

CHALLENGES OF UTILIZING TABLET COMPUTERS FOR INSTRUCTION IN  
THE MIDDLE LEVEL SCIENCE CLASSROOM

by

Michael James Poser

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Michael James Poser

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## ABSTRACT

Tablet computers have the potential to reshape technology use in education. This project examined the impact of using tablet computers for middle level instruction at Hobson Public Schools in Hobson, Montana. Students were provided the tablets at the beginning of the year and data was collected from the administrator, teaching staff and students on the changes in teacher preparation, student/teacher interaction, and district policy needed to make the tablet use successful. It was found that teacher preparation time increased and that teachers needed more professional development. District policies were driven by concerns over technology misuse and led to restricted access to the tablets. Consequently, student/teacher interactions did not change significantly. Ultimately, the staff and students valued the tablet technology and there will be a re-evaluation of district policy and professional development practices to better suit the needs of the district.

## INTRODUCTION AND BACKGROUND

In woodworking, the hand plane is a tool for shaping and smoothing the surface of wood and it is as ancient of a technology as the axe. The basic design still in use today was utilized 1500 years ago by the Romans. Asian designs go back even further. Powered by muscle and the will to use it, the hand plane is my favorite woodworking tool. With it, I can smooth out surfaces with finish superior to those produced by either modern sandpaper or electric planers.

My use of hand planes exemplifies my use of technology in general. I love technology, but it is frequently the old technology that I love best. Wooden pencils, cider presses, and 35 mm cameras are objects of my affection. Reflecting upon this, I have concluded that it is not for a sense of nostalgia, but that I can efficiently achieve predictable results. Given a mechanical pencil, I become unusually flustered and frustrated within seconds. If my best work benefits from old methods, why would I spend the money and time learning new technologies?

So it is with my teaching. I generally shun technology-driven initiatives because I do not feel like they produce better educational outcomes. I certainly see benefits, but remain skeptical because technology is often used simply for the sake of using technology. Multimedia presentations, Web 2.0 tools, and computer hardware get crammed into a lesson as if their presence alone granted untold gifts of knowledge and skill to students. We as teachers inherently know that attendance alone does not necessarily predict learning will occur. The mere presence of technology does grant an education; only through active engagement will learner outcomes be achieved.

For the past seven years, I have been the 7-12 science teacher at Hobson Public School, a rural district in Central Montana. The school includes K-12 students with a part-time preschool. There are 44 students in the middle and high school grades. Ten-percent of students come from ethnically diverse backgrounds and forty-percent qualify for free and reduced lunches (Hobson Schools, 2012). The rural setting on the high-plains of Montana offer particular challenges to technology use in the classroom. The area is prone to wind storms that can cut access to the internet, electricity, or cause brownouts that damage electronics. We share tech services with other rural schools and it is often days before we can get repairs on equipment. There is limited broadband access both at the school and for the homes of students. Cellular signal is poor. The restricted infrastructure limits the interest and use of technology in the community.

It is only tentatively, that I use new technologies in my classroom. I am allowed a lot of leeway in teaching my classes. When an administrator asked how I used technology in a lesson, I noted that microscopes and pencils were a form of technology. Reluctant as I am, I do see that there are topics and skills my students need that cannot be obtained simply using my current teaching practices. My district has been reducing some of the barriers that have prevented using computer technology to teach. We are increasing the number of machines students have access to, increasing bandwidth, and students are coming into my classes with the technology skills such that I can teach more about science content and less about software. In particular, I see a lot of potential using tablet-computing devices such as I pads. They can connect to the internet, be used for data collection, allow for collaborative work, and a growing library of applications provides manipulative tools for interpreting and displaying information.

My interest in tablets led to the formation of my focus question, what are the impacts of using tablet computer for instruction in the middle level classroom? As with my hand planes, I wanted to know if this was the best tool I can be using. In particular, I was interested in how the students are able to use the device and what it takes from the teacher's standpoint to make tablets valuable learning tools. I included the following sub-questions to help direct my research:

- In what ways do teaching practices change in order to accommodate tablet computers?
- How does student/teacher interaction change when using tablet computers for instruction?
- How are other teachers in the district able to utilize tablet computers as part of instruction?
- What changes are needed in district policies and procedures to accommodate student use of tablet computers?

### CONCEPTUAL FRAMEWORK

In the *National Education Technology Plan* (2010), the United States Department of Education acknowledged the role of technology in the daily lives of Americans. The authors outlined a series of recommendations for the inclusion of technology into instruction and pedagogy with the goal of improving student learning. Writer Pamela Hieronymi (2012) has opined, “a set of podcasts is the 21<sup>st</sup>-century equivalent of a textbook, not the 21<sup>st</sup>-century equivalent of a teacher.” She continued to say students need training to make use of all of the information and ideas available through

technology. Teachers need to guide students through that confusion, teaching them to think and to evaluate (Hieronymi, 2012). Kopcha (2012) has noted that there is an apparent gap between the amount of technology available today and the amount of technology being used for instructional purposes.

A number of authors have found that instructional use of technology is limited due to barriers such as lack of access, time to plan, educational leadership, vision of the school district, teacher skill and the willingness of the teacher to change (Baylor & Ritchie, 2002; Kopcha, 2012; Maninger & Holden, 2009; Petko, 2012; Urhahne, Schanze, Bell, Mansfield & Holmes, 2010). These obstacles may not be easy to overcome. Petko (2012) has stated that barriers exist due to the interplay of various factors including: the beliefs of the teachers and students, the infrastructure of the school and its educational leadership, and the policies of the education system. Urhahne et al. (2010) classified barriers and the interplaying factors as either first-order or second-order barriers. The first-order barriers are extrinsic, often have straightforward solutions, and include lack of access, time to plan, and administrative support. Second-order barriers are intrinsic, difficult to change, and include beliefs, established practices and willingness to change. Further categorization of these barriers includes the “will, skill, tool” model (p. 222). For instructional use of technology to take place, there needs to be access to the tools, the skills to use the technology, and will to create the change.

Access to tools is most easily overcome by providing an ample number of units in each classroom (Petko, 2012). Li and Pow (2011) documented that even without changes to curriculum or instruction, deep-infusion of one-to-one devices in and out of the classroom can have a positive impact on learner outcomes. Sufficient access should take

account of the functionality of the device, ease of user interface, up-to-date components and usefulness of the hardware and software for teaching (Kopcha, 2012; Petko, 2012). In a study of a Texas school's one-to-one laptop initiative, Maninger and Holden (2009) found that teachers were often frustrated by the lack of good model curriculums for using technology and the inability of available technology to meet student needs. In addition to supplying the physical resources, districts must also model technology utilization that supports the curriculum before technology becomes a useful instructional tool.

In addition to model curricula, districts can provide professional development so that teachers have the skills needed to use technology as an instructional device. Kopcha found that mentoring programs were successful to teach the necessary skills but many districts lacked the resources and ability to scale these programs. Communities of professional learners may resolve some of these issues, but it is important that these learning opportunities follow practices of effective professional development, are situated to a teacher's classroom, and include in-classroom follow-up. Additionally, it is important to include a technician to help resolve issues that may arise (Kopcha, 2012). In a large study that surveyed 94 different classrooms, Baylor and Ritchie (2002) found that teacher competency or skill was predicted by the teacher's beliefs or willingness to change. Districts could promote this change by providing professional development opportunities and incentivizing teachers to participate. Prolonged exposure of five to six years to technology tools was required before classroom behaviors changed. Additionally, Baylor and Ritchie found a negative impact on student learning related to a teacher's non-school use of technology. They hypothesized this was because these teachers focused on teaching the technology rather than applying the technology to the

curriculum. Petko (2012) noted that there is a distinction between the personal skill of using technology and the professional skill of using technology to teach.

The last of the barriers, the will to change, is what Urhahne et al. (2010) called a second-order intrinsic barrier. The will to use technology as part of instruction stems from the belief that the technology will be useful. Petko (2012) defined this belief as a subjective element of knowledge that an individual considers true and important. The beliefs of teachers are affected by their personal history, emotions and values. A change in belief occurs when teachers are convinced a tool can improve learning. Baylor and Ritchie (2002) found teachers most willing to use technology when they felt it would lead to higher student accomplishment or would allow students to complete tasks on their own. Additionally, Baylor and Ritchie classified teachers into two groups based on their perceptions of technology. Teachers who viewed technology as tools for collecting, analyzing and presenting information tended to be constructivists and were more likely to use technology in innovative ways. Teachers grouped as behaviorists viewed technology as teaching machines and were less likely to use it innovatively.

For technology to improve student learning, be effective and appear useful, there must be strong educational leadership encouraging technology use (Baylor & Ritchie, 2002). It must actively engage the teacher and students, and the teacher must use it with a constructivist approach (Urhahne et al., 2010).

Educational leadership can determine the impact technology has on a student's ability to learn content knowledge and develop higher-order thinking skills. Successful leadership models technology use, plans and articulates a vision of technology use, rewards teachers and shares leadership (Baylor & Ritchie, 2002). Maninger and Holden

(2009) have argued that successful use of technology to support education requires committed leaders who communicate expectations to the stakeholders. The National Research Council (2012) reports that the expectations, priorities and decisions of school leaders establish a climate that encourages particular pedagogical approaches.

Consistent with the NRC (2012) reporting that science is a social endeavor, Chickering and Ehrmann (1996) argued that technology is a lever that supports good teaching practice when it allows for great communication between teacher and students and between groups of students. Reviewing how technology was being used in classrooms, Baylor and Ritchie (2002) found that students showed greater development in higher-order thinking skills when the technology was being used for collaborative endeavors. In developing chemistry curriculum for secondary students, Lewis, Zhao and Montclare (2012) address the concern that overuse of technology would lead to students' inability to relate to other humans by designing the activities to be collaborative in nature.

Even, though Petko (2012) only found a small correlation between a teacher's constructivist viewpoint and whether a teacher was likely to adopt technology use in the classroom, Baylor and Ritchie (2002) found constructivist activities to increase learner outcomes. Urhahne et al. (2010) modeled an instructional method with five principles. Teachers envision a lesson by creating a plan and organizing students. Arranging students in small groups or pairs enables collaboration. Students are encouraged and provided guidance. Teachers ensure learning by supervising progress and checking learner outcomes. Finally, teachers evaluate achievement by assessing students. Through this model, the teacher is never passive or redundant and is equally active in helping students assemble ideas and information.

Tablet computers may be a technology that can support education. Barriers, such as a teacher's willingness to use technology, the teacher's skill level with technology, and lack of access to technology tools can prevent useful technologies from being adopted in classrooms. A teacher's belief that technology presents a useful approach, identified as the willingness to change, may be the most difficult barrier to overcome. However, strong educational leadership with relevant professional development, activities that foster collaboration among students and a constructivist approach may impact student achievement and convince teachers of the value of using technology for instruction.

## METHODOLOGY

The Hobson School District is a rural district in Central Montana. It hosts 102 students in grades K-12 (Hobson Schools, 2014). The district made changes to the structuring of the middle level grades during the 2013-2014 academic year. Lead by a new vision of the role of middle school, we adapted teaching duties, developed new practices, and introduced one-to-one Ipad mini tablets to students in grades 5-8. We developed two new teaching groups: a core group that focused on the needs of middle-level students and an Ipad team that worked on the challenges of introducing one-to-one tablet technology.

Successful use of tablet computers for instruction depended on district-wide acceptance and use of this technology. Data for this project focused on the challenges addressed by our Ipad team in addition to the use of Ipad in the middle level science classroom. The Ipad team included fifth grade teacher, our sixth and seventh math and English language arts teacher, our social studies teacher, our business and computers

teacher, our special education coordinator, the district superintendent and me. The students who participated in this project included 12 seventh grade students and 7 eighth grade students. The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for working with human subjects was maintained (Appendix A).

Treatment began with the introduction of tablet computers on the first day of classes. Students and teachers were provided training from our district technology consultant on the capabilities and limitations of the Ipad. From there, teachers of core disciplines were expected to begin using the Ipad to enhance learning. The staff of the Ipad team established a weekly meeting to address the goals of Ipad integration, management issues and teaching strategies. Much of this time was spent developing policies related to Ipad use by the students and acquiring apps to use in our classrooms.

The seventh grade students in this project had access to the Ipad during English language arts, math, social studies and science. The science curriculum focused on earth and space science content including topics on mapping, minerals, rocks, the fossil record, plate tectonics, the atmosphere, weather, astronomy, stars and the solar system. Students used the Ipad as research tools and to record video presentations of their work.

Likewise, the eighth grade students had access to the Ipad for the same core classes, but were taught a physical science curriculum that included topics on the properties of matter, states of matter, kinematics, work and energy, atoms, chemical bonding and chemical reactions. Students used the tablets to record data from investigations, create presentations communicating results of investigations, to explore properties of the periodic table and build models of compounds, and as research tools.

Qualitative data was collected to determine the impacts of tablet computers at the middle level including changes in teaching practices, student and teacher interactions, utilization of the technology, and changes in district policies and procedures. This data came from my observations, administrator observations, surveys of other teachers and interviews with students. Data from these sources were compared for congruence. The relationship between the focus questions and the data collection strategies are displayed in a triangulation matrix (Table 1).

Table 1  
*Data Triangulation Matrix*

Focus Questions	Data Source 1	Data Source 2	Data Source 3
<i>Primary Question:</i> What are the impacts of using tablet computers for instruction in the middle level classroom?	Instructor observations and journaling	Administrator observations	Staff interviews
<i>Secondary Questions:</i> In what ways do teaching practices change in order to accommodate tablet computers?	Instructor observations and journaling	Administrator observations	Staff interviews
How does student/teacher interaction change when using tablet computers for instruction?	Instructor observations and journaling	Administrator observations	Student interviews
How are other teachers in the district able to utilize tablet computers as part of instruction?	Staff interviews	Administrator observations	Student interviews
What changes are needed in district policies and procedures to accommodate student use of tablet computers?	Staff interviews	Administrator observations	Artifacts

To collect data on methods of using tablets for instruction and needed changes to district policy, middle level teachers completed the Poser Instructional Use of Tablets Survey (Appendix B). This instrument asked staff to reflect on instructional changes, preparation time, outcomes, barriers and policy related to using Ipad in the classroom. The interview was repeated at the end of the treatment period to highlight changes that developed through the school year. Responses from the survey were analyzed for trends and themes in responses as well as insights that stood out. The willingness of teachers to make changes in instruction was used as a measure of impact tablet computing was having at the middle level.

Student comments about tablet use were collected using the Poser Student Tablet Use Interview (Appendix C). During classroom discussions, students were asked to share how they were using the Ipad for learning, whether they had an effect on student/teacher interactions, as well as share their frustrations and concerns. Comments were reviewed for trends and recurring patterns.

Instructor observations and journaling were used to record possible changes in teaching practice, time spent preparing lessons, and student reactions to the tablets. Information was recorded about the process of developing lessons, troubles with the technology, success, and student reactions to the projects. The data was analyzed for congruence with observations made by other staff as well as by looking for unintended consequences of introducing tablet computers at the middle level.

Artifacts provided data on the changes made in district policy to accommodate the use of Ipad for instruction. The Hobson School Middle Level Ipad Oath (Appendix D) shows the initial policy that was put into place with the introduction of the tablets. Notes

during Ipad team meetings provide staff and administration reflection on the policy. Artifacts from the beginning of the year were compared to staff and administrator views on policy at the end of the year. The data was analyzed for trends, themes, and discrepancies.

Reflections from the district administrator were collected in the Poser Administrator Tablet Implementation Interview (Appendix E). During the treatment period, the school administrator made observations of classrooms with access to tablet computers as well as classes without access to tablet computers. He observed classroom management, instructional strategies used, and student interactions. His reflections on policy, utilization of tablets, student/teacher interactions, teaching practices, and impact of tablet computers were recorded in an interview at the end of the treatment period. This data was analyzed for congruence with other data sources, themes and unique insights.

## DATA AND ANALYSIS

The results of the Poser Instructional Use of Tablets Survey revealed 100% of respondents indicated an increase in teacher preparation time to make use of tablet computer for instruction ( $N=5$ ). When asked how teaching practice needed to change to incorporate tablet computers for instruction, the district superintendent responded, "Preparation. Preparation. Administratively, that's another area that I need to reflect upon. How we can better serve teachers with such a new change of this nature? How do we provide them time and resources to prepare?" Several teachers indicated that the time was spent reviewing websites, applications and the capabilities of the device. One teacher noted that time was needed to write backup lesson plans in case the technology was not working smoothly. Another wrote, "The biggest change is the time it takes to

research and practice apps or programs... otherwise valuable class time may be wasted trying to get the app to work as needed.”

Getting the app or tablet to work as expected a major concern for all parties. When asked about barriers to utilizing the tablets for instruction, staff referenced the limited capabilities of the district network. “Sometimes, things are working extremely smooth and students are able to get where I want them to go and it happens in a timely manner,” wrote one teacher. “Other days, we have to have 2-3 backup plans because the technology isn’t working properly or it’s extremely slow.” During the Poser Student Tablet Use Interview, one student implied that poor instructional planning was to blame for some of the networking issues. “Ipad training for students shouldn’t happen all at once,” she said. “That many students trying to get on at once makes the system crash... they should stagger students using the Ipads.”

The students were very vocal about teachers becoming better trained in using the tablets. One seventh grader said, “The teachers don’t even really know how to use them. They even say that they don’t know what they are doing.” Respondents indicated limited professional development related to instruction uses for tablet computers. Everyone has participated in 2-3 hours of district trainings and 40% of respondents have participated in additional workshops or training sessions outside of the district. One respondent wrote, “I have found that most of the sessions I have attended focused primarily on elementary level students.” The district trainings have focused on Ipad functions rather than instructional uses. In speaking to changes needed for next year, the superintendent said, “Changes in professional development would be my number one priority... I think the staff needs to be provided with more genuinely effective professional development. And

I think that starts with reflection on which resources we are using and how comfortable we are.

Staff members noted a variety of other barriers to the use of technology. These included the inability to print projects, not having access to review and purchase apps, and time to research and experiment. One teacher reported, “There are other difficulties such as not having the device charged, not being able to locate it or it not working, and the regulations on filtering.” The same teacher wrote, “When the internet provider is down or even the school servers not functioning are problems we have to be ready for.”

The students reported that it was the district policy that was a barrier to tablet use. “They are so firewalled that you can barely use them,” said an eighth grader. “We can’t take them out to study. There is nothing you can do with the Ipad that you couldn’t just do with a computer. They are too locked down.” A seventh grade student said, “We can’t even take them home to do assignments on them.” Another comment was that certain classes had different privileges on the Ipads, implying that the policy was not uniform. Other concerns students felt were a barrier to use were the included mini-keyboards which were difficult to type on, lack of a powerful word processing app and the instructional use of the tablets. “They are basically for internet research... which a computer would be better for,” said a student. One boy reported, “We need a business class and learn how to use them for business not for math,” implying that they don’t need to learn how to use the tablet as a calculator because they already have calculators that they can use. One said, “we need instruction on how to make things like games and apps on them.”

When staff members were asked about learning outcomes they hoped to achieve with I pads, they had responses that ranged from big globally connected ideas to short term learning goals. One teacher wrote, “I believe we have to educate students for their future. I believe this is the way of their future so we are taking an important step to improve their transition into the technology world of work and play.” The superintendent hoped for an “increased understanding of appropriate digital citizenship.” Another teacher replied, “I hoped to develop some excitement, individuality, and creativity when using these devices to complete assignments or projects.” Other learning goals included having students demonstrate their knowledge using presentation apps and using the I pads to differentiate learning for students working at different levels.

Teachers indicated small instructional changes, but there was evidence that these changes weren't perceived as change in the teacher/student dynamic. Staff reported they could have students quickly look up answers to questions. “It's a quick reference to questions like: Who was the first person to invent the television etc.. it creates great dialog between the students,” wrote one teacher. Another teacher noted, “It makes it convenient to extend and enhance a lesson.” A third teacher said it was, “Empowering.” But when students were asked if the tablets changed how they interact with teachers, both the seventh and eighth grade classes reacted with a strong, “No!” Asked a similar question the superintendent said, “I don't know if I saw a change.”

In September, the district implemented the Hobson School Middle Level Ipad Oath in addition to the school's Electronic Use Policy (Appendix F). Our Ipad team had made plans to expand how and when students would use the tablets, hoping send them home with students by third quarter. The superintendent said, “We didn't develop a lot

of documented policy – it was very generic, very broad, very philosophy-based. We were going to put this in the student hands and let them drive the policies that we were going to adopt.”

This tentative procedure changed in October. The superintendent implied administrative concerns about the Children’s Internet Protection Act and local backlash to use of the devices prompted policy that restricted how and where the tablets were used. “We had set up the iPads for the middle level just as we have set up every other machine used on our campus – Smoothwall, firewalls – everything met the Child Internet Protection Act. However the iPads allowed for a little different type of use in terms of picture, recording, and some sharing and social media that was able to get through the Smoothwall. It never got to the point that it was misused. But I did have community come in that was very concerned about the possibility of misuse – and they were able to show our tech consultant and me the specific concerns they had... and we weren’t able to provide an answer. That was eye-opening to me as a technologically-tentative superintendent.” As a result, the district started filtering sites through the server (such as YouTube), and only allowing students to use the iPads in a few specific classes. Students were not allowed to use the tablets during free time, study hall, or at home.

Teachers continued to use iPads in the classroom with some modifications to their classroom policies. “I don’t allow them to have their iPads unless it’s for a specific task we are working on,” wrote one elementary teacher. “They usually only use them at their desks so I can monitor as I walk around the class. I think next year, I may want to go over a little bit more about what “acceptable” use means and little more education in regards to safety.” The business teacher (who has mostly high school classes) took a

more laissez-faire approach, “I have had to learn to let go of some of my control. This is hard because I always feel responsible for what they are doing in class. But if they would rather monkey around on the internet rather than do their assignment, then they need to see the consequence of their actions – which is usually a low grade.”

Finally, there will be changes to the district policy on tablets for the next academic year. Teachers reported frustrations of not being able to use the tablets to complete homework. Students reported frustrations over not being able to explore the devices. In reference to the Khan Academy app one student said, “It’s a really good website where you can take whole classes. But when are we supposed to use them?” “I may sound like I’m arguing with myself,” said the superintendent, “but there needs to be more policy and it needs to be less restrictive.”

#### INTERPRETATION AND CONCLUSION

Many barriers prevented my school district from using the Ipad tablets to the extent we had hoped for. These barriers were consistent with the literature and data for this project emphasizes our struggles with lack of student access, time to plan, and educational leadership. However, the staff, students and administration expressed the will to use this technology more effectively for instruction and have made suggestions for improvement next year.

Student access presented an interesting conundrum. We had the physical devices. The students knew how to use the devices. Teachers sought out curriculum to incorporate the tablets. But our district policy prevented students from having that deep-infusion of one-to-one devices described by Li and Pow (2011). Personally, I had expected students to be taking the devices home to collect data, complete homework, and

communicate with me electronically. I had imagined I pads creating new interactions between students and myself and wrote the anticipatory focus question, “How does student/teacher interaction change when using tablet computers for instruction?” It was no surprise then, when students couldn’t access the tablets outside of class that our interactions didn’t change.

Our district superintendent takes full responsibility for a policy that shackled use of the I pads and not providing effective educational leadership. “We will focus on technology professional development next year,” has been his mantra during the last month of the school year. It will take more than a willingness to accept fault to improve our technology leadership though. The policy limiting I pads to use in four core classes came from community concerns. We need solutions to those concerns and education of the community as a whole so that they can encourage and support the changes we are encouraging as educators.

The time to plan new lessons with the I pads was anticipated but not fully appreciated by the staff until we started using them. Beyond the expressed need to research apps and write new inclusive lessons, it took a lot of time for teachers to troubleshoot the technology. Safety filters presented weird quirks to work around; each classroom struggled to find effective ways to project the I pad screens; even our geography, with frequent high wind storms, caused our technology failures that teachers struggled to find solutions to. In a rural Montana school, teachers are already spread thin with six maybe seven different classes to prep for. There isn’t an easy solution here. As Baylor and Ritchie (2002) found, it may take five to six years of exposure to this technology before teachers make significant changes in instruction.

There is a strong will to better use tablet computers for instruction. I was humored by the seventh grader who said, “Teachers should take a day or two in the summer to learn how to use them... We could teach them.” The students were full of great ideas of how the tablets could be used – if only they had more access. The administrator has committed himself to a better Ipad policy and renewed technology vision for the district. And the teachers are continuing to find innovative solutions to incorporating the Ipads into instruction.

#### VALUE

Hobson is a rural town of 221 people and it was fairly safe to assume that I was the only one working on a master’s of education project at the school. But in December I discovered a statistical anomaly – a second person doing a graduate project evaluating the use of tablet computers in the middle level classroom. Shannon Foster moved to Hobson two years ago and has been working on her master’s of education from home. While it was very unlikely that we’d both be doing big projects at the same time, I think it was natural we both chose to look at the use of tablet computers. The Ipads were a large investment for our small school and there is lots of energy around the idea that these small affordable computers can reshape education.

Though we both looked at the use of tablet computers at the same grade band and were essentially talking to the exact same staff, administrator, and students, there are plenty of differences between the two projects. Mrs. Foster’s project was based on an evaluation model and examined the impact tablet computers had on digital citizenship and student academic success. My project was based on the action research model and looked at the impact on teacher preparation, student/teacher interactions, and district

policy. So different areas of tablet use were examined, but there were still data connections. Mrs. Foster's student survey includes comments calling for more teacher trainings, improved access to the devices and frustrations over the technology not always working. She also collected this gem of a quote from student, "I think our school is getting close to having technology of the 21<sup>st</sup> century, but we have further to go still." Like I said, it takes a long time to adopt technology into education; it will possibly be another 80 years before we see all of the technology of the 21<sup>st</sup> century.

It's not always easy getting that technology into the hands of students. It took a number of teachers asking, but I would like to think that this project helped push the administrator over the edge and purchase one-to-one tablets. There is a fear; a struggle to find the right mix of physical devices and software that advance instruction rather than merely "use technology." "My goal with technology is to have a purpose with the device," wrote a teacher. "A Smartboard did not really enhance student learning for me. It was fun to watch and manipulate but I can do almost all of that with just a projector. I didn't see them learning more or better because I had a Smartboard." Whether Ipad tablets help students learn more or better for my middle level science classroom will take continued investigation and reflection.

I now have the tools to investigate and improve my teaching practices. Many MSSE graduates will write how the action research model provides a framework to make and evaluate changes in their classroom, and how they will be encouraged to do more research. This is certainly true for me, but I would like to add that the capstone project has changed how I do projects with my students. Hobson students are now writing longer papers, using better references, participating in peer editing, and doing longer-term

science investigations. All of this has been modeled on my work in MSSE and is helping meet Common Core, the Next Generation of Science Standards, and my personal teaching goals. I'm teaching better and encouraging more students to pursue science. Thirty-five percent of Hobson graduates over the last four years are pursuing STEM-related degrees. In informally surveying my students, I expect that number to climb to 50% over the next two years.

The one-to-one Ipad initiative will take several more years of reflection by the staff at Hobson schools. While continuing this project, I will be spending some time with the NGSS and developing model curriculums and lessons to share with area science teachers. My librarian wife says there is a need for middle level science nonfiction books and thinks I should write one. And finally I would also like to investigate using blended online classrooms with my junior/senior chemistry class, using case studies to teach sophomore biology, and teaching more writing at the freshmen level – all projects inspired by my peers in MSSE at Montana State University.

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APPENDICES

APPENDIX A  
IRB EXEMPTION



INSTITUTIONAL REVIEW BOARD  
For the Protection of Human Subjects  
FWA 00000165

500 Technology Blvd. Room 107  
c/o Immunology & Infectious Diseases  
Montana State University  
Bozeman, MT 59718  
Telephone: 406-994-6783  
FAX: 406-994-4303  
Email: Cheryl@montana.edu

Chair: Mark Quinn  
406-994-5721  
mqquinn@montana.edu  
Administrative:  
Cheryl Johnson  
406-994-6783  
cherylj@montana.edu

**MEMORANDUM**

**TO:** Michael Poser and John Graves  
**FROM:** Mark Quinn, Chair *Mark Quinn et al*  
**DATE:** November 27, 2013  
**RE:** 'Challenges of Utilizing Tablet Computers for Instruction in the Middle Level Classroom' [MP112713-EX]

The above research, described in your submission of November 27, 2013, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

- (b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
- (b) (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.
- (b) (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
- (b) (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.
- (b) (5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.
- (b) (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.

APPENDIX B

POSER INSTRUCTIONAL USE OF TABLETS SURVEY

**Instructional Use of Tablets Survey**

October 2013

The following is to help collect data for my capstone project on tablet computer use. Participation is voluntary, and you can choose to not answer any question that you do not want to answer, and you can stop at any time. I would like it if you could type your thoughts to the questions below (they needn't be long or profound) and email them back to me.

- 1.) In what ways has instruction changed with the introduction of tablet computers?
- 2.) In what ways has teacher preparation changed with the introduction of tablet computers?
- 3.) What outcomes would you hope for as the result of teachers using tablet computers to enhance learning?
- 4.) What professional development have you undertaken to help make use of tablet computers in the classroom?
- 5.) How have you been able to utilize tablet computers in you classroom?
- 6.) What barriers prevent technology, like tablet computers, from being used to enhance instruction?
- 7.) What policy or procedures have had to change to allow for student tablet use?
- 8.) Is there anything else you'd like me to know?

APPENDIX C

POSER STUDENT TABLET USE INTERVIEW

**Student Tablet Use Interview**

October 2013

The following is to help collect data for my capstone project on tablet computer use. Participation is voluntary, and you can choose to not answer any question that you do not want to answer, and you can stop at any time.

- 1.) Have classes changed since introducing tablet computers into the classroom?
- 2.) Have you enjoyed using the tablets?
- 3.) Have tablet computers changed your interactions with Mr. Poser or with science course content?
- 4.) Is there anything else you'd like me to know?

APPENDIX D

HOBSON MIDDLE LEVEL IPAD OATH

HSML IPAD OATH  
Hobson School Middle Level  
(Grades 5th-8th) 2013-2014

**The vision of Hobson School is to improve student learning through the use of technology and meaningful engagement. Our students will develop 21st-century skills, including communication, creativity, collaboration, digital citizenship, and critical thinking.**

The HSML IPad "I will" Oath....

1. "I will" follow the "Responsible Use Policy/Guidelines" for the Hobson School District.
2. "I will" follow classroom rules and procedures for the IPad set up by my classroom teachers.
3. "I will" be on task in class and exclusively use apps and programs that are appropriate to the in-class assignment.
4. "I will" handle my IPad carefully and respectfully:  
\*I will keep my IPad in with me in designated areas and secured at all times.
5. "I will" ask permission prior to recording audio and taking photo/video of my classmates or staff members.
6. I understand that my IPad is property of the Hobson School District and is subject to inspection at any time without notice.
7. "I will" use my IPad as a learning device.
8. "I will" immediately report damage or loss of my IPad to Hobson School Staff.

"The Hobson School will" provide a safe, supportive environment in which students will have the opportunities to benefit academically, socially, and behaviorally.

"The Hobson School" will strive to meet our 1:1 IPad vision through planning, review and reflection, and staff collaboration.

\_\_\_\_\_  
Colby Fitzgerald, Superintendent

\_\_\_\_\_  
Date

\_\_\_\_\_  
Student

\_\_\_\_\_  
Date

\_\_\_\_\_  
Parent/Guardian

\_\_\_\_\_  
Date

APPENDIX E

POSER ADMINISTRATOR TABLET IMPLEMENTATION INTERVIEW

**Administrator Tablet Implementation Interview**

April 2013

The following is to help collect data for my capstone project on tablet computer use. Participation is voluntary, and you can choose to not answer any question that you do not want to answer, and you can stop at any time.

- 1.) In what ways do teaching practices change in order to accommodate tablet computers?
- 2.) How does student/teacher interaction change when using tablet computers for instruction?
- 3.) How are other teachers in the district able to utilize tablet computers as part of instruction?
- 4.) What changes are needed in district policies and procedures to accommodate student use of tablet computers?
- 5.) What are the impacts of using tablet computers for instruction in the middle level classroom?

APPENDIX F  
ELECTRONIC USE POLICY



## Cellular Phone and other Electronic Device Policy:

Student possession and use of cellular phones, pagers and other electronic signaling devices (including iPods) on school grounds, at school-sponsored activities, and while under the supervision and control of District employees is a privilege which will be permitted only under the circumstances described herein. At no time will any student operate a cell phone or other electronic device (including iPods) with video capabilities in a locker room, bathroom, or other location where such operation may violate the privacy right of another person.

Students may use cellular phones, pagers, and other electronic signaling devices (including iPods) on campus, before school begins and after school ends. These devices must be kept out of sight and turned off during the instructional day. Unauthorized use of such devices disrupts the instructional program and distracts from the learning environment. Therefore, unauthorized use is grounds for confiscation of the device by school officials, including classroom teachers. Confiscated devices will be returned to the student at the discretion of the Superintendent. Repeated unauthorized use of such devices will result in disciplinary action.

### In Summary,

#### What is an electronic device?

**Personal electronic device:** Any device that a student is in possession of which electronically communicates, sends, receives, stores, reproduces or displays voice and/or text communication or data. These include, but are not limited to cellular phones, pagers, smart phones, music and media players, gaming devices, tablets, laptop computers and personal digital assistants.<sup>1</sup>

#### When can I use my personal electronic device?

- \*You can use your personal electronic device in the school building before 8:30 a.m..
- \*You can use your personal electronic device in the school building after 3:30 p.m.
- \*You can use your personal electronic device with permission and under the supervision of a teacher or staff member at Hobson School

**\*\*IMPORTANT:** Picture taking and recording is not allowed in any area of the school building unless specifically under the direction and supervision of Hobson School Staff\*\*

#### When am I prohibited from using my personal electronic device?

- \*All personal devices must be **kept turned off** and **out of sight** between 8:30 a.m. and 3:30 p.m.

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<sup>1</sup> Albuquerque Public Schools, "Glossary of Terms." *Albuquerque Public Schools*. 2014. Retrieved, April 29th, 2014.

<sup>1</sup><http://www.aps.edu/about-us/policies-and-procedural-directives/glossary-of-terms>

**\*\*THIS INCLUDES THE LUNCH TIME PERIOD.**

\*At no time are electronic devices allowed in locker room and restroom facilities.

Why?

The Hobson School District believes personal electronic devices are personal privileges that should be utilized outside of the classroom. Personal devices often become distractions and can take away from your and your classmates academic environment. However, the Hobson School District understands the importance of 21st Century Digital learning and communication. We have established a 1:1 iPad culture for our Middle Level students to address the academic needs of a 21st Century Learner. Please review our 1:1 iPad Vision and Mission for more information.