

The Relationship Between Student Information Systems
and Student Academic Achievement

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Introduction

Student Information Systems (SISs) have been described in the literature as a potential lever of student performance. The use of SISs has been reported to have a positive impact on educational outcomes. Bernhardt (2006) posits that “School districts that gather, analyze, and use information about their organizations make better decisions, not only about what to improve, but also how to institutionalize systematic improvement” (p. 2). Wayman, Springfield, and Yakimowski (2004) reached similar conclusions. They have touted the value of employing data use to improve educational practice (p. 2). However, little research has substantiated the direct link between student information systems and student academic achievement. Visscher and Bloemen (1999) argue that there is scarcity of scientific evidence regarding the effects of SISs on educational outcomes in secondary schools. This prospectus describes a study proposal that addresses the relationship between student information systems and student academic achievement within the realm of secondary education.

Problem Statement

As indicated above, there is a dearth of scholarship that examines how electronic Student Information Systems affect student learning. Studies have shown the interrelationship between SISs and parental involvement in children’s education. But there is scant literature that investigates scientifically the relationship between SISs and student academic achievement.

Purpose Statement

The purpose of this study is to measure and analyze the impact of SIS on student academic attainment in Charlotte Mecklenburg Schools (CMS), a school district in North Carolina that has adopted a number of Student Information Systems (SIS) with limited results. It is believed that the adoption of several concurrent student information systems tends to undercut

their overall effectiveness. To offset the costs associated with the adoption of multiple SISs and to save end-users the trouble of working with more than one SIS, it is suggested that CMS adopts one effective and integrated SIS. This study endeavors to elicit clear understanding of the empirical link between a consolidated SIS and student learning outcomes.

Literature Review

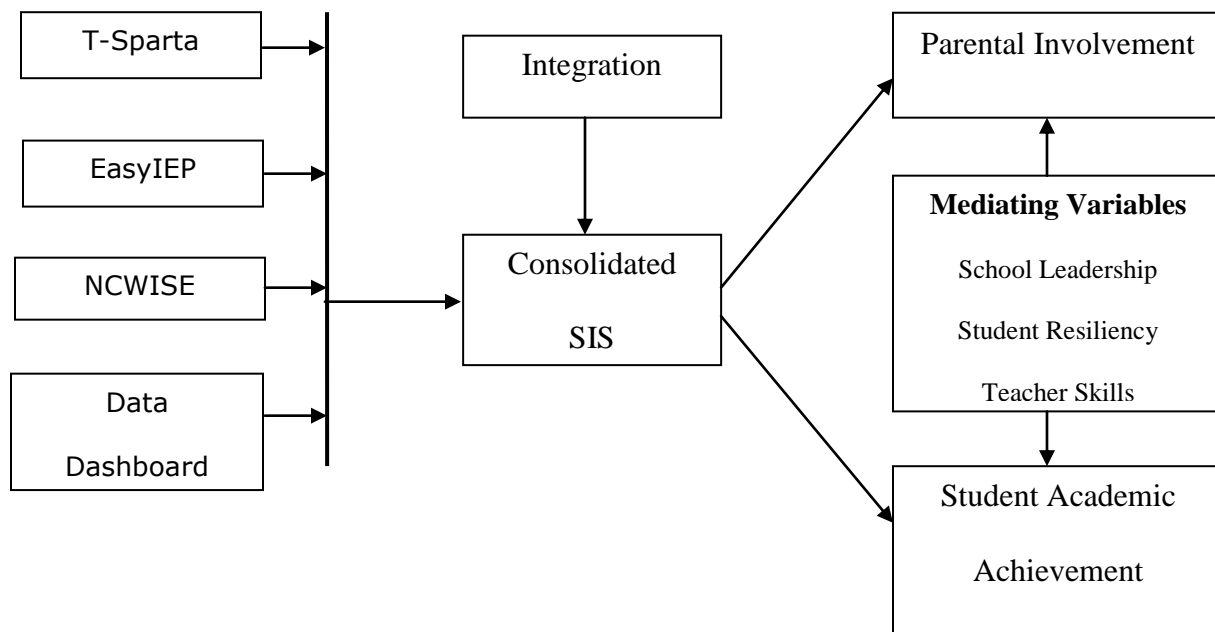
Student Information Systems are paramount to school administration and school management. Scholarship has ascertained that they play an essential part in increasing parent-school collaboration, and thereby, affecting student performance. A good deal of research has demonstrated the strategic importance of Student Information Systems (SISs) in secondary schools (Visscher & Bloemen, 1999; Barrett, 1999; and Bernhardt, 2006). Visscher and Bloemen (1999) observed that worldwide, the use of computerized student information systems “has become very important for the management of educational institutions” (p. 172). With the growing strategic importance of SIS, more school districts are implementing them in schools. As of 2006–07, nearly all school districts maintained at least some student data electronically (U.S. Department of Education, 2008). Schools are increasingly relying on technology in the form of data management systems. The effectiveness of SISs is, however, hard to quantify.

Conceptual Theoretical Framework

The conceptual theoretical framework guiding this research is conceptualized as a strategic planning framework that can guide the selection, adoption, and deployment of an effective and cost-efficient SIS capable of improving student learning throughout Charlotte-Mecklenburg Schools. The framework will combine all existing SISs into one consolidated and integrated Student Information System.

It is argued that an effective SIS should involve a mixture of these three student data management systems. Ward and Peppard (2002, p. 573-574) offer some elements of a seamless integration. They note that "The most significant elements of a 'seamless' integration of services include providing the hardware and software, integration and testing, a secure network infrastructure, reliable mission-critical data centre facilities and a highly qualified team of IT experts managing the entire solution". It is suggested that EasyIEP, Data Dashboard, and T-Sparta be integrated into NCWISE and become subsystems of the main SIS. The Student Information Systems—T-Sparta (IV1), EasyIEP (IV2), NCWISE (IV3), and Data Dashboard (IV4)—constitute independent variables, while parental involvement (DV1) and Student Academic Achievement (DV2) are dependent variables. Other mediating variables include school leadership, student academic resiliency, and teacher pedagogical skills.

Figure 1



Research Question Hierarchy

It is hypothesized that an integrated and interactive SIS will result in elevated student performance and increased parental involvement. Hence, the management dilemma of this study revolves around the question: What Student Information System improves student academic achievement? The study will address the central research question (RQ): In what way does a Student Information System (SIS) support student learning? This RQ will be supported by six investigative questions (IQ).

IQ1: What, if any, barriers exist that may prevent the selection, adoption, and implementation of an effective Student Information System?

IQ2: What, if any, barriers exist that prevent student information systems from increasing parental involvement?

IQ3: What, if any, Information Systems management impediments exist to improving the adoption process of SIS?

IQ4: What, if any, processes, policies, or standards are in place to facilitate the adoption of Student Information Systems?

IQ5: How can a school district adopt one SIS instead of multiple Student Information Systems?

IQ6: How does positive change (improvement) occur in a student's academic achievement with the use of a Student Information System (SIS)?

These questions are designed to generate insights that would enhance the understanding of the unique ways an SIS affects student learning.

Methodological Approach

The driving premise of the study is that improvement of student performance can be achieved mainly through the use of an effective and efficient student information system. As indicated earlier, the study will examine the causal link between a student information system (independent variable, X) and student academic achievement (dependent variable, Y_1), and parental involvement (dependent variable, Y_2) in K9-12 secondary schools in Charlotte-Mecklenburg School district.

A quantitative approach will be employed to collect numerical (fixed) data in support of the research question. A stratified sample of 300 full-time Charlotte-Mecklenburg School district personnel—teachers and administrators—will be chosen based on their education level, their teaching experience, and experience with various student information systems used in CMS schools. They will be separated as follows:

- Current level of education
 - Bachelor
 - Master
 - Doctoral
- Years of teaching experience
 - 0-5 (60)
 - 6-11 (60)
 - 12-17 (60)
 - 18-23 (60)
 - 24-29+ (60)
- Years of experience with SIS
 - 0-5 (100)

- 6-11 (100)
- 12-17+ (100)

A stratified sample of 100 parents will be utilized as well. The sample will encompass parents currently using student information systems, parents not currently using an SIS, and parents who may have used an SIS in the past. They will be separated as follows:

- Age group
 - 30-39 (20)
 - 40-49 (20)
 - 50-59 (20)
 - 60+(20)
- Education Level
 - High School diploma
 - Associate degree or some college education
 - Bachelor
 - Master
 - Doctoral

A questionnaire along with a cover letter and instruction sheet will be distributed to the study participants. It will consist of 30 Likert Scale questions and will be used for data analysis of the relationship between the independent variable (SIS) and dependent variables (parental involvement and student academic achievement). Follow-ups will occur after one week (thank-you cards) and three weeks (follow-up letter). Data collected from end-users will be analyzed through Multiple Analysis of Variance (MANOVA) to determine the extent of the relationship between student information systems and parental involvement, and student achievement.

Justification for choosing the particular methodological approach

A stratified sample fits this type of study. According to Swanson and Holton (2005), “Stratified sampling techniques generally are used when the population is heterogeneous, or dissimilar, where certain homogeneous, or similar, subpopulation can be isolated (strata)” (p. 53). A series of univariate ANOVA tests will be administered to see how individual SISs affect each dependent variable—parental involvement and student achievement. These tests will be followed up by a MANOVA. A MANOVA is appropriate for this study because, as Swanson and Holton (2005) note, “MANOVA creates a linear combination of dependent variables to maximize group differences and tests whether those differences are significant” (p. 133). The sample size and the nature of the variables call for a MANOVA. This combination will minimize the threats to the internal and external validity inherent in a study of this nature.

Strengths and limitations of this approach and design

Ultimately, the study is an investigation of the adoption process of an effective and cost-efficient student information system. It is assumed that a well-designed and properly adopted SIS can yield significant educational outputs for students. For the study to be effective, system designers and decision makers need to be involved in the study. Not involving SIS designers and Chief Information Officers (CIO) who adopt these systems might affect the study. However, the fact that three data sources (teachers, administrators, and parents) are included may solidify the validity of the results. Additionally, the quantitative techniques used along with the representativeness of the population of end-users may enhance the validity and reliability of the study findings.

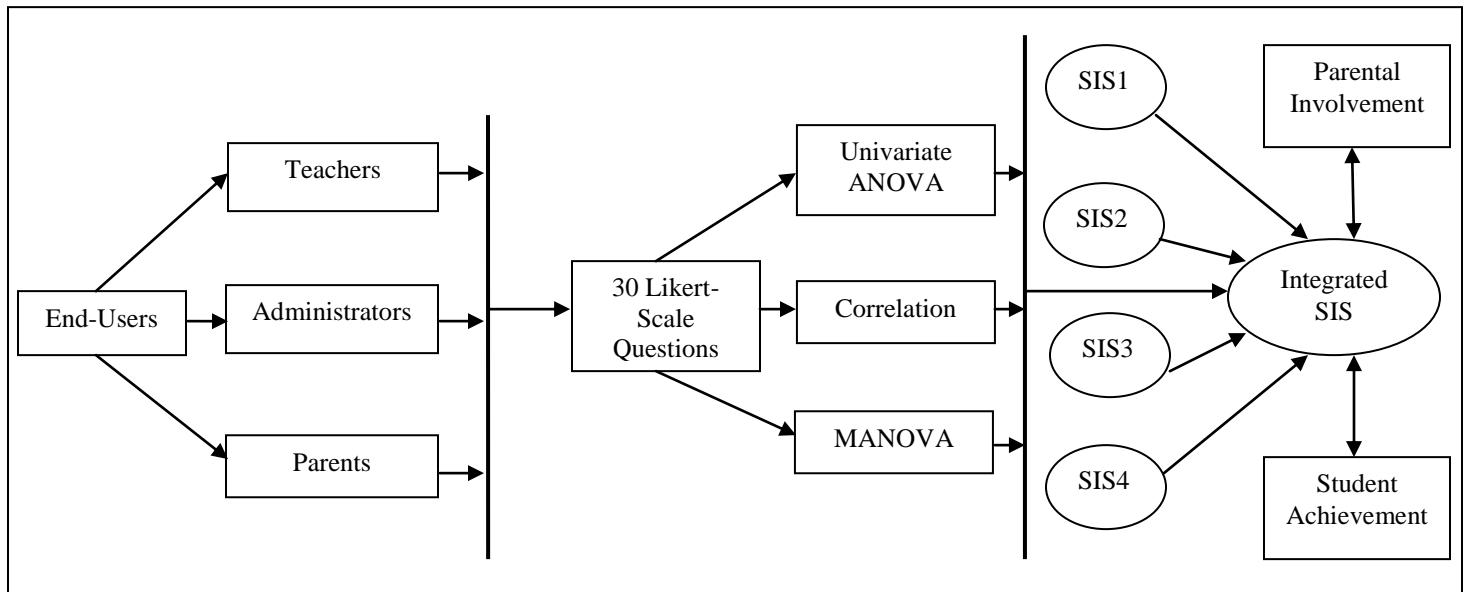
Sources of information and measurement plan

As indicated earlier, a stratified sample will be used for this study. It comprises three main categories of contributors: teachers, school administrators, and parents. Participants will be selected on the basis of their availability and their familiarity with student information systems used in Charlotte-Mecklenburg schools. They will be selected in a systematically random way to guarantee the probability of representation. The stratification variables used—education, experience with SIS, teaching experience for teachers; age range and educational level—are meant to correlate with the level of support of SISs. Effect sizes will be measured to quantify how much sample results will diverge from the null hypothesis. A sampling process error will be conducted to check the alignment of the sample with the population of SIS users.

Data collection plan and procedures

Data collection will cover a period of one month. From January 2012 to February 2012, data will be collected from end-users. Figure 2 shows how data analysis will be conducted.

Figure 2: Positivist/Quantitative Approach



Significance of the study and potential contributions

With the growing strategic importance of SIS, school districts are increasingly adopting and implementing electronic student information systems. As of 2006–07, nearly all school districts maintained at least some student data electronically (U.S. Department of Education, 2008). Despite the widespread use of SISs, scientific studies have yet to measure the extent of the relationship between SISs and student achievement and parental involvement. Most studies tout the value of SISs in boosting student achievement but fail to account for the existence of the link. This study will examine the link between student information systems and student performance and parent involvement, and will show how SISs affect learning outcomes in measurable terms.

Ethical considerations

A study of Student Information Systems can be highly delicate because it involves sensitive student data. The type of student data these systems store may vary. NCES (2000) describes the contents of SIS as follows: “Typical contents may include family information, courses taken and grades, special program participation information, immunization records, assessment scores, extracurricular activities, and other information that is used by the education system to promote student success and provide appropriate services” (p. 2). It is incumbent upon this researcher to protect student data as well as the confidentiality of study participants.

Furthermore, it is important that a researcher explains the nature, the scope, and the purpose of the study to the study participants. “This puts participants at ease, lets them know to whom they are speaking, and motivates them to answer questions truthfully” (Cooper and Schindler, 2011, p. 33-34). One of the benefits of doing this is improved cooperation. In fact, Cooper and Schindler (2011) note that “knowing why one is being asked questions improves cooperation through honest disclosure of purpose” (p. 34). This researcher will abide by these strict ethical guidelines.

Personal reflections and insights

Bernhardt (2006) argues that all school districts need data warehouses. She notes, “It is simply no longer an option not to have one” (p. 358). In fact, it is not enough for a student information system to store student data. It should allow users to analyze the data stored and make informed educational decisions. By its design, a student information system needs to meet a number of core requirements: Interactivity, user-friendliness, access to statistics, and data visualization.

This study will demonstrate the need for the Charlotte-Mecklenburg Schools district to review the adoption process of its student information systems. The lack of integration limits the effectiveness of existing student information systems. The current SISs can be unified and consolidated into one integrated SIS that can meet the needs of the users.

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