Software Enabling School Improvement Through Analysis

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Abstract

This study is on data-gathering software for special teachers in local education agencies Grades K-14. Increasing pressure for the use of accountability to follow the effectiveness of meeting educational standards has caused schools to reassess methods of using data and the core technologies surrounding its collection. The amount of data collection mandated by the administration and government requirements frustrates special education teachers. The researchers sought to determine if in-service and preservice teachers would use a software platform for completing a required task, such as creating and sharing lesson plans. The results indicated that most in- and preservice teachers would use a software platform for achieving a required task when given the opportunity.

Study of Data-Gathering Software Use by K-6 Teachers in General and Special Education

General and special educators experience stress from the responsibility for student learning outcomes. Data results and collection to drive the curriculum must be of excellent quality. Developers of software platforms to collect data for educators need to question and observe educators' needs. No controlled studies exist that examine student data software through the eyes of educators, and how educators use it affects student outcomes (Wayman et al., 2004, p.36). Achieving high levels of mastery is high on the agenda in educational programs in higher education and K-12 schools. Recent historical studies include reports on the challenges faced by teachers of testing and data recording.

Newly graduated special education teachers had an opposing viewpoint about the length of tasks, such as individual education plans, behavioral plans, review materials, and annual goals (Mehrenberg, 2013). The research indicated experiential evidence of the overwhelming workload, the lack of actual data gathered by outmoded and often handmade graphs, and the teacher's focus on curriculum and classroom activities caused by the sheer amount of paperwork required.

Demand and Stressors Collecting Educational Data

Because educational researchers prefer to spend time conducting research rather than investing effort in solving technological and data management issues, they often resort to all-purpose general office applications like spreadsheets that do a poor job of data management (Franklin et al., 2011). The data collected in paper forms must be hand entered into an electronic database to

perform statistical analyses. Researchers have entered data in electronic databases for more than 20 years, but up to 75% of researchers still use paper data collection (Pavlović et al., 2009).

Teachers' workload tasks burden them with being clerical workers, lesson planners, facilitators, and curriculum managers, which prevent them from pursuing the enhancement of their teaching skills. Teachers are now required to provide reference sources and class textbooks and prepare innovative collaboration lesson plans (Nawi et al., 2015). State and federal standards require the alignment of these tasks.

Ingram et al. (2004) reported special education teachers' high stressors and responsibilities are policies, data, and paperwork. Accountability has become an extreme stressor for the classroom educator. A significant challenge for teachers was understanding the use of extant technology to measure data (Ingram et al., 2004). The Institute for Educational Science Center for Education Statistics (2010) submitted a data usage report containing the following information:

- Ninety-seven percent of teachers have remote access to school e-mail, and of these teachers, 85 % used the access sometimes or often. Eighty-one percent of teachers had remote access to student data, and of these teachers, 61 % used the access sometimes or often.
- Teachers sometimes or often used the following for instructional or administrative purposes: word processing software (96 %), spreadsheets and graphing programs (61 %), software for managing student records (80 %), software for making presentations (63 %), and the Internet (94 %).

The percentages of teachers in low and high poverty schools differed based on the tasks they often completed. They are as follows: used e-mail or list-serve to send out group updates or information to parents (69 % compared to 39 %) or students (30 % compared to 17 %), used e-mail to address concerns with parents (92 % compared to 48 %) and with students (38 % compared to 19 %), used a teacher web page to correspond with parents (47 % compared to 30 %) or with students (36 % compared to 18 %) (Institute for Educational Sciences for Education Statistics (IES), 2010).

The researchers sought to determine if in-service and preservice teachers would use a software platform to complete a required task, such as creating and sharing, using a software platform to achieve a required task. Certain grade-level teachers were more likely to collaborate than others. The frequency of their usage of the software platform was not a quality indicator for lesson plans.

Educational Data Systems

Reducing the paperwork burden on special educators and increasing individual time with students while helping districts meet complex federal and state compliance regulations, the operational special education data management systems can aid school districts in making special education processes more efficient. This system can reduce the paperwork burden on special educators and increase their time with students while helping districts meet complex federal and state compliance regulations. The data systems can include compliance and event alerts with adjustable parameters to help schools agree with the Individuals with Disabilities Education Act requirements and timelines.

Efficient systems also feature secure, virtual file cabinets of each student's special education-related documents such as Individualized Education Programs or "individual education plans." These systems ensure comprehensive and accurate record-keeping and allow central office personnel to create state reports from data stored in the system, reducing duplicate data entry (Meller et al., 2012).

The newer systems are often web-based, allowing provider, teacher, and administrative access. Because the systems eliminate the time needed for sorting paper files or retyping or even handwriting information, special education teachers are better able to concentrate their efforts on implementing instructional best practices and planning new or renewed lessons for students (Meller et al., 2012). Also, the potential exists for the use of software to correlate general education requirements working with Response to Intervention (RTI) and special education inclusionary students.

RTI is a multitier approach to the early identification and support of students who have learning, and behavior needs. The process begins with high-quality instruction and universal screening of all children in the general education classrooms. Learner interventions are at increasing levels of intensity to increase their rate of learning. Individual student responses to instruction provide a base for decisions about the power of educational interventions and duration. The RTI design offers a design in making decisions in both general education and special education. The RTI system helps create a plan of instruction and intervention guided by child outcome data (RtlNetwork.org, 2016).

School personnel must meet procedural requirements by completing professional paperwork for the federal, state, or local special education law or regulations as required by the Individuals with Disabilities Education Act. Some of the documents are individual education plans, behavioral plans, manifestation determination review materials, annual goals and objectives, and student re-evaluation forms (Meller et al., 2012).

Software developers with platforms that collect data for educators need to question and observe the educator's needs. No controlled studies exist that examine student data software through the eyes of educators and how educator use affects student outcomes (Wayman et al., 2004).

New ways improve strategies and outcomes for those students with disabilities by focusing on the technology and ability to collect data on general education teachers. A preponderance of the evidence shows that classroom teachers are the single most important influence on student achievement. How general education teachers receive preparation to work with students with disabilities has been overlooked in brief, it urges investment in the preparation of general educators is key to improving outcomes for students

In a report about the application development environment for educational data collection systems, researchers concluded that through an accretion of best practices research to identify likely success factors, information technology (IT) implementation projects are rarely successful. Across industry sectors, at least 40% of such generic IT projects either are abandoned or fail to meet business requirements, while fewer than 40% of large systems

purchased from vendors meet their goals (Kaplan & Harris-Salamone, 2009). Several research accounts noted an unsuccessful rate of 70%. However, from additional collaborative efforts of IT, other rates were one in eight enterprises was found to yield positive results as productive.

Unfortunately, at least half of financial statements with charts did not produce agreed results. Hence, in 2006 a document compiled by the Report from the Standish Group found 35% of IT efforts were reaching proposed guidelines, timely results, and on budget. In summary, this research account noted that this yielded

Successful Data-Gathering Tools

A selection of development tools for collaboration is an essential factor in successfully creating, testing, deploying, and adopting an application. Further, as most applications are challenging to change post-deployment, the application can age rapidly. Many benefits can be lost, as the application no longer meets the users' needs and educational institution.

Developing an application is time-consuming and expensive. Even so, tools exist on the market that can provide a school-sized user base (100 or fewer educators, administrators, and clinicians) with rapid development capabilities. These modern tools reduce development time, minimize security risks, and reduce "glitches" (Cleveland, 2016). In Table 1 are the Required Computing Core Technologies for such expandable data gathering software.

Table 1

Computer Core Technology

Communications Infrastructure	Hardware Devices	Operating System	Application	Access and Security
Open Systems Interconnection Model (OSI Model) Standardized communication "language" Communication Mediums (i.e., Fiber Optics, Ethernet, Wi-Fi)	Computers, tablets, phones, and personal digital assistants	iOS macOS Windows Android	Data storage Relational Architecture Logic Controls User interface (UI)	Transport encryption User Privilege Sets User Credentials Operationalization of security policies and procedures (Cleveland, 2016)

Notes: Abbreviations UI user interface.

The following are specific requirements of a successful data gathering software tool used by educators and can include 100 educators or 100,000:

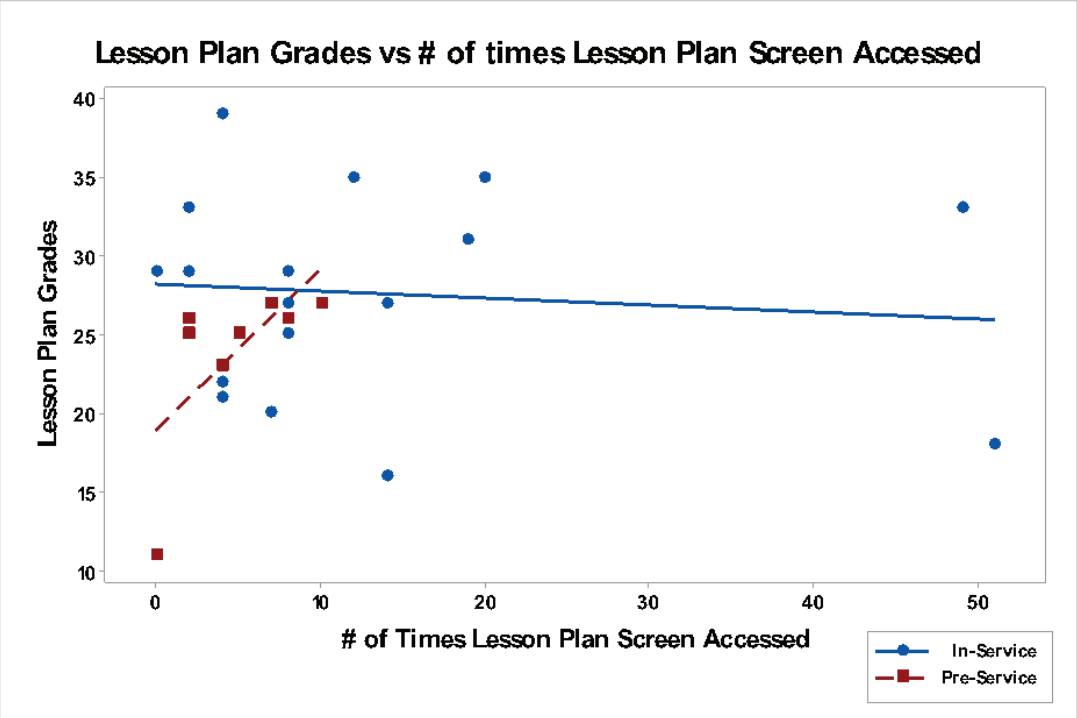
- Compile data, which is actionable by teachers based on an increased awareness of individuated student requirements.
- Enter individualized student goals or select from multiple professionally written goals.
- Generate automated charts to attain a clear understanding of unfulfilled student goals to implement appropriate and detailed interventions immediately.
- Record daily notes, photographic/video details
- Produce comprehensive reports for parents and government entities with easy-to-read graphs designed to indicate accurate tracking and trending of student academics, behaviors, and socio-emotional interactions.
- Optimize educational and behavioral techniques, resulting in measurable academic, behavioral, and socio-emotional improvements (Cleveland, 2016).

Administration and government entities require and mandate data collection by general and special education in-service and preservice teachers, who become frustrated by the required amount of data collection. One requirement is lesson plans. This pilot study used a technology-based self-monitoring platform and post surveys to compare preservice and in-service teachers' frequent use, quality, and collaboration in developing lesson plans.

Methods

A convenience sampling included (n = 18) general and special educators with 56% participation, in-service teachers in a rural K-6 school district in South Mississippi, and (n = 8) with 66% participation of preservice teachers, students at The University of Southern Mississippi in Hattiesburg, MS, United States. The researchers graded the lesson plans submitted by 18 in-service and eight preservice teachers. They graded the plans on a scale of 1–4 for 11 subscales using Lesson Pan Rubric (see Appendix A) metrics approved by MAET for the 2017–18 school year. The subscale scores were then totaled. Total scores ranged from 11 to 39 points out of the 44 possible. *t*-tests compared the mean lesson plan grades. The mean scores were similar (=0.14) for in-service and preservice teachers [In-service: mean = 27.7 (SD = 6.3); Preservice: mean = 23.8 (SD = 5.3).

In-service teachers who taught Kindergarten through 3rd grade scored significantly higher than those who taught Grades 4 to 6 [$p < .01$, (Grades K-3: n = 12, mean = 30.9, SD = 4.4), (Grades 4–6: n = 6, mean = 21.2, SD = 4.2).



Software recorded date/time of option selection when using the software. In-service and pre-service teachers were accessed using Wilcoxon two-sample tests by comparing the number of times software options. The teachers logged into the software between 1 and 29 times, with the median # of logins = 4. Teachers selected the "Go to Lesson Plan" option between 0 and 53 times, with the median # times = 3. Approximately 20% of the teachers never selected the "Go to Lesson Plan" option. There was no correlation between the number of times participants chose this option and the teacher's grade on the lesson plans for in-service teachers (p = .84). In contrast, there was a significant correlation between the teacher's grade and the number of times the option was selected (p = .03, r = .74).

Results

Total scores for in-service (N-18) and preservice teachers (= 8) ranged from 11 to 39 points out of the 44 possible. *t*-tests compared the mean lesson plan grades. The mean scores were similar (=0.14) for in-service and preservice teachers [In-service: mean = 27.7 (SD = 6.3); Pre-service: mean = 23.8 (SD = 5.3).] In-service teachers who taught Kindergarten through 3rd grade scored significantly higher than those who taught Grades 4 to 6 [p < .01, (Grades K-3: n = 12, mean = 30.9, SD = 4.4), (Grades 4–6: n = 6, mean = 21.2, SD = 4.2).]

No correlation existed between the number of times educators selected this option and the teacher's grade on the lesson plans for in-service teachers (p =.84). In contrast, among preservice teachers, there was a significant correlation between the teacher's grade and the number of times the option was selected (p = .03, r = .74)

Limitations

This pilot study provided a foundation for data management using an informatics tool with in-service and preservice teachers. The small sample size (n = 26) made it difficult to find statistically significant relationships from the available data. The data gathering tool used in this study was an innovative data gathering system that implemented portable data gathering on an iPod touch. Only a few prior research studies were available. Because of the nature of the portion of the pilot that took place in a public-school educational setting, time restraints limited researchers to a 2-hr training session with the teachers.

Although the study provides foundational findings, the main limitations are as follows: the school technology department director, who, because of his workload, was intermittently available. Additional delays in troubleshooting were the phone connection that continued to cause technological issues. School computers were outdated and contained numerous school firewall systems that had not been removed and interfered with lesson plans to access and software functions. It also delayed in-service teachers from accessing and implementing their use of the informatics tool.

Experimental mortality occurs in the public schools with teachers dropping out of, or never fully participating in, the study on a non-random basis. One school semester and only the spring semester limited access to in-service teachers. Starting and training the in-service teachers in the first semester of the fiscal school year and submission in the second semester would have provided them with an acclimation time. The school's administration of state testing materials limited teachers' data gathering and participation time of lesson plans and implementation. The preservice teachers were in their first year and had limited pedagogy and technology skills.

Summary

Most in-service and preservice teachers will use a software platform for completing a required task when given the opportunity. Certain grade-level teachers were more likely to collaborate than others. The frequency of their usage of the software platform was not a quality indicator for lesson plans. Providing teachers with a tool that collects, collaborates, and assesses offers them time for teaching students, evaluating tasks, and sharing with colleagues.

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Appendix A

LESSON PLAN RUBRIC

	Unsatisfactory	Emerging	Target	Distinguished
Standards (CAEP 1.4)(InTASC 4) NA	Standards are missing.	Standards are provided and partially correlate to lesson objectives and tasks by reference number only.	Standards are provided (including reference member) and correlate with leaning objectives and tasks	Standards are provided (including reference number) and correlate with learning objectives and tasks; standards reflect integration of another subject area OR multiple parts of the standard are addressed in the objectives
Learning Objectives (CAEP 11, 1.3; InTASC 2) NA	Student learning objectives provide a broad focus for instruction objectives are teacher centered.	Student learning objectives provide a clear focus for Instruction	Student learning objectives are clear, measurable, and specific to the standard(s) and include active (action) verbs that define what all students will do.	Student learning objectives are clear, measurable, and specific to the standard(s); objectives provide differentiation/accommodations/variability to meet needs of all students
Assessment (CAEP 1.2; InTASC 6) NA	Assessment partially measures objective(s)	The assessment strategy is teacher observation OR assessment inaccurately measures the objective s)	Formative and/or summative assessment has clear relationship to the lesson objective(s)	Formative and summative assessments are defined, showing clear relationship to all objectives addressed in the Lesson; includes how students will receive timely, effective, and descriptive feedback toward quality work based on assessment results

	Unsatisfactory	Emerging	Target	Distinguished
				include a high level of detail; provisions are made for early/late finishers
Procedure's Instructional Strategies (CAEP 1.1, 1.3, 1.4, 1.5; InTASC 2, 3, 4, 5, 8) r NA	Lesson is teacher centered and incorporates minimal student practice; content is conveyed using one modality	Lesson is more teacher centered than student centered offering few opportunities for guided and/or independent practice. Limited multi-sensory support is provided with some variety in teaching strategies	Lesson is student centered; multiple teaching strategies are included multi-sensory support is provided, individual and group work are present and provide adequate practice	In addition, strategies show creativity and/or originality; Lesson integrates multicultural OR interdisciplinary components; tasks provide extensive and/or highly creative practice and engage students in the processes of critical thinking and problem solving in meaningful contexts
Procedures: Closure (CAEP 1.1) r NA	Focus is on clean-up and/or transition to next activity	The learning objective is restated; homework assigned, if appropriate	Candidate revisits the purpose for the Lesson and ties to real-life. Lesson is summarized by candidate and refers to future learning; Student questions are provided (Candidate centered)	Students review the Lesson by summarizing and/or sharing what they learned; question responses allow students to express that they have achieved understanding of the Lesson's main concepts; candidate revisits the purpose for the Lesson, ties to real-life and/or future learning (Student centered)
Materials (!STE 2a) r NA	List of materials given limited attention in the lesson plan. No materials listed	List of materials is incomplete or inaccurate. Teacher created handouts and/or other reproduced	List of materials is provided and accurate for both teacher and students. All handouts, both teacher centered and those	Detailed list of materials is provided for both teacher and students. All handouts, both teachers created and those from other resources, are referenced in the procedures

	Unsatisfactory	Emerging	Target	Distinguished
		handouts are not attached to the lesson plan	reproduced from other resources, are attached to the lesson plan	and attached to the lesson plan and include active URL hyperlinks
Technology (!STE 2a)		2	3	4
NA	Candidate selects technology/media unrelated to lesson objective	Candidate selects technology and/or media for the Lesson	The candidate engages learners in content and skill development utilizing media and technology to meet learning objectives	The candidate engages learners supported by media and technology throughout the Lesson to promote student learning and creativity
Professional Writing		2	3	4
NA	Poor quality of professional writing is evidenced by more than 4 errors in clarity, spelling, usage &/or grammar; the required lesson plan template is used	Fair quality of writing is evidenced by 3 or 4 errors in clarity, spelling, usage &/or grammar; the required lesson plan template is used	Professional writing is evidenced by 1 or 2 errors in clarity, spelling, usage &/or grammar; the required lesson plan template is used	Professional attention to formal writing is evidenced by clarity in writing as well as absence of spelling, usage, and grammatical errors: the required format is followed
				Rubric Score
				Rubric Mean

88 possible points