Improving Student Learning: A Strategic Planning Framework for an Integrated Student

Information System for Charlotte-Mecklenburg Schools

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Abstract

There is growing recognition that an electronic Student Information System (SIS) affects student learning. Given the strategic importance of SIS in supporting school administration and enhancing student performance, school districts are increasingly interested in acquiring the most effective and efficient Student Information Systems for their schools. Over the years, the Charlotte-Mecklenburg Schools (CMS), a school district in North Carolina, has adopted a number of disjointed SISs with limited results. Adopting a successful SIS that has direct and positive effects on standardized test results, grade point averages, and authentic assessments requires a sound strategic plan. This paper provides a critical overview of SISs currently used in CMS and outlines 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 combines existing SISs ─ NCWISE, EasyIEP, and T-Sparta ─ into one consolidated and integrated Student Information System.

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Introduction

The increased importance of web-based Student Information Systems as a factor influencing student learning and the need to increase parental involvement in education have caused a paradigm shift in school administration. Web-based student information systems are increasingly replacing traditional, paper-based student record keeping systems. Currently, many schools are using SISs because they allow instant access to student records, sparing school administrators and teachers time and energy. The Journal (2000), a magazine dedicated to transforming education through technology, notes the change that has occurred with the advent of Student Information Systems. "Administrators no longer need to run from classroom to classroom or search from file to file to get the information they need, as the system provides instant access to all student records with a simple point and click" (p. 92). This goes to show that there has been a tremendous evolution in student data management systems.

Although there is scarcity of empirical evidence regarding the implementation process and effects of SISs (Visscher and Bloemen, 1999), it is undoubtedly evident that the use of SIS does have a positive impact on educational outcomes. Visscher and Bloemen (1999, p. 184) found in their 1997 survey of 498 Dutch secondary schools that "SIS use has led to better insight into school functioning, better evaluation of school performance, improved use of resources, better internal communication, and better information for curriculum planning".

Wayman, Springfield, and Yakimowski (2004, p. 2) echo similar conclusions reached by school effectiveness researchers. These researchers have touted the value of employing data use to improve educational practice. Indeed, several studies support the correlation between student data systems and improved student learning. By providing timely relevant and accurate information about student curricular choices, standardized test results, progress reports, parent-

teacher conferences, curriculum nights, Student Information Systems can ultimately increase

parent-school collaboration. It is pertinent to point out that effective parent-school collaboration

usually results in increased student academic performance and improved student conduct.

Bernhardt (2006), Executive Director of the *Education for the Future Initiative*,

demonstrated immensely the cause-and-effect relationships between effective use of data

management systems in Canyon View School District and the positive education outcomes. Her

study revealed that school districts that make effective use of student data do improve district

processes and student learning because they have a clear understanding of the impact of

processes on student population. Furthermore, student data allows school districts to identify the

root causes of problem areas. As a result, they base their decision-making processes on facts

rather than hunches and hypotheses. Similarly, it is our view that teachers who make decisions

based on actual facts/hard data, and objective considerations are more likely to implement

successful teaching strategies than those who use hunches and intuition.

Ultimately, the interrelationships between SIS and student academic achievement may

explain why many school districts including CMS have been under pressure to adopt student

information systems. Visscher, Wild, and Smith (2003, p. 34) note that SIMS (School

Information Management System) has the largest market share of computerized school

administration systems in England. Thus, England recognizes the centrality of Student

Information Systems in improving student performance. According to Visscher (1999), who

designed and evaluated an integrated school information system (SIS) for Dutch secondary

schools, SISs are widely used because of the quality of information they produce. In the United

States, federal and state accountability requirements including No Child Left Behind partially

account for increased attention that Student Information Systems are receiving.

In essence, the Charlotte-Mecklenburg Schools has a multitude of student information systems and teacher management information systems. Each performs a particular function. In 2004, CMS implemented a web-based, state-mandated SIS known as the *North Carolina Window on Student Education*, commonly referred to as NCWISE. This SIS replaced an outdated and antiquated SIMS, which was the official public schools' data collection source in North Carolina public schools for more than 20 years. Believed to be more effective, NCWISE operates alongside three other SISs: *EasyIEP* for personalized education plans, *T-Sparta* for student academic history, and *Data Dashboard* for district-wide school reports. It should be noted that NCWISE is the main SIS used in CMS schools. EasyIEP, T-Sparta, and Data Dashboard are ancillary SISs.

Analysis of these SISs reveals gaps and operational overlap. It also shows the need for an integrated SIS. By combining three of these SISs into one consolidated and integrated SIS, CMS will avoid wasting IS/IT investments. Furthermore, it will harness more benefits in terms of academic performance and data-driven decision-making. In addition to a positive impact on student grade, a solid student information system will increase parent-school contact; hence, preventing such problems as repeated failing grades, school suspensions, and dropouts. Thus, it will assist in exploring individual differences among diverse students, academic growth over time, discrepancies in learning outcomes, learning styles, behavioral problems, and curriculum-based problems. Simply put, an effective SIS can help identify root causes of learning successes and educational problems. The purpose of this paper is to suggest a comprehensive framework for the adoption and deployment of an integrated SIS that can yield practical educational results in Charlotte-Mecklenburg Schools.

Definition and Scope of SIS

It is important to establish at the outset a clear understanding of the notion and scope of Student Information System before providing any strategic perspective on an integrated system. Several terms are frequently used to describe a Student Information System (SIS) in the research literature. They include "Student Information Systems" (SIS), "Student Management Information Systems" (SMIS), "School Management Information System" (SMIS), "Student Monitoring System" (SMS), "Student Data Systems" (SDS), "Student Data Warehouse" (SDW), "Student Academic Information Systems" (SAIS), and "Student Information Management Systems" (SIMS). On close examination, all these concepts are essentially similar. Indeed, all these nomenclatures suggest that there is a clearly heightened emphasis on managing student data for better educational outcomes.

Wild, Smith, and Walker (2001, p. 100) define SIMS as "a modular system comprising various different elements. It is an integrated system in that once entered, core data is available to other modules". Barrett (1999), Director of Technology for Conroe Independent School District in Conroe, Texas, also views a student information system as an integrated system. He defines SMIS as "an integrated software package that maintains, supports, and provides inquiry, analysis, and communication tools that organize student accountability data into information to support the educational process" (p. 4).

The U.S. Department of Education (2008) considers student data systems as encompassing "hardware and software that provide many different functions to users, such as storing current and historical data, rapidly organizing and analyzing data, and developing presentation formats or reporting interfaces" (p. 2). The IDANET Steering Committee (2003)

defines ISIMS as "a secure, centralized data system where public school information is stored, accessed and analyzed" (p. 2).

It is our view that an effective SIS should encompass the following key performance indicators: 1) collect student data, 2) increase parental involvement, 3) analyze and measure comprehensive student data, 4) make informed decisions based on results of data analysis, 5) identify learning problems, 6) create personalized education plans, and 7) diagnose student learning styles.

Objectives of SIS

Student Information Systems are used to fulfill a number of data-processing functions in schools. Visscher (1996, p. 324) summarizes these functions as follows:

1. Computer database update: recording changes in the organizational environment and changes within the organization itself.

2. Information retrieval and document production: reporting on the organizational situation for operational activities that require little or no problem diagnosis because data leads directly to the action to be carried out.

3. Decision-making support: some problems are structured, i.e., have a limited number of solutions and the way in which they have to be solved is known.

4. Decision-making: the computer "itself" makes a decision on the basis of available information.

5. Communication: mutually connected computers exchange messages and other data with other staff and other organizations.

According to Visscher (1996), SISs can be used to evaluate student long-term progress; therefore, allowing school administrators and teachers to assess strengths and weaknesses of individual students. More recently, SISs have been used to store student 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 (NCES, 2000).

In a nutshell, a student information system is one the best tools that can help a school and parents work together to promote student learning and success. It should be designed to help a school "increase success and decrease failure", to borrow Jenkins's (2003) expression. It should serve as a tool for collecting student progress data and for monitoring alignment with educational processes and continuous improvement of student learning. The ultimate goal of a student information system is to improve student learning.

Overview of Student Information Systems used in CMS schools

Second largest school district in North Carolina, the Charlotte-Mecklenburg Schools (CMS) district is located in the city of Charlotte in Mecklenburg County. It currently serves 133,664 students and employs 18,862 people. It has 176 schools—103 elementary schools, 33 middle schools, 31 high schools, 4 alternative schools, and 5 pre-K schools. It is operating this school year with a budget of $1.14 billion (Charlotte-Mecklenburg Schools, 2010).

With an ever-increasing student population, CMS has implemented several disjointed and unrelated SISs within the last few years, notably NCWISE, TeacherEase, T-Sparta, EasyIEP, and Data Dashboard. They are all structured to help students achieve greater academic proficiency. Here is a quick overview of four of these student information systems: EasyIEP, Data Dashboard, NCWISE, and T-Sparta.

EasyIEP

EasyIEP is a web-based database that allows teachers to track student progress and recommend individualized, personalized education plans for students who are failing some core courses. This is a newly adopted program. Teachers are currently being trained to use it. It is a

fairly good program. But its efficiency could be enhanced if it was integrated into NCWISE, a

student information system which is used to manage student grades and other records. An

integrated system would save teachers time and would allow teachers to make more effective

decisions based on student grades.

Figure 1: Screen shot of EasyIEP
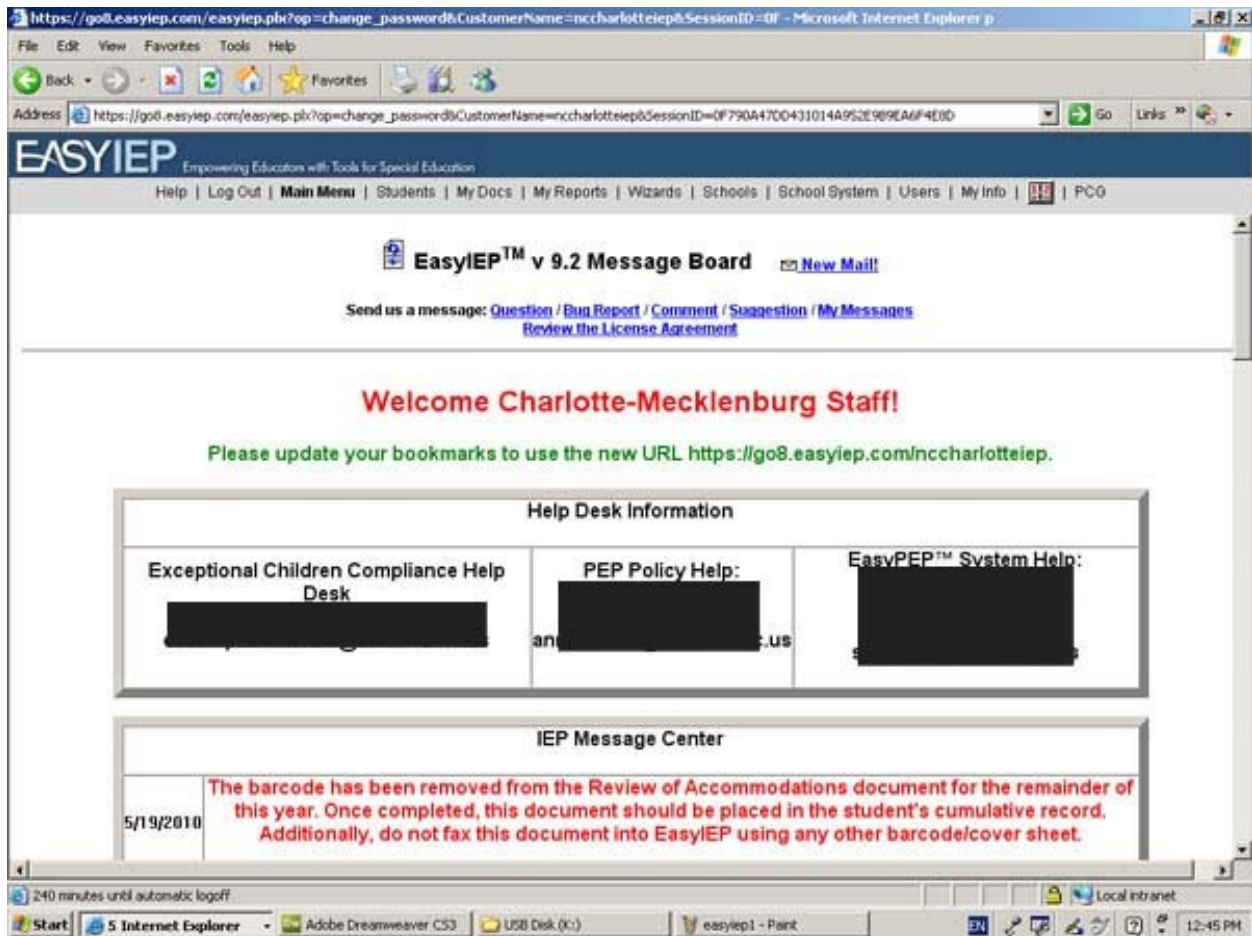
The CMS Chief Information Officer notes that "EasyIEP is not a scheduling system, but a

system for the management of the individual education plans required for our students with

disabilities. It was selected at the department level and Technology Services assists with its

interface back into the CMS data warehouse". CMS is currently building special teacher portals

to allow EC teachers to see this level of detail in the fall of 2010, the CIO went on to say in

response to one of five questions we asked her for this paper.

Data Dashboard

Data Dashboard is a web-based, interactive database which was designed to allow the

community to access data about a school, a learning community, and the school district as a

whole. It is an interactive online tool for parents, CMS staff and the community. According to

CMS, it "offers in-depth data profiles of the district as a whole, academic achievement and CMS

performance in many areas of teaching, learning and school operations" (CMS Performance,

2010).

Figure 2: Screen shot of CMS Data Dashboard
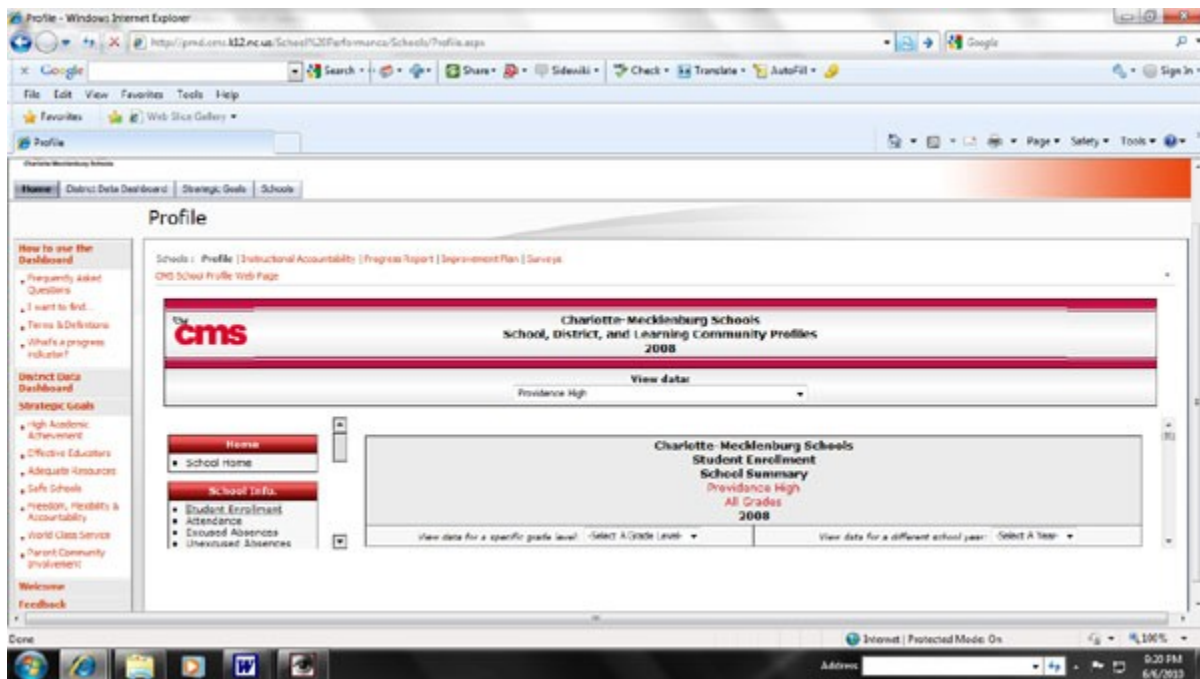
The CIO describes it in the following terms: "Data Dashboard was developed as a pilot

representation of the district's and school performance on some high level indicators. It is not

"live data" in that it relies on static data sets that are updated once a year. In Phase II of the

Managing for Performance project, the current data dashboard will be completely reworked".

The context for creating the Data Dashboard can be summarized as follows:

> "The Charlotte-Mecklenburg Board of Education established Reform Governance Policy
>
> AEC in October 2006 so that everyone in the community could see how our schools are
>
> performing. The first page of the dashboard is intended to offer an assessment of the
>
> district's performance at a glance. It includes easily accessible measures of operations,
>
> such as school safety and bus punctuality, as well as measures of district progress toward
>
> the goals in the *Strategic Plan 2010: Educating Students to Compete Locally, Nationally*
>
> *and Internationally.* The plan is the district's map for progress through the year 2010 and
>
> the Board wanted the public to be able to assess our progress" (CMS Performance, 2010).

Currently, Data Dashboard works quite well. It is an effective and efficient communication tool

for the district. However, it is worth wondering what will happen to Data Dashboard after 2010

since it was designed to showcase the progress of individual schools through 2010. The state

budget shortfalls will ultimately affect any plan to implement Phase II of the district's initial

plan.

NCWISE

Used in over 1,000 schools in the state of North Carolina, the North Carolina Window of

Information on Student Education, commonly referred to as NCWISE — the main SIS used in

CMS schools — was first introduced to North Carolina Public Schools in 2004. In 2009, it was

implemented throughout the state's 115 LEAs and 98 charter schools. NCWISE has three basic

components: Electronic Student Information System (eSIS) which allows individual schools to

manage student information, Electronic Data Interchange which provides the capability to

electronically transmit all student instructional records and demographic information between

school districts, between schools within a district and to universities and colleges in North

Carolina, and Uniform Education Reporting System (UERS) which transfers information from

the local school district to the North Carolina Department of Public Instruction (NCDPI).

Figure 3: Screen shot of NCWISE

The CMS CIO describes NCWISE as follows: "The student information system is mandated by

the State. There is a policy, NC State Board of Education TCS-C-018. CMS was the first

district installed on the eSIS (commonly referred to as NC WISE) and remains the leader in the

usage of the system." NCWISE was deployed in three phases throughout 115 schools. It is

important to note that NCWISE uses Parent Assistant to allow access to student grades online.

Hence, it serves as a parent-school communication system.

T-Sparta

T-Sparta, on the other hand, allows teachers to access a wealth of information about a student including academic history and socio-economic status. The Charlotte-Mecklenburg Schools Chief Information Officer notes that "T-Sparta is considered a rogue system by Tech Services. It started out as a series of reports of the data warehouse, then evolved to have a user interface for the teachers. As a rogue, it is not well supported and not documented – a risk for its long term use. As a result, Tech Services and Accountability have agreed to move any T-Sparta functionality into the official Managing for Performance teacher and principal portals."

Figure 4: Screen shot of T-Sparta

T-Sparta can be used to set achievement goals for students in reading, math, science, and technology. Teachers can use specific information about student academic history and socio-economic background to plan differentiation activities.

Other E-Tools used in CMS Schools

The Charlotte-Mecklenburg Schools (CMS) district strives to make a sound use of all its IT/IS resources to allow its students to compete locally, nationally, and internationally. With respect to e-tools, there are a variety of ways in which CMS uses electronic resources effectively. One good example is its Intranet. The CMS Intranet is a full-fledged, integrated information portal consisting of many relevant e-resources that staff needs. It has specific tools that teachers and administrators use on a daily basis. The Intranet allows them to access their webmail. The Intranet has many other resources including *MyPD*, *Liquid Office*, *Moodle*, *NCWISE*, *Learning Village*, *Payroll Schedules*, Performance evaluation tools, *SmartFindExpress* (a substitute and employee management system for schools), and to mention a few. It also includes surveys for instant feedback on school issues.

With respect to MyPD, this e-tool lets teachers manage their professional development activities and keep track of their credit renewal status. This is a very important tool because teachers are able to track their professional development progress. One of the drawbacks of this program is that teachers have to register for workshops and upload their own renewal credits earned. Teachers may lose credits if they fail to do so. This actually happened to me. I have no credits from 2005 to 2006 because I did not register for workshops through MyPD. I expected the site administrator to do it for me as was the case in the past.

Liquid Office lets teachers access their observation reports. *SmartFindExpres*s allows

teachers to report absences, find substitutes, and upload assignments or class activities for

substitutes. Moodle, a Course Management System, offers teachers an opportunity to view

resources (course blueprints and curriculum guides). It also offers a forum platform for teachers

to interact with one another. It promotes student engagement.

As noted earlier, in addition to the Intranet, the district has a vibrant and interactive

website. It streamlines podcasts and videos (sometimes aired on the district's closed-circuit

television channel, CMSTV). It contains several links to useful resources such as

DataDashboard, *EasyIEP*, *Parent Assistant*, and *Parent University*. All of these resources are

invaluable for parents to stay involved in their children's education.

School websites have a unified interface and design, conforming to CMS's vision of a

school's website. CMS has content policy that all school webmasters must abide by. Webmasters

are required to strictly follow CMS guidelines for maintaining and designing websites. As the

Webmaster of Harding University High School, I have to follow CMS guidelines for

Webmasters.

Furthermore, teachers are required to have personal websites. *CMS Pages* is the sole

proprietary web development authoring program that teachers have to use. It has a limited

number of templates for teachers. The *CMS Pages* online resource center provides tools and

utilities to help teachers build their sites, convert files to PDF format, resize images, and create

tables in HTML codes (CMS Pages Support, 2010). Teachers are required to use their websites

effectively to communicate with parents and students. As the web trainer at my school, it was my

duty to train every teacher to use CMS Pages (Harding University High School, 2010). My

website provides an illustration of what the principal's expectations of a teacher's website

(Ngoma, 2010). It was reported that *CMS Pages* will be replaced by *Microsoft SharePoint* next

school year.

In any event, CMS has three important goals for this school year: 1) Provide all students

with the opportunity to perform to their fullest potential; 2) Ensure there is no discernible

achievement gap among students based on race, gender or economic level; and, 3) Prepare all

students to be successful in institutions of higher learning or the workforce without remediation

(CMS Strategic Plan, 2010, p. 17).

Clearly, electronic resources are essential for CMS to attain its educational goals and

promote a professional culture. As indicated earlier, the Intranet is one of the resources that is

paramount for helping CMS faculty and staff move into a more professional culture. Bennett

(2007) argues that "cultural knowledge is conveyed and renewed through the intranet" (p. 35).

The Intranet has several tools that assist CMS teachers grow professionally.

But developing a seamless integrated Intranet requires users' input. As Whitehouse

(2006) notes, "key to developing a successful intranet is to work collaboratively with your

audience—faculty, administrators, and, most significantly, students—to reflect their world view.

As obvious as this may sound, it is often overlooked. When the effort to develop an enterprise-

wide portal comes from the enterprise itself, the final product often reflects that viewpoint" (p.

67). Bernhardt (2006, p. 10) notes that "Learning takes place neither in isolation, nor only at

school. Multiple measures must be considered and used to understand the multifaceted world of

learning from the perspective of everyone involved". Successful school districts utilize all their

resources (including electronic resources—Intranet and Internet) effectively and focus on clear and measurable results aligned with high academic standards.

Lack of Integration of Student Information Systems

A good deal of research has demonstrated the strategic importance of Student Information Systems (SISs) in secondary schools (Visscher & Bloemen, 1996; Barrett, 1999; and Bernhardt, 2006). This has led many schools to adopt multiple isolated SISs that are sometimes disconnected from each other. Visscher and Bloemen (1999) point out that "Worldwide, the use of computerized school information systems (SISs) has become very important for the management of educational institutions" (p. 172). Despite the improved efficiency goal assigned to these systems, they tend to undercut their overall effectiveness because of their lack of integration with instructional curricula.

The question of SIS integration into instructional curricula has received considerable attention among educational leaders, decision-makers, and system designers in the recent past. The integration question arises because school districts are adopting several student information systems at the same time and are relying heavily on SISs. As Barrett (1999) observes, in an effort to efficiently document and maintain accountability data, schools are relying more on technology in the form of student management information systems (SMIS) (p. 4). The Charlotte-Mecklenburg Schools (CMS) district, for instance, has implemented several unrelated SIS recently, notably NCWISE, TeacherEase, I-Sparta, T-Sparta, EasyIEP, and Data Dashboard. All CMS teachers are required to use more than one SIS notably NCWISE, T-Sparta, EasyIEP, and Data Dashboard.

Each of these systems is assigned a specific goal. EasyIEP was designed to manage individualized student plans, NCWISE manages student attendance and grades, T-Sparta and I-Sparta manage student records, and *Data Dashboard* allows everyone to access data about a school, a learning community, and the school district as a whole. According to the superintendent, Peter Gorman (2008), *Data Dashboard* gives site visitors "CMS at a Glance" (¶. 2). TeacherEase was briefly used in a few CMS schools before it was replaced with NCWISE.

The rationale for the adoption of these systems is unclear. Teachers have to use multiple heterogeneous and complex SIS to manage student data and performance. This may place them in a difficult position. CMS can implement one single integrated SIS which can perform the functions of all other SISs for teachers. That would save teachers, parents, students, school administrators the hassle of using several systems. Furthermore, analyzing the current and future needs of the district, schools, students, teachers, parents, and community in several student information systems in order to plan for the future may not be easy.

There seems to be a tendency for CMS to acquire numerous student information systems for a variety of reasons. As Tinio (2009) notes, "planners should go with tried and tested systems; stability issues plague many of the latest technologies. Again, the rule of thumb is to let the learning objectives drive the technology choice and not vice versa—the latest technologies may not be the most appropriate tools for achieving the desired educational goals" (p. 20). Our purpose is not to suggest that CMS adopts a tried and tested SIS. We believe that NCWISE is a fairly good foundational system that needs major improvements.

The lack of student information systems integration is due to a lack of coordinated effort and proper planning. Some systems are selected by state legislators (NCWISE, for example);

some are selected by district technology services without involving end-users. An SIS that is not

primarily tested and adopted by end users may present design and usability challenges.

As can be seen, the way CMS and the North Carolina Department of Public Instruction

adopt SISs plays a part in the systems effectiveness. One issue emerging from the multiplicity of

student information systems in Charlotte-Mecklenburg Schools is a lack of integration. An

integrated student information system which meshes with curricular goals is a critical enabler for

efficient student record management. One of the solutions is a systems integration plan.

SIS Adoption Framework

An SIS is to be viewed as a core educational resource that must be exploited strategically.

In view of current SISs used in CMS, it appears that a more comprehensive approach is needed

before effectively deploying an effective SIS throughout the school district. CMS has a plethora

of disconnected student information systems. Moreover, it has a multitude of outdated data

management systems.

Clearly, some of these systems are not aligned with the bold goals stated in the 2014

Strategic Plan. Part of the reason is that major decisions regarding the selection and adoption of a

new SIS are made without involving end-users (teachers and school administrators). The cursory

web-based surveys seeking teachers' input do not allow teachers to share helpful opinions. Most

decisions are made by state legislators, state and district technology services. Another reason is

that the Strategic Plan teams do not always involve experts with a mix of instructional

technology knowledge and teaching experience.

The CMS Chief Information Officer described the SIS adoption process. "After selection

and contract negotiation, then a full scale project plan is developed to take the software through

implementation (whether internal or web based), train all users, test the software against the

functional requirements list, then take it to go-live. Plans must be made for the ongoing training

and support of any system and annual maintenance processes must be documented."

There is urgent need for a different strategic planning approach. Allison and Kaye (1997)

propose five steps for an organized process: (1) Identify specific issues or choices that the

planning process should address, (2) Clarify roles (who does what in the process), (3) Create a

Planning Committee, (4) Develop an organizational profile, and (5) Identify the information that

must be collected to help make sound decisions. Such an approach can benefit CMS, especially

with respect to SIS adoption. An SIS system must be effective and efficient. Woo et al (2006, p.

199) suggest a three-dimensional adoption framework: efficiency, effectiveness, and reusability.

Ward and Peppard (2002, p. 151) believe that efficiency, effectiveness, competitive or value-

adding objectives must be included in an IS/IT strategy for an effective exploitation of IS/IT

process.

Clearly, it is not enough to select an SIS strategy; the strategy must yield practical

educational results. A new strategic approach is needed to develop an effective SIS for CMS. It

is clear that the design of a strong SIS which can yield significant results must involve end-users.

Teachers and school administrators must be surveyed and consulted for their expertise and

experience with SIS use. They should not be expected to use a system that can affect them

directly without their input. According to the CIO, CMS is considering adopting a new and

improved SIS. "We are moving our eSIS (NC WISE) application to a hosted data center in

Rutherfordton, NC in the next 12 months. We will be up-revving it to version 12.1 at the end of

June. There has been a long standing rumor that the State is looking for a replacement to AAL's

eSIS, but with the budget situation, I don't think this will occur for a few more years yet."

Surprisingly, no one has asked teachers and school administrators in a systematic way how they feel about the systems that they are currently using.

SWOT Analysis of NCWISE

Several end-users ― teachers and administrators ― expressed their opinions regarding the effectiveness of NCWISE in a 2009 survey that we conducted (Ngoma, 2009). The results of the survey show that NCWISE end-users have mixed feelings regarding the effectiveness of the SIS. Perceptual strengths and weaknesses of the system expressed by NCWISE users are presented in the table below.

Table 1: Summary of NCWISE strengths and weaknesses

Strengths	Weaknesses
• Ease of use	• Does not generate seating charts
• Grades availability online	• Does not allow teachers to modify reports
• Student attendance	
• Ease to generate and print progress reports	• Does not interface with MS Word
	• Offers limited customization options
• Access to student schedules	• Is not flexible and interactive enough
• Ease to post grades	• Cannot handle blank grades
• Ability to share assignments	• Does not show pictures of students
• Parents' contact information	• Does not provide parent email links
• Better communication with parents	• Does not store parent email addresses
• Reduces frequency of phone calls	• Unreliability of the program
• Increases parental involvement	• Too slow at times

• Parents can keep up with student grades	• Takes time to update student information
• Ability to modify assignments	• Too many clicks
• Opportunity to track student academic progress	• Wastes a lot of paper
• Insight into teacher's ability to provide prompt feedback on student assignments	• Does not emphasize correct information on reports
• Shows students where they stand	• Is not user-friendly
• Allows students to maintain good grades	• Too complex
	• Missing task reports
	• Does not show assignments where student receives zero
	• Lack of sufficient training

Clearly, NCWISE has many positives listed above but still needs improvement. It is not very effective in managing student performance. It was not designed to be performance-driven. It is not a key driver or enabler of student performance. Currently, NCWISE is not sufficiently interactive. Parents and students can check grades online but do not have the opportunity to use the system interactively to see the factors that influenced a given grade or a documented discipline log that influenced a conduct. Grades and conduct assigned to students are "silent" in a way. Yet, the system could also allow parents to query about a child's conduct, grade, absences, teacher's notes, and so forth. Parents could check whether grades are standards-based or curriculum-based. It could allow parents to analyze specific data about their child's performance and conduct and make informed decisions that can better assist their child.

In addition, NCWISE is used concurrently with other EasyIEP and T-Sparta. However, NCWISE does not have the same level of interactivity as EasyIEP. Hence, CMS has a unique opportunity to make NCWISE an effective analysis tool. By not exploiting several possibilities that NCWISE may offer, CMS is not making an optimal use of the potential of its main SIS. NCWISE does not actively promote collaboration between parents and schools.

It is worth noting that collaborative interaction between parent and school is important in children's education. According to a 2003 study conducted in a middle school by Common Goal Systems Inc., the company that designed TeacherEase, "When a parent or student checks grades on-line, student performance improves dramatically: grades increase 5-8% and missed work drops by 40%" (Common Goal Systems Inc., 2010). As the study points out, the use of TeacherEase, a web-based gradebook for teachers, is positively associated with student success. Although Common Goal Systems Inc. may have reasons to prove the effectiveness of its product, but as a former user of TeacherEase, I can ascertain that TeacherEase does affect student performance by increasing parental involvement.

Eccles and Harold (1996) highlight reasons why parents are not more involved in their children's education. Those reasons include time, energy and/or economic resources, familiarity with the curriculum, confidence in one's ability to help, attitudes regarding the appropriate role for parents to play at various ages, and prior experiences with the schools that have left some parents disaffected. An ineffective SIS can be added to this list. Instead of reducing the communication gap between school and parents, it widens the gap.

But even more importantly, an ineffective student information system that cannot influence parental involvement and does not increase parent-school contact is dangerous. It can, thus, impede student learning by not encouraging and not promoting effective collaboration and

interaction between school and parents. Accordingly, an ineffective SIS can hinder decision-making and data analysis processes by providing disparate data that can be hard to organize into an efficient database. In fact, educational leaders can be misled to make the wrong decisions based on the quality of data provided by an SIS. Thorn (2001) cited by Wayman, Stringfield, & Yakimowski (2004, p. 4) described a case study where a district was ready to implement data based decision-making, but technological barriers hindered the process.

Overall, NCWISE appears to be a valuable tool for student data management. However, users' responses also provide indications of several areas of improvement. The findings of the SWOT analysis indicate that despite an overwhelming preference of NCWISE to SIMS, NCWISE still needs improvement. It is important that any steps to improve it take into account the perceptual strengths and challenges reported in the survey. There are evident reasons why NCWISE should be designed in such a way that it dynamically promotes parental involvement in education. Several research studies have demonstrated that parental involvement is essential in a child's success.

Toward an Integration of Existing Student Information Systems in CMS

The analysis of the existing student information systems architecture reveals that the limited effectiveness of student data systems used by CMS is attributable partly to the lack of SISs integration. It is my view that a unified and consolidated SIS which combines NCWISE, EasyIEP, and T-Sparta will provide the user more flexibility and will be more beneficial to students.

The CIO alluded to possible changes to NCWISE. The changes do not include a systems integration component. Responding to our survey question "What changes, if any, are expected for the near future?", she said: "We are moving our eSIS (NC WISE) application to a hosted data

center in Rutherfordton, NC in the next 12 months. We will be up-revving it to version 12.1 at

the end of June.   There has been a long standing rumor that the State is looking for a

replacement to AAL's eSIS, but with the budget situation, I don't think this will occur for a few

more years yet."

Furthermore, she also painted a profile of an effective SIS in response to our question

"What is your vision of an effective student information system? Her response shows that she

shares the users' pessimism regarding the effectiveness of the current system. She observed that

"An effective system is one that meets 90% or more of the district requirements to manage the

student population effectively. It captures the important information about the student's lifecycle

in CMS, has quality assurance built in so that data entered is the best it can be, flexes as the

district's needs flex, is easily maintained and grows with the district through time. Our eSIS is in

that class I would say, but it is struggling to deal with ad-hoc grouping of students for special

attention – commonly used in elementary schools." It is critical that CMS consolidates its three

SISs into one. Below is the integration model that we recommend.

Figure 5: A model of SISs Integration
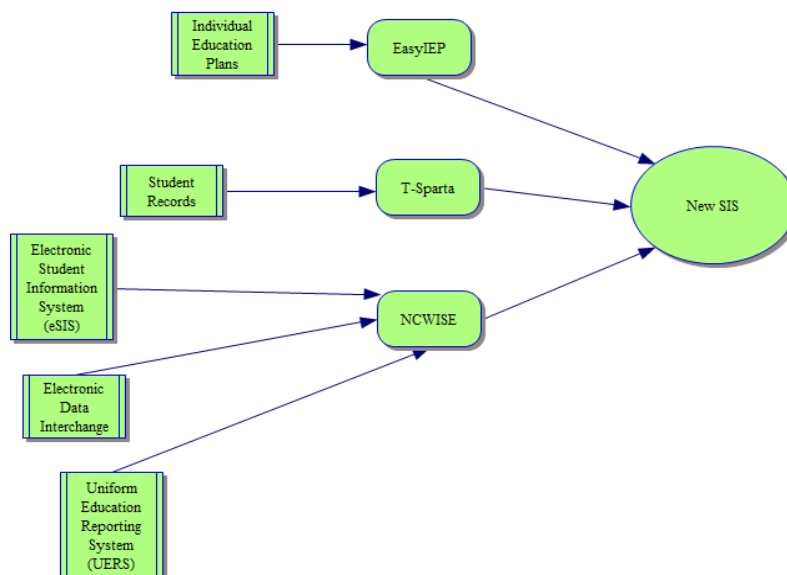
It should be noted that any consolidation or improvement of NCWISE that does not take into account the other two SISs notably, EasyIEP and T-Sparta, may result in an ineffective student data system.   An effective SIS should involve a mixture of these three student data management systems. Ward and Peppard (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". We are advocating that EasyIEP and T-Sparta be integrated into NCWISE and become subsystems of the main SIS. The development, production, test/verification, deployment/installation, operation, support, and training for the resulting revamped NCWISE must be overseen by a carefully selected strategic planning team comprised of technology services experts, teachers, school administrators, and (outsourced) system developers.

It is crucial for CMS to develop a clearly articulated strategic plan for a student information system. The plan needs to consider the educational goals that the SIS is expected to support. Rather than developing a number of systems throughout the school year, one solid student information system can successfully fulfill the tasks of three or four systems. A well-structured and integrated SIS can facilitate the necessary changes needed to improve student learning. Learning Point Associates (2006, p. 4) posit that "Data fuel the process of change. Schools and districts should have electronic data systems that store data and make it easy to extract useful information".

An effective and efficient SIS should include a component about the learning styles of individual students. If teachers can use a student data system to find out individual students'

learning styles, that knowledge can enlighten their teaching strategies. Nothing makes teaching much easier for the teacher than knowing the learning styles of individual students.

Improving Student Learning: Critical Success Factors

Bernhardt (2006, p. 3) notes that "Very few districts take the time to understand the needs of the children being served. Few take the time to understand the impact current processes have on these children. Few take the time to determine the root causes of recurring problems, or to measure and analyze the impact of implementing new approaches". An effective and efficient SIS will serve as an aid that helps teachers and educational leaders implement instructional strategies that can enhance student learning. Teachers should be able to use comprehensive data collected and generated by an SIS to align their instructional strategies with individual student needs and learning styles.

Using a student information system as a quality tool, teachers may analyze student data and gain more insights into the achievement gaps between minority and non minority students. Based on their findings, they can either enrich the academic content of their subjects or adjust their teaching approaches. This is just one example of the possibilities of an SIS.

Unfortunately, as Barrett (1999) notes, "school districts may be installing elaborate SMISs without adequate strategies or knowledge about how to use them effectively or the extent of their effects on the functioning of the school system" (, p. 5). Several factors are critical for the successful implementation of an SIS: strategy formulation and planning, adequate training of users, involvement of users in the design process, a highly committed strategy team, understanding of core educational issues, data migration, data analysis, school data needs, alignment of an SIS with school-wide improvement plans, evaluation of alternative data management systems, and technological leadership. Ward and Peppard (2002) argue that many

systems failures result from a short planning phase followed by an interminable implementation phase. Proper planning is key for the selection and adoption of an effective and cost-efficient SIS.

Conclusion

This study demonstrates 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. Our recommendation is that EasyIEP and T-Sparta become subsystems of NCWISE, the main student information system used by CMS. NCWISE, EasyIEP, and T-Sparta are disconnected, complex, and expensive. An integrated system will allow teachers to make better data-driven decisions that can have a positive impact on student learning. Several studies have shown a link between a student data system and student academic achievement.

Moreover, a strategy team comprised of SIS users, educational leaders, system developers, and technology services experts is needed to formulate the right strategy before adopting a robust and effective system. This team will have the ultimate responsibility of determining system requirements, and of overseeing the SIS development process. Over the years, SISs were selected by the state or the school district and handed over to teachers to use. Time has come for the state and CMS to involve system users in the system development process.

Further research is needed to explore the limitations of current student information systems used in Charlotte-Mecklenburg Schools and in North Carolina public schools. This study pointed out that an SIS may impede the learning process if it is poorly designed. It is our hope that other researchers will examine the negative and positive effects of an SIS on student learning.

About the author

Sylvester Ngoma teaches Foundations of Information Technology (FIT) and Scientific and Technical Visualization at Harding University High School in North Carolina in the United States. He is currently pursuing a doctoral degree in Information Technology at Capella University. He obtained his Master of science in Internet Strategy Management from the Graduate Center of Marlboro College in Brattleboro, Vermont in 1998. He is the 2008 recipient of the CMS Libby Gray Webmaster of the Year Award. His research interests include the impact of Student Information Systems (SIS) on student learning in the United States and the impact of ICT-driven education in Africa. He is originally from the Democratic Republic of Congo.

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APPENDIX A: CIO's responses to our questions

Question 1: How does CMS select, adopt, and implement Student Information Systems

  (NCWISE, EASYIEP, T-SPARTA, Data Dashboard...)?

CIO's response:

1. The student information system is mandated by the State. There is a policy, NC State

   Board of Education TCS-C-018. CMS was the first district installed on the eSIS

   (commonly referred to as NC WISE) and remains the leader in the usage of the system.

2. EasyIEP is not a scheduling system, but a system for the management of the individual

   education plans required for our students with disabilities. It was selected at the

   department level and Technology Services assists with its interface back into the CMS

   data warehouse. We are currently building special teacher portals to allow EC teachers to

   see this level of detail in the fall.

3. T-Sparta is considered a rogue system by Tech Services. It started out as a series of

   reports of the data warehouse, then evolved to have a user interface for the teachers. As a

   rogue, it is not well supported and not documented – a risk for its long term use. As a

   result Tech Services and Accountability have agreed to move any T-Sparta functionality

   into the official Managing for Performance teacher and principal portals.

4. Data Dashboard was developed as a pilot representation of the district's and school

   performance on some high level indicators. It is not "live data" in that it relies on static

data sets that are updated once a year. In Phase II of the Managing for Performance

project, the current data dashboard will be completely reworked.

 Question 2: How do you evaluate current SISs used by CMS?

CIO's response: When we look at new systems, we look first to make sure there isn't any

existing system that has been overlooked. If there is no system available, then we try to get the

end user (department, or groups of departments/schools) to document their requirements for the

new system. We often get resistance on this, but we're pretty adamant about it. Once

requirements are documented, then a project team is formally set up with functional and

technical staff who move through the review of the market, selection based on requirements and

adherence to CMS technical requirements. Price comes into play at this point and sometimes the

district has to compromise on functionality**.** After selection and contract negotiation, then a full

scale project plan is developed to take the software through implementation (whether internal or

web based), train all users, test the software against the functional requirements list, then take it

to go-live. Plans must be made for the ongoing training and support of any system and annual

maintenance processes must be documented.

Depending on the complexity of the system and its requirements for interfaces to other

applications, the implementation process can be short or very long.

Question 3: What changes, if any, are expected for the near future?

CIO's response:

We are moving our eSIS (NC WISE) application to a hosted data center in

Rutherfordton, NC in the next 12 months. We will be up-revving it to version 12.1 at the end of

June.   There has been a long standing rumor that the State is looking for a replacement to

AAL's eSIS, but with the budget situation, I don't think this will occur for a few more years yet.

Question 4: What is CMS's software/system development life cycle?

CIO's response: See item 2. The cycle is pretty well listed there.

Question 5: What is your vision of an effective student information system?

An effective system is one that meets 90% or more of the district requirements to manage the student population effectively. It captures the important information about the student's lifecycle in CMS, has quality assurance built in so that data entered is the best it can be, flexes as the district's needs flex, is easily maintained and grows with the district through time. Our eSIS is in that class I would say, but it is struggling to deal with ad-hoc grouping of students for special attention – commonly used in elementary schools.

Thank you in advance for your cooperation.

Educationally,

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