

CHAPTER IX

SUMMARY AND RECOMMENDATIONS

Early in this study there were several guiding questions that lead the explorations of both EDU and mathematics interventions in general. This chapter will revisit those questions in terms of the themes previously defined and conclude with a general direction future studies will want to explore.

The original intent of the study was to garner evidence about using EDU in skill building. It was thought there would be enough population between treatment (Schools 2, 3, & 4) and controls (Schools 1 & 5) that a quantitative study could be completed. Fortunately, from the outset, detailed notes began to be kept. It quickly turned out that the diversity in the use of EDU was such that there were not enough students involved to justify a quantitative study. Further, it became very clear that the term reteaching has a different meaning to each of the five teacher participants.

Another factor that became evident was that the recording of student data is somewhat disjointed, suggesting that the classroom teacher's individual diligence in their record keeping is a potential factor in maintaining uniformity throughout the district.

The Validation of Data

The entire data collection and analysis of each case was written and submitted in electronic form to each participating teacher. These member checks were a method used to validate the data. Minor changes were made in the initial analysis as indicted by each educator to ensure accurate information was reported.

The three themes were a result of the cross-case analysis of the data – supporting a degree of reliability within the analysis. To ensure these were accurate, additional discussion amongst my peers were held to verify the accuracy of the themes and compared to the recent report by the National Mathematics Advisory Panel (2008), which also indicated the three areas of teacher, materials, and student were factors in improving student achievement.

Conclusions about Reteaching

Reteaching is a reactionary process engaged when a student does not meet predetermined objectives. Reteaching means different things to different instructors. In the cases of School #1 and School #2, reteaching was an entire class activity. School #1 used an examination of the individual performances on the assessment to guide reteaching in a full class discussion, whereas School #2 used similar problems that were made up by the instructor, pulled from the textbook, or modified from the assessment. In the latter case, this meant that students were asked to work a few problems before being reassessed and in the former, students were reassessed after the instruction.

In four of the schools, students were the focus of all the reassessment – meaning they were trained to identify which areas they had to retest. In Schools #3 and #4, there typically was an overall class discussion and then guidance into working with particular EDU materials focused on the student's needs.

In School #5, it was formative assessment during instruction that dictated revisiting the topic. Though other reassessment measures were in place, Carrie's goal of minimizing times where students had to retest were quite successful because of the pre-

interventional strategies she had employed.

In all five locations, additional practice often played a role in improving student performance. In Schools 2, 3, 4, & 5, the amount of individual practice varied from student to student. At the EDU sites, the teacher indicated that a student needed to practice until she or he actually earned a score of three or four out of four before moving to another objective. At School #5, this variation in amount of practice was in the type of rehearsal practice the student was engaged in, the problems worked on during the peer tutoring sessions, and the guided discussions Carrie conducted. The total amount of practice remained close to the same each week. Through the small group discussions, Carrie led focused on problems those students were struggling with and more practice on their individual white boards clearly showed that repetitive practice built higher levels of self-confidence.

Conclusions about EDU

However, the variability in the usage of EDU and the total number of participants within each module made quantitative study inappropriate, it seemed that the three participants found an effective way to utilize EDU as an instructional intervention. School #2 used it as a tool to keep all students engaged in the current mathematics topics to create situations where peer-to-peer interactions could be maximized while the instructor worked one-on-one with other students. School #3 used the laptop method as a method of additional practice problems that students could utilize to build their own confidence in their skills before retesting. School #4

used it both for the additional practice and for the social structures it created for students.

The most noteworthy success in the use of EDU within this study is the systems ability to actively engage students in the content they are being assessed. This allowed a couple of interesting dynamics to come into play – particularly in extending the social parameters of the student-teacher relationships. At School #4, EDU was a means for students to self-report their progress and open up a dialogue between themselves. At School #2, EDU provided an engaging forum in which the student-teacher discussion could "talk through the mathematics."

The feedback added to each objective provided some guidance for students. Though the use of feedback had to be modified after the study began, there were indicators that feedback to the students (correct/incorrect) seemed to not only motivate them but also cause them to seek assistance. When the feedback was simply an indication of a right or wrong answer, the wrong answers brought about more moments of discussion. Sometimes that discussion revisited those questions where more elaborative feedback was given – following the same reteaching elements given in the elementary curriculum.

Interestingly, though, other recording features of EDU were only observed at School #2's site. This shows a broader scope that David identified within the study – particularly as he was looking at ways to continually track the progress of his students.

Future Directions and Recommendations

An evident benefit of EDU was that it addressed the individual needs of the students in a just-in-time manner. Reteaching is a way to take formative assessment data and guide instruction to improve learning – and EDU can be a valuable resource when used in this fashion. Other concerns from teachers regarding the use of EDU, however, whether they be at the elementary or post-secondary level, is the apparent complexity in writing questions that use the randomization process. The benefit Dr. Friesen had noted (see Chapter 1) can become diluted and eventually lost because of the perceived difficulties in programming. Only David had experience writing his own questions. He also had shared about his inability with respect to the programming.

Other indicators suggest that if district-wide consistency with respect to curriculum is necessary, building such systems might prove beneficiary as well. This would create an expanded view of using EDU and remove much of the burden from teachers in trying to build their own systems. Just as this study was being conducted, a set of similar objectives were built and shared among all the EDU sites, creating confidence that an expanded emphasis for the entire curriculum could have major benefits.

Training is another factor that should be a central theme. If a system such as EDU, were to be built, then offering time for teachers to learn how to use it for both the instructional interventions and the assessment tracking would provide greater benefits in student learning. In this study, I was there to provide instruction in EDU

use for students. Some instruction for those students always will be necessary.

This study explored EDU and reteaching from a very narrow perspective. Two additional topics emerged in this study, however, that might provide a solid rationale for expanding the use of EDU: formative assessments and professional learning communities. As these topics begin to take hold and become part of the everyday vernacular of the instructional staff of this district, expanding the use of successful tools like those that EDU can prove to be valuable.

A Call for Further Research

As one considers the six recommended strategies proposed by the NCTM (2007a), a renewed effort from the research community should be established to explore the impact technology can play in supporting student learning, particularly in the areas that address the use of additional practice, feedback, and development of self-regulatory strategies for struggling students. The literature indicates a continued effort in exploring the learning of adolescent or adult learners, but little addressing the academic deficiencies of younger students. Accepting this challenge will support the request to create a "constant of time and support for each individual student who is struggling in their learning" (DuFour, DuFour, Eaker, and Karhanek, 2004).

Many support a need for further research. Burns (1998) identified support as one of three pillars necessary to diminish "math phobia" seen across America. Cunningham and Allington (2007) identified the use of technology as an effective intervention technique in providing additional support for those students who need it the most.

Marzano, Pickering, and Pollock (2001) recognized the significance additional practice can play in improving assessment. Finally, the National Mathematics Advisory Panel (2008) reported similar findings – indicating that the United States is at a crossroads in mathematics education. They reported that classroom educators have a huge obstacle in front of them in building stronger conceptual understanding of mathematics. To overcome this obstacle an effort should be placed introducing mathematics at a preschool age and building automaticity of basic skills and facts. The later is difficult to achieve with today’s curriculum and this panel further suggests technology as a valuable asset in building these skills.

It is this report along with the alignment of the recent literature and assessment data that suggests a further development and research needs to continue to explore the benefits of automated tools. Furthermore, expanding the EDU tools to include a method to record student data would help broaden the scope of further studies to be able to utilize more quantitative procedures and validate.