To: Cordelia Twomey

From: Patrick Holness

Date: August 12, 2016

Subject: ASSESSMENT III

Please find attached my EDTC 803: Assessment III. This assessment contains a proposal for a research study on UDL and the integration of a web-based application to improve student achievement in algebra. I enjoyed researching this topic.

REPORT WITH PRIMARY AND SECONDARY DATA

UNIVERSAL DESIGN FOR LEARNING AND THE INTEGRATION OF A WEB-BASED APPLICATION TO IMPROVE STUDENT ACHIEVEMENT IN ALGEBRA

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CHAPTER ONE: THE STUDY AN OVERVIEW

Introduction

The National Education Technology Plan 2016, *Future Ready Learning: Reimagining the Role of Technology in Education* communicates the role of technology as being inclusive, every student has access to technology, and technology is used to enhance learning (US Dept. of Ed, 2016). The NETP is written for Colleges & Universities, administrators, teachers, and policymakers. The idea is to have continuous learning supported with technology. In December 2015 Congress passed the Effective Use of Technology (Title IV-A) of Every Student Succeeds Act that supports the NETP. The new act comes on the heels of the No Child Left Behind Act. ESSA foundation is rooted in using technology resources to improve teaching and learning. Part of the NETP is the use of Universal Design for Learning (UDL). UDL uses scientific based cognitive research to develop a framework to improve and enhance teaching and learning for all learners (CAST, 2015). Heavily researched based, UDL has proven to increase student achievement of varying learners.

Universal Design for Learning

UDL is a philosophy and a variety of multiple approaches to make learning accessible to a wide range of students (Basham, Israel, Graden, Poth, & Winston, 2010). The UDL practice is truly inclusive and accounts for varying types of learners regardless of background, physical make-up, or cognitive limitations (TEAL, 2012). The idea of UDL stems from architecture; it utilizes a principle that it is easier to include accessibility rather than reconstruct the building (Stanford & Reeves, 2009). UDL creates an equal opportunity for diverse learners to access content.

The reauthorization of the Individuals with Disabilities Act laid the groundwork for UDL and was later defined by David Rose and Ann Meyer at CAST. UDL came about during a time when students with disabilities were being included with their mainstream counterparts. There needed to be a way for students with special needs to be blended in instructionally. This presented a problem. Students were viewed as having barriers to learning. UDL rejects that idea by stating the curriculum is the barrier to learning and through the principles of UDL, those barriers can be refuted.

The CAST model for UDL has three components. The components are multiple means of representation, multiple means of action and expression, and multiple means of engagement. Multiple modes of representation is the "what"; in what ways will the teacher present this information to the student. Examples include auditory, visual, colors, and text size. Multiple means of expression is the "how"; in what ways will the student demonstrate what they learned. Examples include projects and differentiated activities. Multiple means of engagement is the "why" of learning, engaging students by tapping into the learners' interest, inspiring new interest and challenging them appropriately. Employing these strategies removes the barriers to learning and gives all students the opportunity to learn in a way that is best suited to them. These are the building blocks for successful teaching and learning. UDL is further supported in the 2016 National Education Technology Plan, which calls for the incorporation of UDL within all educational institutions (US Department of Education, 2015).

Web-Application: Fluid Math

The proper implementation of technology positively influences student engagement (Gunuc & Kuzu, 2014). Today's learner must be able to apply concepts and

be proficient in the use of technology. Technology allows students to discover and produce new information that can be used immediately or stored in their memory for future application (Isman & Yaratan, 2005). It is equally important that educators and instructional leaders create these opportunities for students to learn.

Fluid Math is a web-based application will eliminate the redundancy of drawing graphs on paper and focus on providing students with practice manipulating online tools, so they feel comfortable using these tools on standardized tests. Fluid Math at the algebra level brings math alive by combining hand gestures and graphing. Whereas students would populate a graph in a static format, they are now able to graph in a dynamic way. This changes learning because within seconds students and teachers can change the direction of a graph.

Student engagement remains a vital element in teaching and learning (Carnahan, Zieger, & Crowley, 2016). Technology and the use of web applications afford students the ability to be engaged, build retention, and comprehension. Teachers can provide exciting, engaging activities by integrating web-based applications in their lessons. This will improve student performance.

Statement of the problem

Nationally, there is a steady decline in mathematics achievement as students move from grade four, grade eight, and grade twelve (The Nations Report Card, 2015). Students are underachieving in the area of mathematics. This is of particular concern because there is a need for students to understand mathematical concepts to meet the demands of 21st-century learning skills. This study will investigate the effectiveness of using UDL and a web-based application as an intervention to improve student's

mathematical skills in 8th grade algebra. This study will determine if UDL and a web-based application improved students academic performance, engagement, and students view of algebra. The research shows that UDL is useful. This study will help to support future research by determining the level to which a web-based application used as an intervention helped support student achievement. Current research bears limited data on the impact of interventions on UDL.

Purpose

The adoption of the Common Core has shifted the focus of mathematics to problem solving and collaboration. This has led to districts to respond by purchasing the newest programs and resources to remain competitive in the testing world. The idea to conduct this study is two-fold: first underachievement nationally and locally in mathematics. Secondly, to improve teaching and learning practices in an environment that do not account for the varying learner. The US Department of Education supports the notion of using UDL as part of a method for delivering instruction. The President's panel calls for more focus on making students ready for algebra by grade 8 (Brown, 2008).

Target Group

Identified Classes

The identified class that has been chosen to receive the stimulus is an eighth-grade inclusion class with 24 students and two teachers in the room. Teacher, A is middle school mathematics certified, and teacher B is certified students with disabilities. This particular group was randomly chosen. The control group has a similar makeup as Group A. Group B the control group is also an inclusion class. Group B will receive the standard

curriculum. This delivery of instruction will help to ensure reliability and compatibility amongst the groups during data analysis.

Identified Teachers

The research shows that UDL is effective, however; appropriate professional development has to be given to the teacher for UDL to work effectively. Both teachers will receive professional development in understanding UDL, implementing UDL, and UDL in practice with support. As an administrator; the researcher will receive professional development to further understand UDL and the relationship to the Danielson Framework for teaching. This will assist the researcher in giving supportive and constructive feedback during implementation. Professional development session will be held for the math application that we will be using as the technology component in UDL. The researcher's role will be to coordinate, facilitate, observe, and evaluate the effectiveness of UDL and the math application. Each teacher participant has agreed to receive an additional evaluation. During this study, the researcher will complete three weekly visits to ensure that UDL and the web application are being implemented correctly.

Research Methods

The research method that will be used is a mixed method approach both quantitative and qualitative. The mixed method accounts for limitations of using one over the other. There are several reasons why the researcher will employ this method. This research will investigate and evaluate participant perspectives, student engagement, and student achievement. Student performance data before, during, and after will be looked at as well. The researcher will be testing a new instrument with using a mathematics

application as an intervention. Using a mixed method will be critical in explaining and interpreting data. How does UDL and web application affect an inclusion 8th grade class in mathematics? Several questions to consider: What are the implications if any of student achievement as a result of using UDL and the math application? What are the implications of student engagement? What are the implications for students with IEPs and ELL students? This research will help to determine if using these two instruments caused improved student achievement. Participants will be randomly selected and a control group assigned (the remaining inclusion class). All students took a District math placement test before eighth grade. That information along with administrative consideration will be used to assign a student to class. The researcher will have no involvement in choosing the class. The remaining inclusion classroom will be labeled as the control classroom. Students in that classroom will be taught the curriculum in a standard way. The researcher will use data from the control and the intervention class to compare data and results. Data in the form of teacher interview, student interview, and district assessment scores will be used.

Technology

UDL support and encourages the use of technology as part of its design. National Report Card data shows that Mathematics scores are declining (NAEP, 2015). Having students connect with content in a meaningful way is a goal in education. Many educators seek out ways to make content come alive. Teachers strive to provide useful, engaging resources to hook the students' interest while making sure they fit in with the current curriculum. Web applications provide teachers with this opportunity.

The use of a web application paired with tablets and other devices will help facilitate student learning. Web applications supplement traditional instruction in various ways. Students can work collaboratively in small groups to solve the problems while enriching their math vocabulary. Students get the practice they need to become successful, feedback in most cases is immediate, and students have access to real-time data that they can use to self-assess. Teachers benefit by spending less time grading papers, which reduces gaps in teaching and learning. Valuable time saved helps to support further learning. Teachers can quickly assess their student's progress toward learning goals. Thus learning targets become real. Teachers can complete standard analysis by a student or as the class. Dashboards help to confirm that students are meeting their personal goals. Monitoring student learning can be done from a bird's eye view, which puts the focus on the learner.

CHAPTER TWO: DATA COLLECTION

Primary Data Sources

Data collection will be from October 2016 to December 2016. During the first few weeks of school, preliminary data will be collected. It is important for the researcher to know and collect data on the population being used. Both a passive and active method will be employed. Student demographic information race, age, lunch status and students with disabilities will be identified. Teacher and student interviews will be conducted; classroom observations and assessment scores will be gathered. Student demographic provides the race, sex, age, lunch status, and identifies students with disabilities as well as ELL students. Teacher and student interviews will be conducted to determine perceptions and attitudes toward teaching and learning. Classroom observations will allow the researcher to witness and record observable behavior that can be documented over the course of time. Attitudes Toward Mathematics Inventory (ATMI) will be used. This assessment will measure students' perceptions toward mathematics using a 40-question test and 1 to 5 Likert scale.

Secondary Data Source

The secondary data source for consideration would be the use of National Assessment of Educational Progress (NAEP) National report data. Data from the NAEP provides mathematics data on students that are in grades 4, 8, and 12. For this research data on eighth grade students will be helpful in comparing national progress to the population of study.

Data Presentation

The data will be presented using a combination of tables, bar graphs, and pie charts. Tables could be used to display individual student performance. A bar graph will display the comparison of pre and post data. Additional bar graphs would be used to display comparisons of the class ethnic make-up, and a comparison of the class makes up to national demographic figures.

Conclusion

The capability of technology and the potential impact on student achievement is what has brought me to the field of educational technology. Through research on UDL, I have grown fond of this instructional practice. As an instructional technology leader, I am always seeking ways to engage students in meaningful ways while creating access to the curriculum for all students. Creating the right learning environment for students is what will propel them to the next level of learning. Understanding how students learn best, eliminating barriers, and supporting teachers' instructional practice through professional development are key elements in student achievement.

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APPENDIX A

Classroom Observation Protocol

1. Is there a lesson objective? Do students know what they will be learning?
2. Is there differentiation: i.e. lesson presentation, technology, student choice in activities, and demonstration of learning
3. Was the web-application implemented during class?
4. Are students engaged: i.e. questioning, discussions, feedback teacher/classmate(s), self-assessment and peer interactions. What are the observable behaviors? Are students passive in their learning?
5. Was there an opportunity for students to consolidate their learning?