharePoint, TracDat, and Taskstream are not data management systems. Each of the vendors of these systems has its own file format to store data. These file formats are not interoperable and are not compatible. The data need to be extracted from each vendor’s format and converted to a common file format in order to integrate all the data. Integrated data provides integrated evidence (CAEP, 2015). The researcher presented the idea of building the data management system to the program advisor and the faculty in the Department of Educational Leadership. The program advisor and the faculty in the Department of Educational Leadership agreed that the researcher could build such a system on a pilot basis for dissertation. The pilot system is implemented on a standalone machine, such as a laptop.

**Description of the Setting**

This study has been conducted in the Department of Curriculum and Instruction in the School of Education in a small university in southeast USA. The current enrollment (Fall 2015) indicates 90 undergraduate students (77 students in the Early Childhood Education Program and 13 students in the Educational Studies Program) and 11 graduate students. The faculty is specialized in the areas of Reading and Language Arts, Early
Childhood Education, Educational Psychology, Special Education, Social Studies, Field-based experiences, and Physical Education. The number of years of experience of the faculty at the School of Education range from 5 years to 50 years.

**Sampling**

Some members of the faculty dealing with the undergraduate programs of the Department of Curriculum and Instruction, the chair, and one administrator in the School of Education at the institution form the sample. The size of the sample is 5 people. This includes 3 members of faculty from the undergraduate programs, chair of the Department of Curriculum and Instruction, and 1 administrator from the Dean’s Office. The sample chosen is a convenient sample.

**Working with Human Subjects**

In order to collect data through surveys, observation, and interviews in this study, appropriate procedures and permissions were obtained from the Internal Review Board (IRB) at the institution.

**Instrumentation**

Pre and Post treatment surveys, observation form, and an interview protocol are provided in Appendix A of this dissertation. These instruments have been developed by the researcher. The instruments have been validated by the dissertation committee. The surveys and a part of the observation form use a 6-point Likert Scale (Strongly Agree (5), Agree (4), Uncertain (3), Disagree (2), Strongly Disagree (1), and Not Applicable (0)). The interview is a qualitative interview with open-ended questions. The instruments were distributed to the departmental faculty and to the administrator in order to collect their
responses prior to using the system (Pre Treatment Survey) and also to collect their responses after using the system (Post Treatment Survey). The Observation Form was administered at the time that the user (departmental faculty and administrator) was trained and worked on the data management system. The observation was conducted with each user individually. The researcher was a participant-observer who noted down the observation responses while observing the user being trained to use the system by the researcher. Interviews were conducted with a few members of the faculty and the administrator who participated earlier in responding to the surveys and the observation. The qualitative responses in the interviews strengthen the analysis results from the earlier quantitative data collection.

Training was provided to each user individually. A time log was maintained for the training sessions of each user. Training was provided on a Microsoft® Windows platform which has the data management system installed on it.

**Data Collection Procedures**

Data have been collected using the instruments mentioned in the earlier section: pre and post surveys, observation, and interviews.

**Statistical Applications**

The statistical data analysis has been performed by the researcher by hand or using Microsoft Excel® because the data collected from this sample size could be managed without sophisticated tools.
Summary

This project is a mixed methods study with quasi-experimental treatment. It is a single case experimental study. There is no control group. The sample chosen is a convenient sample.

This chapter explained the research design and statistical data analysis that have been used in this study. The setting and the sample in the study were also described. Instruments developed by the researcher for data collection (pre and post surveys, observation form, and interview protocol) are placed in Appendix A of this dissertation.
CHAPTER V
DATA PRESENTATION AND ANALYSIS

This chapter describes the procedures of data collection, data analysis, and the presentation of the results of this study. The sequential explanatory strategy in the mixed methods approach is characterized by collection and analysis of quantitative data in the first phase of research followed by the collection and analysis of qualitative data in the second phase that builds on the initial quantitative results. This strategy may or may not have a specific theoretical perspective (Creswell, 2009).

Data Collection

In this research, quantitative and qualitative data have been collected concurrently. The data collection was interleaved with quantitative pre-surveys administered first, followed by quantitative and qualitative in-treatment observations. Thereafter, the quantitative post-survey was administered after the treatment was applied. In the final stage of data collection, interviews (qualitative) with the participants were conducted. The treatment in this context is the use of the data management system. All the data were collected in the site where the data management system was developed and deployed on a pilot basis. All instruments pertaining to surveys, observations, and interviews are located in Appendix A.
A mixed methods design approach is used in this project. Four aspects influence the design of procedures for a mixed methods study (Creswell, 2009). They are timing, weighting, mixing, and theorizing.

Timing deals with the timing of quantitative and qualitative data collection, whether it is sequential in phases or concurrent. Weighting refers to the weight or priority given to quantitative or qualitative research in the mixed methods study. The choice of priority is based on the goals of the study, the audience for the study, and the interests of the researcher. The order of quantitative or qualitative research indicates a higher priority given to the first type of research in the study. As quantitative data is collected first and analyzed in the interleaved process in this study, more priority is assigned to it.

Mixing refers to the strategy that is used to mix the data, the research questions, or the method of conducting the study. In the mixed methods approach, the data analysis from the first phase can be connected to the data collection in the second phase. Qualitative data can also be integrated or merged with quantitative data, during concurrent data collection. The researcher could also embed a secondary form of data (possibly qualitative) within a larger primary database that is quantitative. In this study, the quantitative data that is collected and analyzed is supported by the qualitative data that is collected and analyzed.

Theorizing refers to whether a larger theoretical perspective guides the design. This study does not utilize an explicit theoretical perspective. This is in agreement with the sequential explanatory strategy.
Surveys

The pre-survey and the post-survey use a 6-point Likert Scale (Strongly Agree (5), Agree (4), Uncertain (3), Disagree (2), Strongly Disagree (1), and Not Applicable (0)). Sample surveys are located in Appendix A. The pre-survey was administered before the treatment was applied individually to each participant. The post-survey was administered after the treatment was applied individually to each participant.

Observations

The initial part of the observation form consists of quantitative observations made by the researcher as the treatment was applied to each participant individually. It uses a 6-point Likert Scale (Strongly Agree (5), Agree (4), Uncertain (3), Disagree (2), Strongly Disagree (1), and Not Applicable (0)). The second part of the observation consists of qualitative questions that were answered by the researcher through observation as the treatment was applied individually to each participant. The observation protocol containing descriptive notes and reflective notes as well as the observation report have been prepared by the researcher after completing the observation with each participant. These are located in Appendix B. The researcher was a participant-observer in the observation.
Interviews

The researcher conducted face-to-face interviews with each participant in the concluding phase of data collection. The interviews were recorded with permission from the participants. Semi-structured qualitative interviews (Creswell, 2009) were conducted with individual participants. The interview protocol was developed and distributed to the participants prior to the interviews.

The characteristics of semi-structured interviews are as follows.

- The interviewer and respondents engage in a formal interview.

- The interviewer develops and uses an interview protocol. This is a list of open-ended questions and topics that need to be covered during the conversation, usually in a particular order.

- The interviewer follows the protocol, but is able to follow topical trajectories in the conversation that may stray from the guide when he or she feels this is appropriate.

Semi-structured interviews are often preceded by observation and informal interviewing in order to allow the researchers to develop a keen understanding of the issues. Since semi-structured interviews contain open-ended questions and the discussions may diverge from the interview protocol, it is generally best to tape-record the interviews and later transcribe these tapes for analysis. The transcribed interviews from this study are located in Appendix C.
Data Analysis

The process of data analysis involves making sense out of the numeric and text data that were collected during data collection. It involves preparing the data for analysis (Creswell, 2009), representing the data, and making an interpretation of the larger meaning of the data. The quantitative data that were collected through surveys were analyzed first and statistical parameters, such as mean, standard deviation, and variance were calculated as shown in Table 2 (see page 47).

The data analysis of the qualitative data collected in this research is performed in the series of the following steps:

- Organize and prepare the data for analysis. This involves typing up the observation field notes, transcribing interviews, and so on.
- Read through all the data (text). The first step is to get a general sense of the information and to reflect on its overall meaning. The researcher reads and analyzes the notes and text responses of participants many times to understand and interpret the full meaning of what they said.
- Begin detailed analysis with a coding process. Coding is the process of organizing the text material into chunks or segments of text before interpreting the whole text (Creswell, 2009). It involves taking the text data, segmenting the sentences into categories, and labeling each of those categories with a topic label. Each category would contain phrases or segments of sentences that are similar in meaning or bear the same significance to the label.
Abbreviate the topic labels to create unique codes that are associated with each category.

Repeat the process with all the text data collected and verify if new categories emerge.

Group similar categories together to create a shorter list of topic labels and associated codes.

Themes will be identified through the coding process.

In this research, the researcher has hand-coded all the observation reports and transcribed interviews of the participants. The code numbers appear as superscripts attached to the phrases or text segments that represent each category. The coded observation reports and transcribed interviews are located in Appendix B and Appendix C respectively. Table 3 shows the coding matrix for the surveys. Table 4 shows the coding matrix for the observations. Table 5 shows the coding matrix for the interviews. Table 6 shows the emergent themes that were identified through the coding process. They are listed as follows:

1. User perception of Functionality of the data management system
2. User perception of Response Time of the data management system
3. Training of the user of the data management system
4. Usability
5. Actionability
Table 2

Calculated Statistical Parameters

<table>
<thead>
<tr>
<th>Variable</th>
<th>Likert Scale Range: 5 (Strongly Agree) to 0 (Not Applicable)</th>
<th>Surveys</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Items or Questions</td>
<td>Mean</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>User perception of Functionality of the system</td>
<td>10</td>
<td>46 (Range: 0-50)</td>
<td>4.082</td>
</tr>
<tr>
<td>User perception of Response Time of the system</td>
<td>3</td>
<td>11.25 (Range: 0-15)</td>
<td>1.5</td>
</tr>
<tr>
<td>Training of the user</td>
<td>3</td>
<td>14 (Range: 0-15)</td>
<td>1.414</td>
</tr>
<tr>
<td>Usability</td>
<td>3</td>
<td>13 (Range: 0-15)</td>
<td>1.414</td>
</tr>
<tr>
<td>Actionability</td>
<td>2</td>
<td>9.5 (Range: 0-10)</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7 lists the questions or items in each of the instruments that address the first three themes listed earlier (the independent variables). Table 8 indicates the alignment of variables with instrument items. Table 9 indicates how the research questions are addressed by each instrument.
### Table 3

**Coding Matrix for Surveys**

<table>
<thead>
<tr>
<th>Code Number</th>
<th>Words</th>
<th>Frequency in Document</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dr.M</td>
</tr>
<tr>
<td>Code:S1</td>
<td>Reports, Forms, Catalogs of rubrics, Spreadsheet of partnerships, enter data, data analysis, features, functionality</td>
<td>15</td>
</tr>
<tr>
<td>Code:S2</td>
<td>Time, response time</td>
<td>2</td>
</tr>
<tr>
<td>Code:S3</td>
<td>Training</td>
<td>4</td>
</tr>
<tr>
<td>Code:S4</td>
<td>Use, useful</td>
<td>12</td>
</tr>
<tr>
<td>Code:S5</td>
<td>Improving curriculum and instruction practices, addressing gaps, identify weaknesses and gaps</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 4

*Coding Matrix for Observations*

<table>
<thead>
<tr>
<th>Code Number</th>
<th>Words</th>
<th>Frequency in Document</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dr.M</td>
<td>Dr.Y</td>
</tr>
<tr>
<td>Code:O1</td>
<td>Reports, Forms, Catalogs of rubrics, Spreadsheet of partnerships, enter data, data entry, data analysis, mining, features, functionality</td>
<td>35</td>
</tr>
<tr>
<td>Code:O2</td>
<td>Time, response time, undue delays</td>
<td>3</td>
</tr>
<tr>
<td>Code:O3</td>
<td>Training</td>
<td>12</td>
</tr>
<tr>
<td>Code:O4</td>
<td>Use, useful, usable, usability, used and adopted, user-friendly, easy to use</td>
<td>7</td>
</tr>
<tr>
<td>Code:O5</td>
<td>Planning, decision-making, practice, actionable, action, discovering weaknesses and gaps</td>
<td>6</td>
</tr>
</tbody>
</table>
Table 5

Coding Matrix for Interviews

<table>
<thead>
<tr>
<th>Code Number</th>
<th>Words</th>
<th>Dr.M</th>
<th>Dr.Y</th>
<th>Prof.T</th>
<th>Dr.DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code:I1</td>
<td>Reports, Forms, Catalogs of rubrics, Spreadsheet of partnerships, enter data, data entry, data analysis, mining, features, functionality</td>
<td>26</td>
<td>32</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>Code:I2</td>
<td>Time, response time, undue delays</td>
<td>4</td>
<td>4</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Code:I3</td>
<td>Training</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Code:I4</td>
<td>Use, useful, usable, usability, used and adopted, user-friendly, easy to use, help in work</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Code:I5</td>
<td>Planning, decision-making, actionable, action, discovering weaknesses and gaps, identify weaknesses and strengths, improvement for the student, improvement for the program, improve student performance, modify the curriculum, improving curriculum and instruction practices, focus resources and effort</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>12</td>
</tr>
</tbody>
</table>
### Data Analysis Matrix 1

<table>
<thead>
<tr>
<th>Emergent Themes</th>
<th>Data Collection Methods</th>
<th>Associated Data Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surveys</td>
<td>Observations</td>
</tr>
<tr>
<td>User perception of functionality of the system</td>
<td>S1</td>
<td>O1</td>
</tr>
<tr>
<td>User perception of response time of the system</td>
<td>S2</td>
<td>O2</td>
</tr>
<tr>
<td>Training of the user</td>
<td>S3</td>
<td>O3</td>
</tr>
<tr>
<td>Usability</td>
<td>S4</td>
<td>O4</td>
</tr>
<tr>
<td>Actionability</td>
<td>S5</td>
<td>O5</td>
</tr>
</tbody>
</table>
Table 7

*Data Analysis Matrix 2*

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Surveys</th>
<th>Observations</th>
<th>Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Quantitative</td>
<td>Qualitative</td>
</tr>
<tr>
<td>User perception of Functionality of the system</td>
<td>Pre-Survey: Q2, Q3, Q4, Q5, Q6, Q10, Q10</td>
<td>Q1, Q2, Q3, Q4, Q5</td>
<td>Q6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-Survey: Q3, Q4, Q5, Q6</td>
<td></td>
</tr>
<tr>
<td>User perception of Response Time of the system</td>
<td>Pre-Survey: Q7, Q8</td>
<td>Q6</td>
<td>Q7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-Survey: Q7</td>
<td></td>
</tr>
<tr>
<td>Training of the user</td>
<td>Pre-Survey: Q9</td>
<td>Q7</td>
<td>Q1, Q2, Q3, Q4, Q5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-Survey: Q8, Q9</td>
<td>Q4, Q5</td>
</tr>
</tbody>
</table>
Table 8

*Alignment of Variables with Instrument items*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Survey</td>
</tr>
<tr>
<td>User perception of Functionality of the system</td>
<td>Q2,Q3,Q4, Q5,Q6,Q10</td>
</tr>
<tr>
<td>User perception of Response Time of the system</td>
<td>Q7,Q8</td>
</tr>
<tr>
<td>Training of the user</td>
<td>Q9</td>
</tr>
<tr>
<td>Usability</td>
<td>Q11</td>
</tr>
<tr>
<td>Actionability</td>
<td>Q12</td>
</tr>
</tbody>
</table>
### Table 9

**Research Questions and Instrument Matrix**

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Research Questions</th>
<th>Instruments/Data Collection methods and Question Numbers</th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1               | Is there a relationship between usability of the data management system and user perception of functionality of the system? | Pre-Survey: Q2, Q3, Q4, Q5, Q6, Q10, Q11  
Post-Survey: Q1, Q2, Q3, Q4, Q5, Q6  | Q1, Q2, Q3, Q4, Q5, Q10  | Q1, Q2, Q3, Q6 |
| 2               | Is there a relationship between usability of the data management system and user perception of response time of the system? | Pre-Survey: Q7, Q8, Q11  
Post-Survey: Q1, Q2, Q7  | Q6, Q8, Q10  | Q1, Q2, Q3, Q7 |
| 3               | Is there a relationship between usability of the data management system and training of the user? | Pre-Survey: Q9, Q11  
Post-Survey: Q1, Q2, Q8, Q9  | Q7, Q8, Q10  | Q1, Q2, Q3, Q4, Q5 |
| 4               | Is there a relationship between actionability of the data management system and user perception of functionality of the system? | Pre-Survey: Q2, Q3, Q4, Q5, Q6, Q10, Q12  
Post-Survey: Q3, Q4, Q5, Q6, Q10  | Q1, Q2, Q3, Q4, Q5, Q9  | Q6, Q8 |
| 5               | Is there a relationship between actionability of the data management system and user perception of response time of the system? | Pre-Survey: Q7, Q8, Q12  
Post-Survey: Q7, Q10  | Q6, Q9  | Q7, Q8 |
| 6               | Is there a relationship between actionability of the data management system and training of the user? | Pre-Survey: Q9, Q12  
Post-Survey: Q8, Q9, Q10  | Q7, Q9  | Q4, Q5, Q8 |
Summary of Interviews

Some quotes from the interviews (reports located in Appendix C) that were conducted in this study are given below. The quotes emphasize the themes in the study.

Theme: User perception of Functionality of the data management system

Dr. DM: “Well, the web forms and reports are highly functional. The catalogs of rubrics and the spreadsheet of partnerships exceed my expectations. … You are able to analyze data particularly with Oracle and the Data Miner. Those tools I am particularly interested in.”

Theme: User perception of Response Time of the data management system

Professor T: “Yes, the response time was reasonable. Maybe because I was learning as I was using the system, the response time was reasonable. There were no undue delays. … Right now, the response time is fine.”

Dr. DM: “Yes, the response time was reasonable. There were no delays. It was delightful to see the system transition from one module (program) to another. I was pleased with the response time.”

Theme: Training of the user of the data management system

Dr. DM: “… Pretty much the same training [is needed] but more in-depth training.”

Dr. M: “I think the more you use it [the data management system], the better you get at it. The same training will be good but more of the training.”
**Theme: Usability**

Dr. DM: “I found the data management system to be quite useful. I enjoyed seeing the 21st century tools and technology that is electronically available for assessment, especially the web forms.”

Dr. Y: “I was thinking about accreditation that is coming up in 2 to 3 years. What this would help us do is to systematize all the program data. The accrediting process has changed. Everything is now submitted electronically. This system would be consistent with what CAEP is asking for.”

**Theme: Actionability**

Professor T states:

> I think certainly in making course and program decisions, all aspects of the data mining module will be helpful. It let me look at and consider some connections that I hadn’t thought about before. It gives me the opportunity to explore the data of individual students, groups of students, their performance, and to compare the groups. It helps to see how these assessments fit into overall program assessments and evaluation. I was quite impressed with the overall picture. … I will be able to share the potential of this system with my colleagues in Math and Chemistry because they don’t have the same perspective on student assessment that we have. I know that I can share what I learnt with this system to assist them with preparation for their PSc accreditation.”
The responses from the interviews indicate that in order for the data management system to be adopted and used by the department, adequate training has to be provided to the faculty and staff. All of the interviewees stated that more training was needed. The features and functionality of the system should meet the expectations of the users in order for the system to be usable in their work. The system should also provide response to user inputs within a reasonable time. Delayed responses will reduce the usability of the system.

In order for the data analysis results to be actionable, the system should have the requisite features and functionality to perform analysis, calculate the required metrics, generate the required graphical plots, and thereby assist the user to plan, to make decisions, and to take action to improve student performance or modify curriculum and instruction practices. Further, the response time of the system also impacts its actionability. Adequate training of sufficient duration should be provided to the users in order for them to master the techniques of data analysis and mining provided by the system. This would enhance the actionability of the system.

**Data Analysis Results**

Referring to Table 2 shown earlier in page 47, the mean, standard deviation, and variance indicate values that represent a positive user perception among the participants regarding the functionality of the data management system, its response time, and the training given to the user in order to use the system. The values of these metrics for the dependent variables usability and actionability also indicate that the participants found
the system to be highly usable, and the data analysis results generated by the system also to be highly actionable.

The results of this research study indicate that the features and functionality of the system should meet the expectations of the users in order for the system to be usable in their work. In order for the data management system to be adopted and used by the department, adequate training has to be provided to the faculty and staff. The system should also provide response to user inputs within a reasonable time. Delayed responses would impact the usability of the system.

The system should have the requisite features and functionality to perform analysis, calculate the required metrics, generate the required graphical plots, and thereby assist the user to identify strengths, weaknesses and gaps in student performance, to plan, to make decisions, and to take action to improve student performance or modify curriculum and instruction practices. The response time of the system also impacts its actionability. Adequate long-term training of sufficient duration should be provided to the users in order for them to master the techniques of data analysis and mining provided by the system. This would also improve actionability of the system.

Validity

Validity is based on determining whether the findings are accurate from the standpoint of the researcher, the participant, or the readers of the study. This research is validated by the following strategies.

- Triangulation. Triangulation makes use of multiple sources, methods, investigators, and theories to provide corroborating evidence. This is typically
done to confirm themes that arise from different data sources and data collection methods. The different sources of information are triangulated by examining evidence from the sources and using it to build a coherent justification for themes.

- Member-checking. It is used to determine the accuracy of the findings by taking the final report back to the participants and determining whether they feel that the report is accurate.

All the themes identified through coding in the previous sections are validated by triangulation. Additionally, member checking was also used to validate these themes discovered during interviews.

**Research Questions**

In this section, the researcher attempts to answer the research questions posed at the beginning of this study. All the questions are undergirded by the change theories described in Chapter 3. Kurt Lewin’s theory was found to be the most appropriate in this study.

1. **Is there a relationship between usability of the data management system and user perception of functionality of the system?**

   Referring to Table 2 shown earlier in page 47, a mean score of 46 in the surveys for user perception of functionality of the system implies that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system has good functionality. A mean score of 13 in the surveys for usability implies that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is usable.
From the quantitative observations in Table 2 (page 47), a mean score of 24 for user perception of functionality implies that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system has good functionality. A mean score of 9.6 for usability indicates that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is usable.

These findings are confirmed by the qualitative results from analysis of word counts in coding matrices Tables 4 and 5 (pages 49 and 50) for observations and interviews respectively. From the results of this research, it is clear that there is a relationship between usability of the data management system and user perception of functionality of the system. The user has certain expectations in terms of functionality of the system and the features that the system offers. These expectations are related to the need to use the system to assist the user in his or her work. The user may expect the system to perform some complicated data analysis, generate tables of metrics and graphs of the results of analysis (for example, in order to satisfy accreditation procedures) and use these results for understanding some underlying problems that may not be visible by examining raw data by itself. If the expectations of the user are not met by the system, the system may not be usable.

2. *Is there a relationship between usability of the data management system and user perception of response time of the system?*

Referring to Table 2 shown earlier in page 47, a mean score of 11.25 in the surveys for user perception of response time of the system implies that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system has quick response...
time. A mean score of 13 in the surveys for usability implies that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is usable.

From the quantitative observations in Table 2, a mean score of 5 for user perception of response time implies that the respondents in the sample unanimously ‘Strongly Agree’ that the system has quick response time. There is no variance in this metric. A mean score of 9.6 for usability indicates that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is usable.

These findings are confirmed by the qualitative results from analysis of word counts in coding matrices Tables 4 and 5 (pages 49 and 50) for observations and interviews respectively. There is a relationship between usability of the data management system and user perception of response time of the system. Time is valuable to all people. A system that is slow to respond to user input is generally considered to be inefficient by the user. The user would abandon such a system and choose an alternative system (of comparable cost) that is faster in terms of response time. The results of this research also confirm that the user would like to receive responses to user input from the system within a reasonable time and avoid undue delays. A system that is slow to respond to user inputs would not be usable.

3. Is there a relationship between usability of the data management system and training of the user?

Referring to Table 2 shown earlier in page 47, a mean score of 14 in the surveys for training of the user implies that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that training is necessary and sufficient to use the system. A mean score
of 13 in the surveys for usability implies that the respondents in the sample tend to
‘Agree’ or ‘Strongly Agree’ that the system is usable.

From the quantitative observations in Table 2, a mean score of 4 for training of
the user implies that the respondents in the sample unanimously ‘Agree’ that training is
necessary and sufficient to use the system. There is no variance in this metric. A mean
score of 9.6 for usability indicates that the respondents in the sample tend to ‘Agree’ or
‘Strongly Agree’ that the system is usable.

These findings are confirmed by the qualitative results from analysis of word
counts in coding matrices Tables 4 and 5 (pages 49 and 50) for observations and
interviews respectively. From the results of this research, it is clear that there is a
relationship between usability of the data management system and training of the user. A
new user has to be trained to use the system. The duration and the quality of the training
impact the usage of the system in the future. If the training is insufficient or of poor
quality, the user will not be inclined to use the system. In such an event, the system will
not be usable.

4. Is there a relationship between actionability of the data management system and user
perception of functionality of the system?

Referring to Table 2 shown earlier in page 47, a mean score of 46 in the surveys
for user perception of functionality of the system implies that the respondents in the
sample tend to ‘Agree’ or ‘Strongly Agree’ that the system has good functionality. A
mean score of 9.5 in the surveys for actionability implies that the respondents in the
sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is actionable.
From the quantitative observations in Table 2 (page 47), a mean score of 24 for user perception of functionality implies that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system has good functionality. A mean score of 4.2 for actionability indicates that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is actionable.

These findings are confirmed by the qualitative results from analysis of word counts in coding matrices Tables 4 and 5 (pages 49 and 50) for observations and interviews respectively. There is a relationship between actionability of the data management system and user perception of functionality of the system. In order to make decisions and take action to improve student performance or modify curriculum and instruction practices, the user expects certain functionality and features from the system. The user may wish also to identify weaknesses and strengths of students in order to plan content in future classes accordingly. The system provides actionable results to the user only if it can provide the features (for example, calculation of certain metrics or measures for the class) and functionality that the user expects to use. Such functionality would assist the user in accomplishing his or her task. The results of this research also confirm that there is a relationship between actionability of the data management system and user perception of functionality of the system.

5. Is there a relationship between actionability of the data management system and user perception of response time of the system?

Referring to Table 2 shown earlier in page 47, a mean score of 11.25 in the surveys for user perception of response time of the system implies that the respondents
in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system has quick response time. A mean score of 9.5 in the surveys for actionability implies that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is actionable.

From the quantitative observations in Table 2, a mean score of 5 for user perception of response time implies that the respondents in the sample unanimously ‘Strongly Agree’ that the system has quick response time. There is no variance in this metric. A mean score of 4.2 for actionability indicates that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is actionable.

These findings are confirmed by the qualitative results from analysis of word counts in coding matrices Tables 4 and 5 (pages 49 and 50) for observations and interviews respectively. The results of this research confirm that there is a relationship between actionability of the data management system and user perception of response time of the system. The user may wish to modify the content of the next lesson that is taught in class based on some gaps that are identified through data analysis in the system. If the data analysis results are not generated within a reasonable time, they are not actionable.

6. Is there a relationship between actionability of the data management system and training of the user?

Referring to Table 2 shown earlier in page 47, a mean score of 14 in the surveys for training of the user implies that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that training is necessary and sufficient to use the system to produce actionable results. A mean score of 9.5 in the surveys for actionability implies that the
respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is actionable.

From the quantitative observations in Table 2, a mean score of 4 for training of the user implies that the respondents in the sample unanimously ‘Agree’ that training is necessary and sufficient to use the system to produce actionable results. There is no variance in this metric. A mean score of 4.2 for actionability indicates that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is actionable.

These findings are confirmed by the qualitative results from analysis of word counts in coding matrices Tables 4 and 5 (pages 49 and 50) for observations and interviews respectively. From the results of this research, it is clear that there is a relationship between actionability of the data management system and training of the user. In order to perform data analysis and data mining that assist the user to make decisions and take action, the user has to be sufficiently trained to use these features of the system. If the training is inadequate or of poor quality, the user cannot utilize the system to achieve actionable goals.
Summary

This chapter presented the data collected in this research. The data collection methods were described briefly. Surveys, observations, and interviews were used to collect the data. The data collection was interleaved with quantitative pre-surveys administered first, followed by quantitative and qualitative in-treatment observations. Thereafter, the quantitative post-survey was administered after the treatment was applied. In the final stage of data collection, interviews (qualitative) with the participants were conducted.

The process of data analysis involves making sense out of the numeric and text data that were collected during data collection. It involves preparing the data for analysis, representing the data, and making an interpretation of the larger meaning of the data. Coding is the process of organizing the text material into chunks or segments of text before interpreting the whole text. Themes are identified through the coding process.

Validity of the findings of this research is confirmed through triangulation and member-checking. The research questions posed at the beginning of this study were also answered in this chapter.
CHAPTER VI

DISCUSSION OF RESULTS

This chapter discusses the findings of this research endeavor. A brief description of the pilot system implementation is also provided. The implications of the findings of this study for leadership are described. Some recommendations are also made for future work.

Pilot System Implementation

The data management system designed and implemented on a pilot basis in this research is built using client-server architecture. The pilot is deployed on Microsoft Windows 7 and executes on a laptop. A web browser, such as Microsoft Internet Explorer or Google Chrome acts as the client, where the system displays its features (forms, reports, catalogs of rubrics, and the spreadsheet of partnerships with the Department of Curriculum and Instruction for internships and practicum) for the user. Web server software (Apache Tomcat®) runs on the server where Java Server Pages (JSPs) are executed and the Java logic in the JSPs helps to process the data for input into the system, as well as generate the output data for display on the client. The JSP interacts with a database, such as Oracle to store the data entered on a form in the web page, as
well as retrieve data from the database and display it in a formatted tabular report in the web page. The data stored in Oracle tables can be further analyzed and mined using the Oracle Data Miner. The web forms implemented in the system are based on the paper forms used by the department. These forms were designed in alignment with CAEP requirements. Some screenshots of the system are shown in Figure 2 through Figure 10. Figure 9 and Figure 10 show regression analysis using the Generalized Linear Model (GLM) and the Support Vector Machine Model (SVMM).

**Conclusion**

The results of this study indicate that there is a relationship between usability of the system and user perception of functionality of the system. The user has his/her expectations of the features and the functionality that the system could provide to assist the user in assessment work. If those features are not available in the system, the system cannot assist the user. This reduces the usability of the system.

The results of this study also indicate that there is a relationship between usability of the system and user perception of response time of the system. Time is valuable to all users. The system has to provide responses to user input within a reasonable time. Delayed responses would reduce usability of the system.

Further, this study indicates that there is a relationship between usability of the system and training of the user. A novice user has to be trained to become familiar with using the features of the system, such as data entry in web forms, generating web reports, view or save catalogs of rubrics and the spreadsheet of partnerships. The user also has to
be trained to be familiar with the data analysis and mining techniques provided by the Oracle Data Miner. Inadequate or poor training will impact the usability of the system.

**Figure 2.** Welcome page.

**Figure 3.** Forms Menu page.
Figure 4. Top section of Intern Keys form.

Figure 5. Lower section of Intern Keys form.
Figure 6. Generate Report interface.

Figure 7. Intern Keys table report.
Figure 8. Oracle Data Miner (ODM) canvas set up for regression.

Figure 9. ODM display of regression coefficients for GLM.
Figure 10. ODM display of regression residual plots comparing GLM and SVMM.

The analysis of the results of this study indicates that there is a relationship between actionability of the system and user perception of functionality of the system. The system has to provide the features and functionality to the user to assist him/her to plan, make decisions, and take action to improve student performance and to modify or improve curriculum and instruction practices. If the requisite features are not available, it would impact the actionability of the system.

The results of this study also indicate that there is a relationship between actionability of the system and user perception of response time of the system. Time is a significant factor to initiate appropriate action. A system that generates delayed responses would not be actionable.
It is clear from the results of this study that there is a relationship between actionability of the system and training of the user. In order to perform data analysis and data mining that assist the user to make decisions and take action, the user has to be sufficiently trained to use these features of the system. If the training is inadequate or of poor quality, the user cannot utilize the system to achieve actionable goals.

**Implications**

The implications of the findings of this study for leadership are as follows. The leadership should provide adequate, long-term training of sufficient duration to the users (staff) in order to ease the adoption and usage of the system. The user manual and training documents should be accessible to any user (staff) who wishes to study it. The staff should be encouraged to use the system on a regular basis.

The Office of Information Technology and Communications and the Center for Faculty Professional Development in the university should be involved in deploying the system on a large scale at the institution. The system can be extended to other departments in the School of Education.

The director of the Office of Information Technology and Communications at the university has to be aware that there will be some coordination issues when multiple departments try to access the Oracle database simultaneously. The researcher assumes that the Oracle database used by the university has been set up to ensure data concurrency and data consistency. Oracle provides its own locking mechanisms to maintain data consistency.
This system is cost-effective because it utilizes the university’s existing technology infrastructure, especially the Oracle database.

**Recommendations**

*To the Dean of the School of Education:*

1. Large scale deployment of the system has to be tested on a pilot preferably for each department in the initial stage.

2. Win support for the change from the staff through regular training. There is already positive feedback from all the staff and the administrator who used the pilot system in this research study.

*To the University's Provost:*

3. Integrated architecture can be implemented with the system built in this research. Data from other existing end-user platforms in the university, such as Banner, Canvas, Windows SharePoint, TracDat, and Taskstream can be integrated into this system.

*To the Dean of the School of Education:*

Future research work can focus on the following areas.

4. Based on the results of data analysis with this system, students can be grouped *(classified or clustered)* according to their strengths and weaknesses in content knowledge and skills. This can facilitate planning for their future learning.

5. Association rule mining can be applied to find the strength of associations between resources used by students, specific instructional strategies, and their combined impact on student outcomes.
6. Adaptive learning environments can be created by refining and re-organizing teaching materials, assignments, and class tests, in order to maximize the positive impact on student performance.

Summary

This chapter discussed the findings of this research endeavor. A brief description of the pilot system implementation was also provided. The software is written in a portable language (Java). The software can be ported to other host machines and operating systems.

The conclusions of this research study were elaborated in this chapter. The implications of the findings of this study for leadership were also described. The need for adequate long-term training of sufficient duration cannot be emphasized enough. Training will ease the adoption and usage of the system by the departmental staff. This chapter also enumerated some recommendations for future work.
APPENDIX A

INSTRUMENTS

Pre Treatment Survey

1. Please indicate your level of proficiency in some software applications in the following items.

   a) Level of proficiency in Microsoft Excel: Expert ☐ Proficient ☐ Good ☐ Need more training ☐

   b) Level of proficiency in Microsoft Access: ☐ ☐ ☐ ☐

   c) Level of proficiency in SPSS: ☐ ☐ ☐ ☐

   d) Level of proficiency in Microsoft Office Tool Suite: ☐ ☐ ☐ ☐

For the following items, the scale is as follows:

Strongly Agree (5), Agree (4), Uncertain (3), Disagree (2), Strongly Disagree (1), Not Applicable (0).

2. I am willing to try an easy-to-use software application to enter student assessment data. 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ 0 ☐
3. A comprehensive software module to help me generate student reports across semesters and years (cohorts) can help me in my work.

5 4 3 2 1 0

4. A software module that can save and display comprehensive undergraduate and graduate catalogs of rubrics for various courses is needed.

5 4 3 2 1 0

5. I would like to see the details of partnerships with the School of Education that are available to place our students for internship and field experience.

5 4 3 2 1 0

6. I would like to perform data analysis on student data using an easy software application.

5 4 3 2 1 0

7. I would like to use a software application that can respond to my user input (button clicks, keyboard entry) within a reasonable time.

5 4 3 2 1 0

8. I get annoyed when a software application, such as Microsoft Word does not shut down quickly after I close it.

5 4 3 2 1 0

9. I would like to receive training in using a software system that provides the functionality indicated by items 2 through 7 in this survey.

5 4 3 2 1 0

10. I like working with web forms, graphical user interfaces, and user screens.

5 4 3 2 1 0
11. If I am trained on an easy-to-use software system, I will use the system frequently.

5 □ 4 □ 3 □ 2 □ 1 □ 0 □

12. I am willing to perform data analysis on student data with the objective of improving curriculum and instruction practices and addressing any gaps that are discovered.

5 □ 4 □ 3 □ 2 □ 1 □ 0 □
Post Treatment Survey

For the following items, the scale is as follows:

Strongly Agree (5), Agree (4), Uncertain (3), Disagree (2), Strongly Disagree (1), Not Applicable (0).

1. I found the data management system easy to use.
   5 4 3 2 1 0

2. I would like to use the data management system as frequently as needed in my work.
   5 4 3 2 1 0

3. I found the web forms for entering rubrics assessments of students to be a useful feature.
   5 4 3 2 1 0

4. I found the Reports module for generating Tabular Reports based on the rubrics assessments to be useful and functional.
   5 4 3 2 1 0

5. I could download and save the Rubrics Catalogs for my future use.
   5 4 3 2 1 0

6. I could view the necessary details of partnerships with the School of Education for the placement of our students for internship and field experience.
   5 4 3 2 1 0

7. I was satisfied with the response time taken by the data management system to respond to my user input (button clicks, keyboard entry).
   5 4 3 2 1 0

8. I am satisfied with the training that I received to use the data management system.
9. I would like to receive more hands-on training and exercises on the data management system prior to adopting it in my daily work.

10. The data analysis performed by the data management system can help me to identify some weaknesses or gaps.
In-Treatment Observation

Quantitative Observations

For the following items, the scale is as follows:

Strongly Agree (5), Agree (4), Uncertain (3), Disagree (2), Strongly Disagree (1), Not Applicable (0).

1. The user is able to login to use the data management system.
   
   
   5 □ 4 □ 3 □ 2 □ 1 □ 0 □

2. The user is able to enter data using the web forms feature.

   5 □ 4 □ 3 □ 2 □ 1 □ 0 □

3. The user is able to generate, display and save tabular reports.

   5 □ 4 □ 3 □ 2 □ 1 □ 0 □

4. The user is able to download and save the rubrics catalogs.

   5 □ 4 □ 3 □ 2 □ 1 □ 0 □

5. The user is able to view and save the Spreadsheet with details of School of Education partnerships for internship and field experience placement of students.

   5 □ 4 □ 3 □ 2 □ 1 □ 0 □

6. The user is satisfied with the response time of the system.

   5 □ 4 □ 3 □ 2 □ 1 □ 0 □

7. The user is able to work independently on the system after participating in a training session.

   5 □ 4 □ 3 □ 2 □ 1 □ 0 □

8. The user appreciates the functionality and usability of the data management system.

   5 □ 4 □ 3 □ 2 □ 1 □ 0 □

9. The user could perform some data analysis on the data for planning purposes.
10. The user agrees that the data management system is a useful tool that can be used frequently.

Qualitative Observation Questions

1. How can the dynamics between the trainer and the trainee (user) be described?

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?

3. Did the trainee (user) ask a lot of questions while working on the data management system?

4. How did the trainer respond to the questions?

5. What were the trainee’s (user’s) reactions when the training session concluded?
Interview Questions

1. How useful do you find the data management system to be?

2. How can the system help you in your work?

3. What other features would you like to see in the system in the future?

4. What type of training would you like to receive in your next training session?

5. Would you like to receive more training in using the data analysis module that is implemented by Oracle Data Miner?

6. How far does the data management system meet your expectations in terms of functionality?

7. Was the response time of the system reasonable? Were there any undue delays?

8. How can this system help you to analyze cohort data so as to identify gaps or weaknesses that can be addressed?
APPENDIX B

OBSERVATIONS

Summary of Observations

From the quantitative observations in Table 2 shown earlier in Chapter 5, a mean score of 24 for user perception of functionality implies that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system has good functionality.

A mean score of 5 for user perception of response time implies that the respondents in the sample unanimously ‘Strongly Agree’ that the system has quick response time. There is no variance in this metric.

A mean score of 4 for training of the user implies that the respondents in the sample unanimously ‘Agree’ that training is necessary and sufficient to use the system. There is no variance in this metric.

A mean score of 9.6 for usability indicates that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is usable.

A mean score of 4.2 for actionability indicates that the respondents in the sample tend to ‘Agree’ or ‘Strongly Agree’ that the system is actionable.

These findings are confirmed by the qualitative results from analysis of word counts in the coding matrix Table 4 (page 49) for observations.
Observation Report

Introduction

The observation I conducted of a hands-on training session on the data management system with Professor T of the Department of Curriculum and Instruction on February 3, 2016, will be the event described in this Observation Report. The activities during the timeframe from 3.30 pm to 5.15 pm, on February 3, 2016, will be detailed in chronological order. I am a participant-observer in this event.

Time of Observation: 3.30 pm to 5.15 pm

Date: February 3, 2016

Venue: School of Education, Room No: 220

Observed: Training Session on the data management system on the laptop in progress.

Participant-observer: Hema Nair

Observation Questions

1. How can the dynamics between the trainer and the trainee (user) be described?

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?

3. Did the trainee (user) ask a lot of questions while working on the data management system?
4. How did the trainer respond to the questions?

5. What were the trainee’s (user’s) reactions when the training session concluded?

**Observation Responses**

1. How can the dynamics between the trainer and the trainee (user) be described?
   
   Answer: The dynamics between the Trainer and the Trainee can be described as informal and supportive. The general mood in the room was light and conducive to training.

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?
   
   Answer: The trainee was enthusiastic and willing to try the hands-on exercises on the data management system. After the initial apprehension of seeing a new system, she gradually relaxed as she started working on the simple exercises.

3. Did the trainee (user) ask a lot of questions while working on the data management system?
   
   Answer: The trainee asked a few questions. She was not sure why some of the radio buttons on the web forms were already selected. The trainer explained that those were the default-selected values. The trainee wanted to know if the entire faculty would be trained on the system. The trainer answered that all the faculty who have the time and the inclination for training will receive the training.

4. How did the trainer respond to the questions?
The trainer patiently answered each question. The trainer assisted the trainee when required in using the system.

5. What were the trainee’s (user’s) reactions when the training session concluded?

Answer: This training session concluded with a great sense of accomplishment, both on the part of the trainee and the trainer. The targeted set and number of exercises were successfully completed by the trainee. The trainee was looking forward to another hands-on session of training. The trainee said that she was impressed with the functionality and features of the system. She found the system to be useful and usable in her assessment work. She also said that the response time of the system was good and there were no undue delays. She was impressed by the data analysis results from Oracle Data Miner. She said that she is certain that the results are actionable. They can aid in decision-making in planning and practice. She complimented the trainer for a good training session.
Observational Protocol

Time Frame or Length of Activity: 105 Minutes

Table B1

Observation Protocol with Professor T

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.30 pm</td>
<td>The trainer (Hema Nair) has set up the system to run on the laptop and she calls</td>
<td>Professor T finishes a late lunch and comes into the room.</td>
</tr>
<tr>
<td></td>
<td>the trainee (Professor T) to the room.</td>
<td></td>
</tr>
<tr>
<td>3.30 pm- 3.45 pm</td>
<td>The trainer explains the first set of exercises on data entry(^1) in two web</td>
<td>The Professor listens with rapt attention and in silence.</td>
</tr>
<tr>
<td></td>
<td>forms(^1) in the system: PDEFE Form(^1) and Intern Keys Form(^1).</td>
<td></td>
</tr>
</tbody>
</table>

(continued)
### Table B1 (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.46 pm- 4.01pm</td>
<td>Professor T types (enters) the data on the PDEFE Form(^1) first, and submits the data to be saved in the Oracle database. She was not sure why some of the radio buttons on the web forms(^1) were already selected. The trainer explained that those were the default-selected values. When the data are successfully saved and the system pops up a suitable message, she navigates the Forms(^1) Menu to open the Intern Keys Form(^1). She then types data into the Form(^1) and submits the data to the database. The system issues a pop-up message that the data are successfully saved. The trainee wanted to know if the entire faculty would be trained(^3) on the system. The trainer answered that all the faculty who have the time and the inclination for training(^3) will receive the training(^3).</td>
<td>The trainer is observing as the trainee works on the system in order to understand possible difficulties in navigating the system.</td>
</tr>
</tbody>
</table>
Table B1 (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.02 pm – 4.17 pm</td>
<td>The trainer explains the next set of exercises on generating tabular reports(^1) based on the data that the trainee previously entered.</td>
<td>The trainer waits for the trainee to follow the instructions on generating tabular reports(^1).</td>
</tr>
<tr>
<td>4.18 pm - 4.33 pm</td>
<td>The trainee starts typing the search criteria to generate the tabular report(^1) first from the PDEFE data that were entered. After the report(^1) is displayed on screen, she then types the search criteria to generate the tabular report(^1) from the Intern Keys data that were entered. The report(^1) is displayed on the screen.</td>
<td>The Department Staff Assistant comes into the room to bring coffee for Professor T. Professor T asks for some student assessment forms(^1) from the Assistant. The Assistant leaves the room and returns a few minutes later with the paper forms(^1). Professor T inspects the paper forms(^1) and then returns them to the Assistant. The Assistant leaves the room with the forms(^1).</td>
</tr>
<tr>
<td>4.34 pm - 4.44 pm</td>
<td>The trainer explains the other features(^1) available in the data management system, such as graduate and undergraduate catalogs(^1), and the spreadsheet(^1) containing the details of the School of Education partnerships for internship of students</td>
<td>Professor T listens silently.</td>
</tr>
</tbody>
</table>

(continued)
Table B1 (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.45 pm –</td>
<td>The trainee clicks the hyperlinks to view and scroll down the catalogs(^1). The trainer explains that the catalogs(^1) can be downloaded and saved using the browser. The trainee then clicks the link for the Spreadsheet(^1) and views it.</td>
<td>The catalogs(^1) contain scanned copies of paper forms(^1). Some forms(^1) have spelling errors that the trainee points out. Some of the forms(^1) have similar sections which need to be revised, which the trainee points out to the trainer. The Department Chair has to review those forms(^1).</td>
</tr>
<tr>
<td>4.55 pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.56 pm –</td>
<td>The trainer explains some data analysis(^1) and mining(^1) techniques in the Oracle Data Miner. She shows how regression models can be constructed and how independent variables in a problem that have maximum impact on the dependent variables can be isolated for further action(^5).</td>
<td>The trainee listens and watches as the trainer now explains the more complicated techniques in data analysis(^1) and mining(^1). The trainee is particularly impressed with the graphical plots of mining(^1) results generated by the Data Miner. She told the trainer that doing regression appears to be easy using the tool.</td>
</tr>
<tr>
<td>5.15 pm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion**

The training\(^3\) session with Professor T on the data management system concluded at 5.15 pm on February 3, 2016. All the activities with descriptive and associated reflective notes for different time slots have been noted. Figure 11 shows a sketch of the room where the observation was conducted.
Figure 11. Sketch of the room where the observation was conducted.
Observation Report

Introduction

The observation I conducted of a hands-on training session on the data management system with Dr. M of the Dean’s Office on February 5, 2016, will be the event described in this Observation Report. The activities during the timeframe from 9.45 am to 10.20 am, on February 5, 2016, will be detailed in chronological order. I am a participant-observer in this event.

Time of Observation: 9.45 am to 10.20 am

Date: February 5, 2016

Venue: School of Education, Room No: 103

Observed: Training Session on the data management system on the laptop in progress.

Participant-observer: Hema Nair

Observation Questions

1. How can the dynamics between the trainer and the trainee (user) be described?

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?

3. Did the trainee (user) ask a lot of questions while working on the data management system?

4. How did the trainer respond to the questions?
5. What were the trainee’s (user’s) reactions when the training session concluded?

Observation Responses

1. How can the dynamics between the trainer and the trainee (user) be described?
   Answer: The dynamics between the Trainer and the Trainee can be described as informal and supportive. The general mood in the room was light and conducive to training.

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?
   Answer: The trainee was enthusiastic and ready to try the hands-on exercises on the data management system.

3. Did the trainee (user) ask a lot of questions while working on the data management system?
   Answer: The trainee asked a few questions. She was not sure why some of the radio buttons on the web forms were already selected. The trainer explained that those were the default-selected values. The trainee wanted to know if the radio buttons could be made to appear bigger. The trainer adjusted the Zoom-level of the browser to make the buttons appear bigger.

4. How did the trainer respond to the questions?
Answer: The trainer patiently answered each question. The trainer assisted the trainee when required in using the system. The trainee was well-prepared. She needed very little assistance.

5. What were the trainee’s (user’s) reactions when the training session concluded?

Answer: This training session concluded with a great sense of accomplishment, both on the part of the trainee and the trainer. The targeted set and number of exercises were successfully completed by the trainee. The trainee was confident that she could work independently on the system. The trainee said that she was impressed with the features and the functionality of the system. She found the system to be useful and usable in her assessment work. She also said that the response time of the system was good and there were no undue delays. She was impressed by the data analysis results from Oracle Data Miner. She said that she is certain that the results are actionable. They can aid in decision-making in planning and practice. She said that training has to be given to administrators and the assessment team.
**Observational Protocol**

Time Frame or Length of Activity: 35 Minutes

Table B2

*Observation Protocol with Dr. M*

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.45 am</td>
<td>The trainer (Hema Nair) has set up the system to run on the laptop and she calls the trainee (Dr. M) to the room.</td>
<td>Dr. M finishes a phone call in her Office and comes into the room.</td>
</tr>
<tr>
<td>9.45 am- 9.50 am</td>
<td>The trainer explains the first set of exercises on data entry(^1) in two web forms(^1) in the system: PDEFE Form(^1) and Intern Keys Form(^1). She then explains the second set of exercises on generating tabular reports(^1).</td>
<td>Dr. M listens in silence.</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.51 am-10 am</td>
<td>Dr. M types (enters) the data on the PDEFE Form(^1) first, and submits the data to be saved in the Oracle database. She was not sure why some of the radio buttons on the web forms(^1) were already selected. The trainer explained that those were the default-selected values. When the data are successfully saved and the system pops up a suitable message, she navigates the Forms(^1) Menu to open the Intern Keys Form(^1). She then types data into the Form and submits the data to the database. The system issues a pop-up message that the data are successfully saved.</td>
<td>The trainer is observing as the trainee works on the system in order to understand possible difficulties in navigating the system.</td>
</tr>
<tr>
<td>Time</td>
<td>Descriptive Notes</td>
<td>Reflective Notes</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10.01 am –</td>
<td>The trainee starts typing the search criteria to generate the tabular report(^1) first from the PDEFE data that were entered. After the report(^1) is displayed on screen, she then types the search criteria to generate the tabular report(^1) from the Intern Keys data that were entered. The report(^1) is displayed on the screen.</td>
<td>The Maintenance Staff come in to check the overhead lights in the room. They leave in a few minutes.</td>
</tr>
<tr>
<td>10.06 am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.07 am-</td>
<td>The trainee refers the Training(^3) Document and tries out independently the other features(^1) available in the data management system, such as graduate and undergraduate catalogs(^1), and the spreadsheet(^1) containing the details of the School of Education partnerships for internship of students.</td>
<td>The trainer is impressed as she watches the trainee working independently.</td>
</tr>
<tr>
<td>10.10 am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.11 am -</td>
<td>The trainer explains some data analysis(^1) and mining techniques in the Oracle Data Miner. She shows how regression models can be constructed and how independent variables in a problem that have maximum impact on the dependent variables can be isolated for further action(^5).</td>
<td>The trainee listens and watches as the trainer now explains the more complicated techniques in data analysis(^1) and mining(^1). The trainee is particularly impressed with the graphical plots of mining(^1) results generated by the Data Miner. She told the trainer that doing regression appears to be easy using the tool.</td>
</tr>
<tr>
<td>10.20 am</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

The training session with Dr. M on the data management system concluded at 10.20 am on February 5, 2016. All the activities with descriptive and associated reflective notes for different time slots have been noted. Figure 11 on page 93 shows a sketch of the room where the observation was conducted.
Observation Report

Introduction

The observation I conducted of a hands-on training session on the data management system with Dr. DM of the Department of Curriculum and Instruction on February 9, 2016, will be the event described in this Observation Report. The activities during the timeframe from 1.50 pm to 2.40 pm, on February 9, 2016, will be detailed in chronological order. I am a participant-observer in this event.

Time of Observation: 1.50 pm to 2.40 pm

Date: February 9, 2016

Venue: School of Education, Room No: 220

Observed: Training Session on the data management system on the laptop in progress.

Participant-observer: Hema Nair

Observation Questions

1. How can the dynamics between the trainer and the trainee (user) be described?

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?

3. Did the trainee (user) ask a lot of questions while working on the data management system?

4. How did the trainer respond to the questions?
5. What were the trainee’s (user’s) reactions when the training session concluded?

**Observation Responses**

1. How can the dynamics between the trainer and the trainee (user) be described?
   Answer: The dynamics between the Trainer and the Trainee can be described as informal and supportive. The general mood in the room was light and conducive to training.

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?
   Answer: The trainee was enthusiastic and ready to try the hands-on exercises on the data management system.

3. Did the trainee (user) ask a lot of questions while working on the data management system?
   Answer: The trainee asked a few questions. The trainee remarked that the system is very easy to use. She asked whether the trainer could install the system on her laptop. The trainer agreed to install the system on the trainee’s laptop at a convenient time for the trainee. The trainee was also impressed with the data analysis results from the Oracle Data Miner. The trainee wanted to know if data could be imported into the system from Excel and data analysis results from the system exported to Excel for PAAR Reporting. The trainer said that import and export of data with Excel is easily accomplished on the data management system.

4. How did the trainer respond to the questions?
Answer: The trainer patiently answered each question. The trainer assisted the trainee when required in using the system.

5. What were the trainee’s (user’s) reactions when the training session concluded?

Answer: This training session concluded with a great sense of accomplishment, both on the part of the trainee and the trainer. The targeted set and number of exercises were successfully completed by the trainee. The trainee stated that more training is required for her to become more familiar with the system. The trainee said that she was impressed with the features and the functionality of the system. She found the features to be useful and usable. She said that the features and functionality were relevant and significant to her current work. She said that the results of data analysis from the data management system were actionable. She said that they can assist in discovering weaknesses and gaps in student performance, so that appropriate effort and resources can be directed in order to assuage these weaknesses and gaps. She also said that the response time of the system was good and there were no undue delays. About the training received, she said that the training was user-friendly. She could get more familiar with the system with more training. She said that the trainer was enthusiastic and non-threatening.
Observational Protocol

Time Frame or Length of Activity: 50 Minutes

Table B3

*Observation Protocol with Dr. DM*

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.50 pm</td>
<td>The trainer (Hema Nair) has set up the system to run on the laptop and she calls the trainee (Dr. DM) to the room.</td>
<td>Dr. DM comes into the room after finishing her lunch.</td>
</tr>
<tr>
<td>1.50 pm-1.55 pm</td>
<td>The trainer explains the first set of exercises on data entry in two web forms in the system: PDEFE Form and Intern Keys Form. She then explains the second set of exercises on generating tabular reports.</td>
<td>Dr. DM listens in silence.</td>
</tr>
</tbody>
</table>

(continued)
### Table B3 (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.56 pm - 2.10 pm</td>
<td>Dr. DM types (enters) the data on the PDEFE Form(^1) first, and submits the data to be saved in the Oracle database. When the data are successfully saved and the system pops up a suitable message, she navigates the Forms(^1) Menu to open the Intern Keys Form(^1). She then types data into the Form(^1) and submits the data to the database. The system issues a pop-up message that the data are successfully saved.</td>
<td>The trainer is observing as the trainee works on the system in order to understand possible difficulties in navigating the system.</td>
</tr>
<tr>
<td>2.11 pm – 2.21 pm</td>
<td>The trainee starts typing the search criteria to generate the tabular report(^1) first from the PDEFE data that were entered. After the report(^1) is displayed on screen, she then types the search criteria to generate the tabular report(^1) from the Intern Keys data that were entered. The report(^1) is displayed on the screen.</td>
<td>The trainee asks a few questions (mentioned in Observation Question # 3). The trainer answered each question patiently.</td>
</tr>
</tbody>
</table>
Table B3 (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.22 pm- 2.27 pm</td>
<td>The trainer next navigates the Main Menu to point to the graduate and undergraduate catalogs(^1), and the spreadsheet(^1) containing the details of the School of Education partnerships for internship of students. The trainee downloads the undergraduate catalog(^1) and views it. After that, the trainee looks at the details of the partnerships for internship of students in the spreadsheet(^1) that she downloads.</td>
<td>The trainer is impressed as she watches the trainee working independently.</td>
</tr>
<tr>
<td>2.28 pm - 2.40 pm</td>
<td>The trainer explains some data analysis(^1) and mining(^1) techniques in the Oracle Data Miner. She shows how regression models can be constructed and how independent variables in a problem that have maximum impact on the dependent variables can be isolated for further action(^5).</td>
<td>The trainee listens and watches as the trainer now explains the more complicated techniques in data analysis(^1) and mining(^1). The trainee is particularly impressed with the metrics and the graphical plots of mining(^1) results generated by the Data Miner. She tries out some data analysis(^1) and exploration.</td>
</tr>
</tbody>
</table>

**Conclusion**

The training\(^3\) session with Dr. DM on the data management system concluded at 2.40 pm on February 9, 2016. All the activities with descriptive and associated reflective
notes for different time slots have been noted. Figure 11 on page 93 shows a sketch of the room where the observation was conducted.
Observation Report

Introduction

The observation I conducted of a hands-on training session on the data management system with Dr. Y, Chair of the Department of Curriculum and Instruction on February 9, 2016, will be the event described in this Observation Report. The activities during the timeframe from 10.50 am to 11.40 am, on February 9, 2016, will be detailed in chronological order. I am a participant-observer in this event.

Time of Observation: 10.50 am to 11.40 am

Date: February 9, 2016

Venue: School of Education, Room No: 220

Observed: Training Session on the data management system on the laptop in progress.

Participant-observer: Hema Nair

Observation Questions

1. How can the dynamics between the trainer and the trainee (user) be described?

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?

3. Did the trainee (user) ask a lot of questions while working on the data management system?

4. How did the trainer respond to the questions?
5. What were the trainee’s (user’s) reactions when the training session concluded?

**Observation Responses**

1. How can the dynamics between the trainer and the trainee (user) be described?
   
   Answer: The dynamics between the Trainer and the Trainee can be described as informal and supportive. The general mood in the room was light and conducive to training.

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?

   Answer: The trainee was enthusiastic and ready to try the hands-on exercises on the data management system. After the initial apprehension of seeing a new system, he gradually relaxed as he started working on the simple exercises.

3. Did the trainee (user) ask a lot of questions while working on the data management system?

   Answer: The trainee asked a few questions. They are listed below.

   Trainee: How can the system be used and adopted beyond this dissertation?
   
   Trainer’s Answer: The software, technology, and know-how of the data management system will be transferred to the Office of Technology at the University, so that they can install the system on the University’s network.

   Trainee: How much training will new faculty need?
   
   Trainer’s Answer: Training would depend on the individual’s familiarity with using software such as web forms, Microsoft Office tools and so on. A pre-
survey before the training is given to the individual can help to assess individual capacity and the need for extensive training.

Trainee: Who will train the new faculty?

Trainer’s Answer: The University’s division for Faculty Development will have the responsibility to train new faculty after technology transfer is completed.

4. How did the trainer respond to the questions?

Answer: The trainer patiently answered each question. The trainer assisted the trainee when required in using the system.

5. What were the trainee’s (user’s) reactions when the training session concluded?

Answer: This training session concluded with a great sense of accomplishment, both on the part of the trainee and the trainer. The targeted set and number of exercises were successfully completed by the trainee. The trainee stated that more training is required for him to become more familiar with the system. The trainee said that he was impressed with the features and the functionality of the system. He found the features to be user-friendly. He found the system to be useful and usable in his assessment work. He said that the results of data analysis from the data management system were actionable in terms of the metrics and the numbers generated. He said that they can assist in discovering weaknesses and gaps in student performance, so that appropriate effort and resources can be directed in order to assuage these weaknesses and gaps. He also
said that the response time\textsuperscript{2} of the system was good and there were no undue delays\textsuperscript{2}.

**Observational Protocol**

Time Frame or Length of Activity: 50 Minutes

Table B4

*Observation Protocol with Dr. Y*

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.50 am</td>
<td>The trainer (Hema Nair) has set up the system to run on the laptop and she calls the trainee (Dr. Y) to the room.</td>
<td>Dr. Y finishes a phone call in his Office and comes into the room.</td>
</tr>
<tr>
<td>10.50 am- 10.55 am</td>
<td>The trainer explains the first set of exercises on data entry\textsuperscript{1} in two web forms\textsuperscript{1} in the system: PDEFE Form\textsuperscript{1} and Intern Keys Form\textsuperscript{1}. She then explains the second set of exercises on generating tabular reports\textsuperscript{1}.</td>
<td>Dr. Y listens in silence.</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.56 am- 11.10 am</td>
<td>Dr. Y types (enters) the data on the PDEFE Form(^1) first, and submits the data to be saved in the Oracle database. When the data are successfully saved and the system pops up a suitable message, he navigates the Forms(^1) Menu to open the Intern Keys Form(^1). He then types data into the Form(^1) and submits the data to the database. The system issues a pop-up message that the data are successfully saved.</td>
<td>The trainer is observing as the trainee works on the system in order to understand possible difficulties in navigating the system.</td>
</tr>
<tr>
<td>11.11 am – 11.21 am</td>
<td>The trainee starts typing the search criteria to generate the tabular report(^1) first from the PDEFE data that were entered. After the report(^1) is displayed on screen, he then types the search criteria to generate the tabular report(^1) from the Intern Keys data that were entered. The report(^1) is displayed on the screen.</td>
<td>The trainee asks a few questions (mentioned in Observation Question # 3). The trainer answered each question patiently giving as much detail as possible.</td>
</tr>
</tbody>
</table>
Table B4 (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.22 am- 11.27 am</td>
<td>The trainer next navigates the Main Menu to point to the graduate and undergraduate catalogs(^1), and the spreadsheet(^1) containing the details of the School of Education partnerships for internship of students. The trainee downloads the undergraduate catalog(^1) and views it. The trainee looks next at the details of the partnerships for internship of students in the spreadsheet(^1) that he downloads.</td>
<td>The trainer is impressed as she watches the trainee working independently.</td>
</tr>
<tr>
<td>11.28 am - 11.40 am</td>
<td>The trainer explains some data analysis(^1) and mining(^1) techniques in the Oracle Data Miner. She shows how regression models can be constructed and how independent variables in a problem that have maximum impact on the dependent variables can be isolated for further action(^5).</td>
<td>The trainee listens and watches as the trainer now explains the more complicated techniques in data analysis(^1) and mining(^1). The trainee is particularly impressed with the metrics and the graphical plots of mining(^1) results generated by the Data Miner.</td>
</tr>
</tbody>
</table>
Conclusion

The training session with Dr. Y on the data management system concluded at 11.40 am on February 9, 2016. All the activities with descriptive and associated reflective notes for different time slots have been noted. Figure 11 on page 93 shows a sketch of the room where the observation was conducted.
Observation Report

Introduction

The observation I conducted of a hands-on training session on the data management system with Dr. T, Faculty in the Department of Curriculum and Instruction on February 17, 2016, will be the event described in this Observation Report. The activities during the timeframe from 11.30 am to 12.45 pm, on February 17, 2016, will be detailed in chronological order. I am a participant-observer in this event.

Time of Observation: 11.30 am to 12.45 pm

Date: February 17, 2016

Venue: School of Education, Room No: 220

Observed: Training Session on the data management system on the laptop in progress.

Participant-observer: Hema Nair

Observation Questions

1. How can the dynamics between the trainer and the trainee (user) be described?

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?

3. Did the trainee (user) ask a lot of questions while working on the data management system?

4. How did the trainer respond to the questions?
5. What were the trainee’s (user’s) reactions when the training session concluded?

**Observation Responses**

1. How can the dynamics between the trainer and the trainee (user) be described?
   
   Answer: The dynamics between the Trainer and the Trainee can be described as informal and supportive. The general mood in the room was light and conducive to training.

2. What was the general disposition of the trainee (user) to the hands-on training on the data management system?
   
   Answer: The trainee was enthusiastic. After the initial apprehension of seeing a new system, she gradually relaxed.

3. Did the trainee (user) ask a lot of questions while working on the data management system?
   
   Answer: The trainee asked a few questions regarding saving and back-up of data entered in the data management system. The trainer replied that the data saved in the Oracle database can be saved locally in Microsoft Excel files. She said that the Oracle SQL Developer tool can export and import data to Excel and from Excel respectively.

4. How did the trainer respond to the questions?
   
   Answer: The trainer patiently answered each question. The trainer assisted the trainee when required in using the system.
5. What were the trainee’s (user’s) reactions when the training session concluded?

Answer: This training session concluded with a great sense of accomplishment, both on the part of the trainee and the trainer. The targeted set and number of exercises were successfully completed by the trainee. The trainee stated that more training is required for her to become more familiar with the system. The trainee said that she was impressed with the features and the functionality of the system. She found the system to be useful and usable in her assessment work. She said that the results of data analysis from the data management system were actionable in terms of the metrics generated. She said that they can assist in discovering weaknesses and gaps in student performance, so that appropriate effort and resources can be directed in order to assuage these weaknesses and gaps. She said that with appropriate feedback from the field, the weaknesses and gaps in candidate teachers’ performance can be analyzed up to 1 year into their employment in schools after graduation. She also said that the School of Education’s Assessment Team could take appropriate action based on the data analysis of student performance data and program performance data. She said that the response time of the system was good and there were no undue delays.
**Observational Protocol**

Time Frame or Length of Activity: 75 Minutes

Table B5

*Observation Protocol with Dr. T*

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.30 am</td>
<td>The trainer (Hema Nair) has set up the system to run on the laptop and she calls the trainee (Dr. T) to the room.</td>
<td>Dr. T finishes a phone call in her Office and comes into the room.</td>
</tr>
<tr>
<td>11.30 am– 11.40 am</td>
<td>The trainer explains the first set of exercises on data entry in two web forms in the system: PDEFE Form and Intern Keys Form. She then explains the second set of exercises on generating tabular reports.</td>
<td>Dr. T listens in silence.</td>
</tr>
</tbody>
</table>

(continued)
Table B5 (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.41 am-11.56 am</td>
<td>Dr. T types (enters) the data on the PDEFE Form (^1) first, and submits the data to be saved in the Oracle database. When the data are successfully saved and the system pops up a suitable message, she navigates the Forms (^1) Menu to open the Intern Keys Form (^1). She then types data into the Form (^1) and submits the data to the database. The system issues a pop-up message that the data are successfully saved.</td>
<td>The trainer is observing as the trainee works on the system in order to understand possible difficulties in navigating the system.</td>
</tr>
<tr>
<td>11.57 am – 12.12 pm</td>
<td>The trainee starts typing the search criteria to generate the tabular report (^1) first from the PDEFE data that were entered. After the report (^1) is displayed on screen, she then types the search criteria to generate the tabular report (^1) from the Intern Keys data that were entered. The report (^1) is displayed on the screen.</td>
<td>The trainee asks a few questions (mentioned in Observation Question # 3). The trainer answered each question patiently giving as much detail as possible.</td>
</tr>
</tbody>
</table>

(continued)
Table B5 (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Descriptive Notes</th>
<th>Reflective Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.13 pm-</td>
<td>The trainer next navigates the Main Menu to point to the graduate and undergraduate catalogs(^1), and the spreadsheet(^1) containing the details of the School of Education partnerships for internship of students. The trainee downloads the undergraduate catalog(^1) and views it. The trainee looks next at the details of the partnerships for internship of students in the spreadsheet(^1) that she downloads.</td>
<td>The trainer assists the trainee when required.</td>
</tr>
<tr>
<td>12.25 pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.26 pm -</td>
<td>The trainer explains some data analysis(^1) and mining(^1) techniques in the Oracle Data Miner. She shows how regression models can be constructed and how independent variables in a problem that have maximum impact on the dependent variables can be isolated for further action(^5).</td>
<td>The trainee listens and watches as the trainer now explains the more complicated techniques in data analysis(^1) and mining(^1). The trainee is particularly impressed with the metrics and the graphical plots of mining(^1) results generated by the Data Miner.</td>
</tr>
</tbody>
</table>
APPENDIX C

INTERVIEWS

Interview Report

Time of Interview: 3:40 p.m.

Date: February 16, 2016

Venue: Rm#: 220, School of Education

Interviewee: Professor T

Position of Interviewee: Professor in the Department of Curriculum and Instruction

Interviewer: Hema Nair

Hema Nair: Good Afternoon Professor T.

Professor T: Good Afternoon.

Hema Nair: This is an interview that I am doing with reference to my Dissertation Research on the evaluation of an experimental data management system. So, I have about eight questions and I have e-mailed them to you before. I will be recording this interview
with your permission, and if I need any further information after the interview, I will contact you by e-mail or meet you in person. Is it OK? Shall we start the interview?

Professor T: Yes.

1. Hema Nair: You participated in a training session on the data management system. You tried some simple exercises to enter data, generate tabular reports, and view Catalogs of rubrics and the Spreadsheet of Curriculum and Instruction partnerships with schools for internship and practicum. The first question is: How useful do you find the data management system to be? Is it usable in your work?

Professor T: I think certainly in making course and program decisions, all aspects of the data mining module will be helpful. It let me look at and consider some connections that I hadn’t thought about before. It gives me the opportunity to explore the data of individual students, groups of students, their performance, and to compare the groups. It helps to see how these assessments fit into overall program assessments and evaluation. I was quite impressed with the overall picture.

2. Hema Nair: Ok, the next question. How can the system help you in your work?

Professor T: Well, since I am retiring (smiles), I think I will use the system for other possibilities. Let’s say that I am working with my STEM Program. I will be able to share the potential of this system with my colleagues in Math
and Chemistry because they don’t have the same perspective on student assessment that we have. I know that I can share what I learnt with this system to assist them with preparation for their PSc accreditation.

3. Hema Nair: The next question is: what other features\(^1\) would you like to see in the system in the future?

Professor T: Well, I don’t know whether I have the knowledge base to suggest other possible features\(^1\). I might have to play around with the system a little bit more.

4. Hema Nair: The next question. What type of training\(^3\) would you like to receive in your next training\(^3\) session?

Professor T: (Pause). I would like to take a real full set of my student performance assessment data, enter the data\(^1\), do some data mining\(^1\), see if the results support my hypotheses, and even talk to the students after this kind of analysis. I think it will help me make connections about the problems that students are having. They may not be aware of the problems. Even I may not be aware of the problems. The system helps to identify variables and see if there is a correlation.

5. Hema Nair: The next question. Would you like to receive more training\(^3\) in using the data analysis\(^1\) module that is implemented by Oracle Data Miner?

Professor T: Yes, absolutely. The data analysis\(^1\) and mining\(^1\) results will be helpful for PSc accreditation. We have to take the forms\(^1\), the data collection instruments and make certain that they are reliable and valid and provide the
analysis\(^1\) of the data through statistics. It also helps to correlate the Certification Assessment, Praxis I scores to student performance. I hypothesize that students who do well on these tests also do well in our major courses. The specific needs and weaknesses\(^5\) of students can be identified using the system. Even correlating with student performance in high school and which school they graduated from could be done on this system.

6. Hema Nair: The next question. How far does the data management system meet your expectations in terms of functionality\(^1\)?

Professor T: Well, I assume that I would have the source for the data, manage the data, and analyze\(^1\) the data. The data analysis\(^1\) results could be presented in charts and quantitative metrics. To that extent, we have the system meet my expectations in terms of functionality\(^1\).

Hema Nair: We did some simple exercises with small data sets but did not have a full class size data set.

Professor T: But I can conceptualize and project what can be done with analysis\(^1\) and mining\(^1\).

7. Hema Nair: The next question. You tried some exercises on the data management system during the training\(^3\) session. There was data entry\(^1\) via the keyboard, button clicks and so on. Was the response time\(^2\) of the system reasonable? Were there any undue delays\(^2\)?

Professor T: Yes, the response time\(^2\) was reasonable. Maybe because I was learning as I was using the system, the response time\(^2\) was reasonable. There
were no undue delays\textsuperscript{2}. Once I get better on the system, maybe I will get impatient. Right now, the response time\textsuperscript{2} is fine.

Hema Nair: This is a standalone system installed on the laptop. But when the system is connected to the university network, you may have some delays\textsuperscript{2}.

Professor T: But still, there may be no more delays\textsuperscript{2} than the other systems already existing like Banner.

Hema Nair: Yes. The delays\textsuperscript{2} on the system connected to a network may be comparable to other existing systems.

8. Hema Nair: The last and final question. How can this system help you to analyze cohort data so as to identify gaps or weaknesses\textsuperscript{5} that can be addressed? Are the data analysis\textsuperscript{1} results from the system actionable\textsuperscript{5}? You saw some mining\textsuperscript{5} results which contain graphs, plots, tables and so on. Could these results help you to pin-point areas for improving student performance\textsuperscript{5} or modifying the curriculum\textsuperscript{5}?

Professor T: In order to gain some insight about the cohort, we ought to be able to make decisions\textsuperscript{5} about what impacts their learning. I think this system’s data analysis\textsuperscript{1} results are actionable\textsuperscript{5}. I was especially impressed with the charts. These results can be presented in a manner to help us with PSc accreditation.

Hema Nair: Professor T, is there anything else that you would like to add to your response to this question or any of the other questions that I asked in this interview? Or are you satisfied with your responses?
Professor T: Yes, I am satisfied.

Hema Nair: (giggle) Thank you so much for your time Professor T. I am wrapping up this interview.

Professor T: You are welcome.
Interview Report

Time of Interview: 11:15 a.m.

Date: February 11, 2016

Venue: Dr. M’s Office Rm#: 109, School of Education

Interviewee: Dr. M

Position of Interviewee: Director of Field Services

Interviewer: Hema Nair

Hema Nair: Good Morning Dr. M.

Dr. M: Good Morning.

Hema Nair: This is an interview that I am doing with reference to my Dissertation Research on the evaluation of an experimental data management system. So, I have about eight questions and I have e-mailed them to you before. I will be recording this interview with your permission, and if I need any further information after the interview, I will contact you by e-mail or meet you in person. Is it OK? Shall we start the interview?

Dr. M: Yes.

1. Hema Nair: You have seen the data management system earlier. You received some training and performed some simple exercises on it. The first question is: how useful do you find the data management system to be?
Dr. M: (Pause). I found it [the data management system] to be very useful for my work.

2. Hema Nair: Ok, the next question. How can the system help you in your work?

Dr. M: (Pause). [The system helps by] Organizing, warehousing, and in retrieval of data for current work.

Hema Nair: What about data analysis? Could you try some of the data analysis techniques on the system?

Dr. M: Yes. That does not go with my job so much. I am in a leadership role.

3. Hema Nair: Next question. You have seen the features of the system such as Forms, Reports, Catalogs of Rubrics, and Spreadsheet of SOE Partnerships. What other features would you like to see in the system in the future? Would you like to see some other features that could be added in terms of functionality?

Dr. M: The only thing that I see could be added is that there are three Master’s Programs and 1 Post Bac Program. Curriculum and Instruction is the parent
department. There is MAT in Math and Science and the Special Education Program. We need the system to cover these as well.

Hema Nair: Actually, the Special Education Graduate Forms$^1$ and Reports$^1$ are already incorporated in the system in the Graduate Section. The Forms$^1$ and Reports$^1$ of the Post Bac Program are also incorporated in the system. For MAT in Math and Science, the PDEFE Form$^1$ and Report$^1$ are incorporated in the system. But we don’t have other rubrics assessments for the MAT Programs because we tried to contact the Adjuncts who were dealing with them and I remember that you had e-mailed them a few times inquiring about the assessments that they used. But we did not get a response from them.

Dr. M: Yes I remember that. The rubrics have changed. We don’t have a clear set of rubrics yet in practice [for the MAT Programs].

4. Hema Nair: Ok. The fourth question is: What type of training$^3$ would you like to receive in your next training$^3$ session?

Dr. M: I think the more you use it [the data management system], the better you get at it. The same training$^3$ will be good but more of the training$^3$.

5. Hema Nair: The next question. Would you like to receive more training$^3$ in using the data analysis$^1$ module that is implemented by Oracle Data Miner?
Dr. M: Yes. From looking at the analysis and mining results, I would like to receive more training on the Data Miner.

6. Hema Nair: Ok. The next question. How far does the data management system meet your expectations in terms of functionality? It has to do with the features of the system, like the Forms, Reports, Catalogs, and so on. Do the features meet your expectations? Or did you expect something else?

Dr. M: I thought it was organized. It meets my expectations in terms of functionality.

7. Hema Nair: Ok, next question. Was the response time of the system reasonable? Were there any undue delays in response to your button-clicks, keyboard entry, and so on?

Dr. M: No. There were no undue delays. The response time [of the system] was good.

8. Hema Nair: The last and final question. How can this system help you to analyze cohort data so as to identify gaps or weaknesses that can be addressed?

Dr. M: Well, I think the answer is inside the question. The system helps to analyze cohort data to identify strengths and weaknesses so that you can modify the curriculum and practice.
Hema Nair: You have metrics calculated in the system, such as average score, overall mean score, in each section and in each course. Could these help to identify weaknesses\textsuperscript{5}?

Dr. M: Yes. The system calculates metrics that pin-point areas where you need improvement: improvement for the student\textsuperscript{5} and for the program\textsuperscript{5}. You can focus resources and effort\textsuperscript{5} to cluster in one area or a pedagogy area for improvement.

Hema Nair: Is there anything else that you would like to add to your response to this question or any of the other questions that I asked in this interview? Or are you satisfied with your responses?

Dr. M: Yes. I am satisfied.

Hema Nair: Thank you so much for your time Dr. M. We are going to wrap up this interview.

Dr. M: Thank you.
Interview Report

Time of Interview: 12:10 p.m.

Date: February 16, 2016

Venue: Dr. DM’s Office Rm#: 226, School of Education

Interviewee: Dr. DM

Position of Interviewee: Faculty in the Department of Curriculum and Instruction

Interviewer: Hema Nair

Hema Nair: Good Afternoon Dr. DM.

Dr. DM: Good Afternoon.

Hema Nair: This is an interview that I am doing with reference to my Dissertation Research on the evaluation of an experimental data management system. So, I have about eight questions and I have e-mailed them to you before. I will be recording this interview with your permission, and if I need any further information after the interview, I will contact you by e-mail or meet you in person. Is it OK? Shall we start the interview?

Dr. DM: Yes.

1. Hema Nair: You participated in a training session on the data management system. You tried some simple exercises to enter data on web forms, generate tabular reports, and view Catalogs of rubrics and the Spreadsheet.
of Curriculum and Instruction partnerships with schools for internship and practicum. The first question is: How useful do you find the data management system to be? Is it usable in your work?

Dr. DM: I found the data management system to be quite useful. I enjoyed seeing the 21st century tools and technology that is electronically available for assessment, especially the web forms.

2. Hema Nair: Ok, the next question. How can the system help you in your work?

Dr. DM: Well, forms such as Dispositions (PDEFE Form), Practicum and so on help me in my work as Professor of Record for Practicum I and the capstone course Pre-Service Teaching. I work with Pre-service teachers. The rubrics attached to the forms help to quantitatively evaluate the candidates over a 4-week period in Pre-service Formative Evaluation.

3. Hema Nair: The next question is: what other features would you like to see in the system in the future?

Dr. DM: Well, first of all, I would like to get a handle on the features you have already provided in the system. Other possible features could be to make the system more user-friendly, personalized with more choices. The web form for Intern Keys is very helpful. The system that you are providing is an awesome capture of the assessment tools that we are currently using on paper.
4. Hema Nair: The next question. What type of training would you like to receive in your next training session?

Dr. DM: Umm…Pretty much the same training but more in-depth training. You are able to analyze data particularly with Oracle and the Data Miner. Those tools I am particularly interested in.

5. Hema Nair: The next question. Would you like to receive more training in using the data analysis module that is implemented by Oracle Data Miner?

Dr. DM: Yes. The Data Miner has so much analysis capabilities. I have been doing some analysis so far by hand looking at the Practicum evaluation reports, getting a sense of student strengths and weaknesses, as I plan the agenda for the next seminar or class. I use the data to plan the next class or lesson. I think your data management system helps to get access to the data quickly to identify strengths and weaknesses.

Hema Nair: Commercial systems like Banner, Canvas, and so on do not perform this type of assessment. In this data management system, qualitative rubrics are evaluated and converted to quantitative measures or number scores that can help to pin-point the focus of effort and resources when weaknesses are identified.

6. Hema Nair: The next question. How far does the data management system meet your expectations in terms of functionality?

Dr. DM: Well, the web forms and reports are highly functional. The Catalogs of rubrics and the Spreadsheet of partnerships exceed my
expectations. I may not be the Data Manager. But I would like to have accessibility to use the system.

7. Hema Nair: The next question. You tried some exercises on the data management system during the training session. There was data entry via the keyboard, button clicks and so on. Was the response time of the system reasonable? Were there any undue delays?

Dr. DM: Yes, the response time was reasonable. There were no delays. It was delightful to see the system transition from one module (program) to another. I was pleased with the response time.

8. Hema Nair: The last and final question. How can this system help you to analyze cohort data so as to identify gaps or weaknesses that can be addressed? Are the data analysis results from the system actionable? You saw some mining results which contain graphs, plots, tables and so on. Could these results help you to pin-point areas for improving student performance or modifying the curriculum?

Dr. DM: Yes, I think the system can help me and help others analyze cohort data. We can better identify weaknesses and strengths of our candidates. We can use the data to plan better and meet the needs of our students scientifically. I think the data analysis results are actionable. The growth of the students can be mapped. I don’t know of any other system that can do this.
Hema Nair: Dr. DM, I am grateful for this opportunity to talk with you and get your feedback about using the data management system. Is there anything else that you would like to add to your response to this question or any of the other questions that I asked in this interview?

Dr. DM: No. I would like to have access to the data management system to start using it.

Hema Nair: I will set it up for you at the earliest opportunity. Thank you for your time Dr DM.

Dr. DM: You are welcome.
Interview Report

Time of Interview: 11:55 a.m.

Date: February 18, 2016

Venue: Rm#: 220, School of Education

Interviewee: Dr. Y

Position of Interviewee: Chair of the Department of Curriculum and Instruction

Interviewer: Hema Nair

Hema Nair: Good Morning Dr. Y.

Dr. Y: Good Morning.

Hema Nair: This is an interview that I am doing with reference to my Dissertation Research on the evaluation of an experimental data management system. So, I have about eight questions and I have e-mailed them to you before. I will be recording this interview with your permission, and if I need any further information after the interview, I will contact you by e-mail or meet you in person. Is it OK? Shall we start the interview?

Dr. Y: Yes.

1. Hema Nair: You participated in a training session on the data management system. You tried some simple exercises to enter data on web forms,
generate tabular reports, and view Catalogs of rubrics and the Spreadsheet of Curriculum and Instruction partnerships with schools for internship and practicum. The first question is: How useful do you find the data management system to be? Is it usable in your work?

Dr. Y: Given what I was able to gather from the orientation, I think the data management system would be usable. I think it will systematize the data in such a way that it is organized far better than what we have now.

2. Hema Nair: Ok, the next question. How can the system help you in your work? Do you foresee it having some significant benefit?

Dr. Y: Well, I believe it will help us give some degree of uniformity. In other words, the data set from one group to the next or from one student to the next will be consistent and that can help us. We can then identify gaps. I dealt with one just now. If we had the relevant student data in the system, it would have forewarned us of the problem months ago.

3. Hema Nair: You saw the features of the system during the training session, such as data entry using web forms, generation of tabular reports, view of the Catalogs of rubrics, and the Spreadsheet of partnerships for Internship and Practicum. The next question is: what other features would you like to see in the system in the future?

Dr. Y: Given what you just said, it seems to me that this system would give us an umbrella, with all the features and pieces functioning optimally, we could then make some intelligent decisions about what could be done, what else we
need, what we could add or delete based on the data input\(^1\) or uploading of the data\(^1\). We could then have some notion of [for example] do we have the necessary forms\(^1\) or do we need to create new forms\(^1\).

4. Hema Nair: The next question. What type of training\(^3\) would you like to receive in your next training\(^3\) session?

   Dr. Y: Well, I could go through what I went through in the earlier training\(^3\) session again but at a different pace and having some opportunity to apply as we go through the training\(^3\).

   Hema Nair: Probably more in-depth training\(^3\) with each of the features\(^1\) such as trying out more web forms\(^1\), more reports\(^1\) and so on.

   Dr. Y: Absolutely. It is almost like taking a dummy model and fabricating some data and uploading it into the system as if it were real data. That would be a hands-on opportunity.

5. Hema Nair: The next question. Would you like to receive more training\(^3\) in using the data analysis\(^1\) module that is implemented by Oracle Data Miner?

   We saw some really nice graphs and tables of metrics coming out of the data analysis\(^1\).

   Dr. Y: Yes.

6. Hema Nair: The next question. How far does the data management system meet your expectations in terms of functionality\(^1\)?

   Dr. Y: Well, at present, the features\(^1\) meet the expectations of functionality\(^1\).

   Let me guess-estimate. Let’s assume that from the above set of questions, that
we would have uniform sets of data. Therefore, I believe there will be a sense of evenness on the data from each student and it would enable us to not have hiccups.

Hema Nair: Do you mean when you have something missing in the data?

Dr. Y: Yes. You know the thing is and I was talking to Ms.Bass about it the other day. You would need somebody full-time just to manage the system: entering and uploading data\(^1\), generating reports\(^1\), performing data analysis\(^1\) and so on.

7. Hema Nair: Ok, the next question. You tried some exercises on the data management system during the training\(^3\) session. There was data entry\(^1\) via the keyboard, button clicks and so on. Was the response time\(^2\) of the system reasonable? Were there any undue delays\(^2\)?

Dr. Y: No, there were no delays\(^2\). The response time\(^2\) was good. As you are talking, I was thinking about accreditation that is coming up in 2 to 3 years. What this would help us do is to systematize all the program data. The accrediting process has changed. Everything is now submitted electronically. This system would be consistent with what CAEP is asking for.

8. Hema Nair: The last and final question. How can this system help you to analyze cohort data so as to identify gaps or weaknesses\(^5\) that can be addressed? Are the data analysis\(^1\) results from the system actionable\(^5\)? You saw some mining\(^1\) results which contain graphs, plots, tables and so on. Could
these results help you to pin-point areas for improving student performance\(^5\) or modifying the curriculum\(^5\)?

Dr. Y: I think definitely the answer to that is ‘Yes’. The data analysis\(^1\) results are actionable\(^5\). It would take the guess-work out.

Hema Nair: We have enough measures and metrics generated by this system that can pin-point certain areas of weakness or gaps\(^5\) that have to be addressed, do you think?

Dr. Y: Yes.

Hema Nair: Dr. Y, is there anything else that you would like to add to your response to this question or any of the other questions that I asked in this interview?

Dr. Y: No.

Hema Nair: Thank you so much for your time Dr. Y. I am wrapping up this interview.

Dr. Y: Thank you
REFERENCES


ellucian.com/Solution-Sheets/Banner-Integration-for-eLearning/


of an evolving software system. *Software Practice and Experience* (39), 973-1002.

