

A MORE INCLUSIVE, LESS DISTRACTING AND ENGAGING LEARNING ENVIRONMENT THROUGH SMARTSYNC

Technology in Practice Strand

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1. ABSTRACT

This paper documents some of the initial experiences of using synchronization technology via networked tablet computers in a high school classroom setting. It addresses some of the rudimentary issues of how instructional time is lost by physical motion; how student teacher confidentiality affects student feedback; and how whole class interruptions can do more harm than good. The networked tablet computers allow students to freely communicate with teachers in a more private and personalized study environment, and can be done without the teacher having to move around the classroom. Initial findings suggest a high level of student engagement, less downtime for students, faster and more frequent teacher responses, enhanced communication between teacher and student, and better behavior.

2. PROBLEM STATEMENT AND CONTEXT

The current public high school math classroom has approximately 30 students. With class time ranging from 40 minutes to 80 minutes, and an ever increasing curriculum load, students have much content to consume and in less time, among their many peers within a classroom. While there have been many advances in pedagogy, there are many aspects of classroom teaching that hinder or slow down student progress. Because the classroom format allows one teacher to address the entire class, there have been strategies and structure for teaching such as peer teaching, collaborative work, project-based learning, use of IT, and cross-curricular content integration, which are among things that are integral or complementary to the learning environment. Despite advances in pedagogy, there are simple issues that still prevail in a traditional classroom environment.

2.1 Time is lost as the teacher moves around the classroom

While it is good practice to check student progress and address individual student needs by physically moving around the classroom, teacher movement takes away from students and teachers' time. As the classroom teacher addresses each student individually, time elapses in moving from one end of the classroom to another. This creates "pockets" of "wait-time" for the remaining students waiting to address their own needs with the classroom teacher, and increases the time it takes for the teacher to address all student needs. During this wait-time, students tend to become disengaged from the content or lesson activity, as their questions become obstacles to their successfully progressing through the lesson activity. As a result, student focus and attention become swayed from the intended instruction of the lesson activity, leading to off-task behavior (and possibly even misbehavior) and significant loss of learning opportunity, especially considering the limited time 40 to 80 minutes students have with their classroom teacher.

Furthermore, the physical structure of a classroom can also facilitate or hinder the teacher's ability to navigate around a classroom, potentially leaving certain locations more accessible and others more inaccessible. (it'd be an interesting study to see how much time it takes for teachers to move around – yes, it certainly would!). Our preliminary study has shown that(any data here? Probably not, or is there any literature that says anything about time?) if we can say something like 5-10 minutes is lost from mere teacher motion, that would be kind of cool...

2.2 Students that are less comfortable speaking publically naturally receive less attention

Students have varying level of comfort in addressing their needs/concerns in a classroom environment. The engagement level and confidence level changes in differing settings, and in a traditional classroom setting, those who can speak up invariably get more attention (including those that are not engaged in the prescribed work), and the classroom is a place where those who lack confidence or who struggle are less likely to be addressed given their quiet nature. Much of the teacher's response is based on the feedback that students provide (whether verbal, body language, facial expression, signal tools etc.), and in the absence of such a voice, teachers find it more difficult to address their needs. Consequently, the teacher's ability to ensure that all students get the academic support they need becomes nearly impossible. Student hesitation in addressing their needs in the classroom may be due in part to the lack of privacy that students have, and the fear they perhaps experience in exposing their mistakes or weaknesses. In addition, students may also have limited language skills (both linguistically and technically) to address their needs with the teacher. ,, =--- some kind of literature might be nice....

If technology can provide a way in which students can communicate their individual needs, without publically doing so, teachers can provide feedback in a way that effectively provides specific academic support to each student while maintaining each student's comfort level. This would increase the extent to which the teacher can gain insight as to students' level of mastery/struggle with the content.

2.3 Teacher tendency to interrupt whole class when addressing questions of individuals

As the classroom teacher addresses individual student needs, the teacher becomes aware of commonalities and often stops the entire to class to address a seemingly common misunderstanding that the majority of students are showing. This may seem justified by the number of students making the common error, or perhaps by how misguided the errors are to the goal of the lesson. For the teacher, these interruptions serve the purpose of preventing the other students from making the same errors or holding the same misconceptions. However, this “mass correction” may not have the intended outcome, and may miss its goal altogether as the interruption occurs during different “places” of engagement for each student. As students work at their own pace, the information shared by the teacher during the interruption may bear no relevance to many of the students if they have not yet reached a point in the lesson activity where such a “mass correction” will be beneficial. Consequently, this not only takes away that immersive experience and engagement in the work that some were experiencing, but also is an unnecessary stoppage of work for those that don't require the intervention.

Trying to ensure that all students get the most out of the classroom experience requires a delicate balance of maximizing instructional time while minimizing distractions and obstacles. The result is often a uniform “one-size-fits-all” experience, where student voice is mostly limited. With these constraints and the limited time that students have in the classroom, creating

a learning environment with less wait time, fewer interruptions and more equitable distribution of teacher attention is sure to facilitate greater student engagement in their classroom activities and sure to create more effective learning environments.

3. METHOD EMPLOYED

In this study, we investigate the impact that networked tablet computing devices can have in a high school mathematics and physics classroom. The study took place in a public charter high school in Los Angeles, where the students were juniors and seniors, mostly first-generation college bound students, who lived locally.

Each classroom was provided with 10-20 pen and touch ready tablet computers, where students paired up and shared one tablet per pair. There was also one tablet (sometimes two tablets) provided to the teacher. The tablet devices were wirelessly networked and configured in a way so that the teacher was able to see the screen of all student tablets in real-time on the teacher tablet, using the SMART Sync software provided by SMART Technologies. All written work by the students was done on the tablet device using a stylus, where the tasks were given in the form of electronic worksheets, and the teacher was able to see exactly what each pair was writing into their tablets. The configuration also allowed for the teacher to directly write into the teacher tablet in a way that would show on the student tablet, thus enabling written feedback to appear for students to see. Figure 1 below depicts the relationship between screens.

The classes were video-recorded with a camcorder on a tripod, capturing student-teacher interactions and conversations as well as peer dialog. In addition, a teacher reflection was recorded subsequent to the class (and later transcribed), and also student debriefs took place for feedback. Students also provided written feedback about their experiences using the tablets.

The intent is to measure the.....

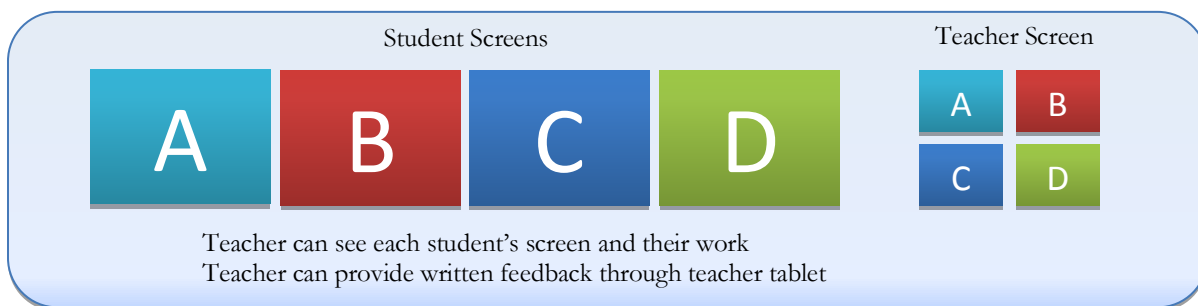


Figure 1: Screen Setup

4. RESULTS AND EVALUATION

4.1 Elimination of physical/social constraints leads to faster and more frequent teacher response

The SMART Sync software eliminated the need for the teacher to move in order to check in with students and address their needs. As a result of the teacher's ability to view all students work on the teacher tablet, less time was spent on physical movement and more time was afforded to addressing student needs. This led to a greater number of student-teacher interactions, and allowed the teacher to address a greater number of questions during the same classroom time period. While the teacher initially expressed frustration in not being able to physically move, and that there was a feeling of 'disconnect' due to lack of physical proximity, the teacher expressed that with practice, talking to the student while checking student work on the tablet alleviates that feeling. In a particular lesson, there were a total of 134 interactions (See

Figure 2 for an example of what is understood by an interaction) between the students and the teacher within a period of 71 minutes, where more than half (72 to be exact) were initiated by the tablets. Since there was no control group for comparison, it is difficult to attribute any significance to this figure, although the video showed very little downtime by the teacher and the conversation continued to flow. Feedback from students also point to quicker teacher feedback: “It was quicker for the teacher to help the students when they have a question”. “One thing that I like very much is how the teacher is able to see what you are doing wrong and answer questions much more faster.”

Additionally, the elimination of teacher movement also eliminates the physical constraints of the classroom environment that may normally limit teacher movement, accessibility, and the ability of the teacher to ensure that all students reach the learning target of the lesson. This means that teachers had equal access to each pair of students. Since communication is facilitated by the SMART Sync tablet, the teacher can still use “virtual physical proximity” to see student work, and can still address students’ needs by writing to them on the teacher screen and allowing the students to see the teachers response on their own tablet screen, keeping communication as confidential (and individualized) as needed. This enables the teacher to reach every student in the classroom, no matter what the physical arrangement of the classroom is. Not only is the teacher

not limited by the classroom space, but the teacher also can continue the practice of checking in with students even when they do not have concerns to address. The use of the tablet, allows the teacher to view student work on the teacher screen to informally assess progress, level of understanding, productivity, and points of confusion. In this manner, the teacher is able to assess individual and overall levels of student engagement, understanding, and misconceptions that may need to be addressed. As a result, the teacher is better able to equitably distribute attention to all students in the classroom and is able to do so more effectively by individualizing that attention.

Definition of a single interaction:

It is a set of question(s) and answer(s) (including immediate follow-ups)

Example of one interaction

Student: does ‘x’ have to be written in a curly funny way?

Teacher: preferably, but it is up to you.

Student: and what font is it if I have to type it up?

Teacher: I am not sure. You would have to look it up.

End of interaction

Figure 2: Interaction

4.2 Student-Teacher confidentiality allows enhanced communication

The SMART Sync and pen and touch technology created a vehicle for all students to communicate their individual needs. Specifically, the students were able to share their questions privately with the teacher (as only the teacher could see their screens), creating an experience where students felt more comfortable asking questions or merely asking for help. This resulted in a classroom experience more rich in student voice, as all students (those usually shy to ask for help, those comfortable asking for help, and even those with limited language skills) were able to use the pen and touch technology to write their needs on the tablet screen, thereby communicating with the teacher in an effective and confidential manner.

Furthermore, the SMART Sync software allowed the teacher to create a learning activity that with the help of the pen and touch technology made it easier for students to address their needs with more preciseness. In this study, the students worked through an activity that facilitated by the use of the pen and touch technology, allowed them to pinpoint precise areas to

address with the teacher. Guided by a “digital document” that students viewed and “wrote on” using the tablet screen and stylus pen, the teacher could see their work on the teacher screen and have greater information as to their points of confusion. Students could also use the language of the document to phrase their questions, making it easier to use precise (both content specific and accurate) language to address their needs with the teacher. Students voiced their experiences on how the technology facilitated their learning: “I think it is easier for students and allows for more educational interaction”. “Also it made working more easier having the teacher check our progress. It was interactive and fun. Seems it can be easier to learn”. “Is also easier to write and fix your work that you are trying to complete”. “I enjoyed using this tablet because it was easy to use and working with a partner made it easier to figure out each problem.”

4.3 Individualized pacing leads to increased engagement, less interruption, and better behavior

The use of the SMART Sync software allows the learning environment to become more individualized to student learning needs. While students are able to work on the lesson activity at their own individual pace, they also maintain the ability to address their individual needs and receive the specific support they need regardless of their “place” in the learning activity. This eliminates the teacher’s desire to interrupt the entire group, as all students can communicate their questions and the teacher can still check in with all students, particularly students with more specialized learning needs (such as English learners, students who tend to need higher levels of academic support, etc.). With fewer interruptions and more individualized support, the learning experience can flow at the appropriate rate for each student (not too fast for those that need more time and not too slow for those that need less time), creating a more individualized learning environment. Specifically, in this study, students reported that working in the SMART Sync classroom using pen and touch technology and tablets was a more enjoyable experience, increased their ability to focus and their sense of independence while learning. “You get to ask us questions and check up on our work without interrupting anyone else in the class”. “I enjoy using the tablets it is very helpful to me and I am able to concentrate much more when using tablet”. “I really enjoyed working this way because you have more flexibility, and you get to work with your partner, and when you have a question the teacher can look at your screen and tell you where you not doing well. This method helps a lot”. “I like how we are able to help each other out. This makes learning more interesting.” In addition, in one of the recorded lessons, there was only 1 classroom management prompt by the teacher in a 71 minute learning segment of the lesson, where the teacher asked some students to get back to work in the last 5 minutes of the segment. This not only is indicative of a high level of student engagement on the prescribed tasks, but is also an indication that the teacher can focus on engaging students to learn instead of spending time on behavioral issues.

While the observed outcomes and reflections of pen-and-touch-tablet use in the classroom described here are in no way conclusive, they suggest significant and optimistic implications. The challenge of creating the most effective, individualized and successful learning environment for each and every student that enters a typical high school math class is not one that is easily met. While the pedagogy of teaching combined with teacher creativity can meet this challenge with success, there is no predetermined pedagogy for how technology can aid in overcoming such challenges fast enough to address their urgency. Therefore, it is important to consider how using technology, such as the pen and touch tablets, created an experience where significant classroom constraints became almost nonexistent, and the conditions for effective

learning experiences prevailed. More specifically, it is important to further consider what unique capabilities pen and touch technology coupled with the SmartSync software offer to the learning environment and how these unique capabilities accommodate the classroom environment to make it a more effective learning environment. The implications for qualitatively better use of class time, for increasing access for all students, and for creating a uniquely individualized learning experience open the door for further possibilities and questions. These and other considerations necessitate further investigation, however, it is certain that the observed benefits to the classroom make such investigation a worthwhile and pressing endeavor.

5. FUTURE WORK

Comparison with control? What this takes away from traditional classroom teaching. What it means for teacher professional development?

6. ACKNOWLEDGEMENTS

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REFERENCES

- [1] Hamilton, E. and N. Harding (2008). *"Agent and Library Augmented Shared Knowledge Areas (ALASKA)"*. Institute for Education Sciences Award 305A080667.
- [2] Hamilton, E. (2010) *PREDICATE Project: Targeted Research on Teacher Creativity at the Intersection of Content, Student Cognition, and Digital Media*. National Science Foundation award 1044478.
- [3] Hamilton, E. (2007). *Virtual and Face-to-Face Workshops to Organize the International Distributed Learning and Collaboration (DLAC) Research Network*, Microsoft Research USA.