Integrating Interactive Whiteboard Technology on Pre-Service Teacher Preparation: Process and Outcomes

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Abstract

Interactive Whiteboards became very popular among P-12 schools in the US. Teacher preparation programs found themselves catching up to the need of equipping pre-service teachers in using this technology. This study focuses on the process and outcomes of integrating interactive white boards (IWB) specifically SMARTBoards in pre-service teacher preparation programs at a private university. A case study approach utilizing a cohort of School of Education (SOE) students assigned for fieldwork at an identified high needs/low resources public elementary school was used. A questionnaire determining baseline technology perceptions, attitudes and skill level was administered at the start and end of the semester. This data was supplemented by focus group discussions to contextualize SOE students' perceptions, attitudes, confidence, and satisfaction levels of using interactive whiteboards in P-12 classrooms. Furthermore, the "Notebook" lessons and field-based teacher observation forms were analyzed to determine connections, relationships, and concerns emerging from interactive whiteboard classroom technology use and learning outcomes among P-12 students. The 5E framework (Engage, Explore, Explain, Expand, and Evaluate) was applied as a guide for lesson plan development (Martin, Sexton, & Franklin 2009). A framework based on the Individualized Inventory for Integrating Instructional Innovations (i5) was refined to help ensure the likelihood of success of technology based projects in the classroom and identify potential barriers that hinder technology integrating efforts (Groff & Mouza 2008). The framework focuses on the role of teachers (methods and field-based teachers), students (SOE students) and contextual factors (training, logistic support, technology infrastructure, etc.). Preliminary outcomes of the study will be shared and the framework for technology integration will be discussed for further refinement and usefulness.

Introduction

The board has been the centerpiece of classrooms since the invention of the black slate writing boards (also known as chalkboards) as early as 1801. Blackboards revolutionized education by providing a medium of visually presenting information to students at the same time and engage in a learning discourse. Schoolhouses across the United States adopted the medium and blackboards became the primary all around educational fixtures for about 200 years. In the 1960s green colored boards with chalk powder gained popularity and the term "chalkboards" became a mainstay in education. By the mid-1980s, whiteboards or marker boards or dry erase boards began to appear and by the late 1990s, almost a fourth of all US school converted from blackboards to whiteboards. With the rapid influence of technology, presentation media continued to evolve and the first interactive white board was introduced by SMART Technologies in the early 1990s. A SMART Board is simply a whiteboard displaying the image from the computer monitor with the surface operating as a giant touch screen. The computer is controlled from the board itself through touching or using an electronic pen. The magic of technology and the whiteboard combined provides teaching and learning the potential for enhanced engagement and interaction in the classroom, supporting different learning styles (visual-spatial, auditory and kinesthetic), and increasing collaboration among students and teacher in the teaching and learning process.

Interactive whiteboards and their potential for enhancing learning soon caught up with schools in Long Island, New York and before long, almost all of the schools in Long Island had SMART Boards. The New York Basic Educational Data System (BEDS) reports from 2010 onwards that more than 90% of schools in the Long Island region are using SMART Boards. The School of Education at Adelphi University soon realized the need to prepare students to use SMART boards before they go out and student teach in these school districts. Through the SOE Technology Committee, SMART boards were installed in several classrooms. Furthermore, a zero credit 4-hour workshop was developed and required for all SOE students before they go out to schools to observe and student-teach. A cadre of SMART Board trainers from both university and k-12 schools were put together to implement the training.

Literature Review

The use of interactive whiteboards (IWBs) has continued to grow exponentially worldwide since their introduction into classrooms in 1991 (Manning Awards 2002). Defined as a display screen that when connected to a computer and projector in a closed loop can be controlled by the board itself, the SMART Board is most widely used in P-12 schools although it has commercial applications. Nearly one million IWB displays were purchased in 2012 alone (Rave 2013; Leneway 2012) even with the growing competition of the smaller tablets. As a replacement for the chalkboard, the IWB is still instrumental in large group instruction in P-12 classrooms, while tablets because of their design structure appear to have been most effective with individualized use patterns.

There is a growing body of research pointing to the effectiveness of the infusion of IWBs in the teaching and learning process. The positive impact is abundant in

elementary, secondary, and higher education levels (McNeese 2007). In the five-year study evaluated by McNeese, the faculty participants concluded that "the SMART multimedia classrooms enhanced both student face-to-face participation and e-learning."

Mechling, Gast, and Krupa (2007) explored the positive impact of the use of the SMART Board on the ability of mildly disabled students in a small group to read sight words. The results indicated that all students reached the criteria for their target set of words within six sessions for each set of words. The authors attributed this to the, "… large screen for delivering target information,…by making images more visible, and increasing attention to the task." Gaitlin (2007) studied the impact of the interactive whiteboard on student achievement by using a pre- and post-test design with 140 students in fourth, fifth, and sixth grade classrooms. Focusing on the content areas of mathematics, English language arts, and science, he determined that students whose teachers used an interactive whiteboard during the teaching and learning process achieved statistically significant gains over the students whose teachers did not use this target technology. In a meta-analysis of instructional applications of the IWB, Dostal (2011) summarizes the instructional advantages of the effective use of this tool to support the teaching and learning process. Although more disadvantages are listed, they all point back to the teacher's ability to effectively use this tool. The IWB is a tool that does not and cannot replace best practices in teaching (Morgan 2010; Preston & Mowbray 2008).

Carpenter (2010) explored the essential conditions for effective use of SMART Boards to raise student achievement. She summarized:

> The meta-analytic findings suggest relatively large percentile gains in student achievement under the following conditions:
> - A teacher is experienced
> - A teacher has used an interactive whiteboard for an extended period of time.
> - A teacher uses an interactive whiteboard extensively in the classroom but not beyond 80% of the time.
> - A teacher has high confidence in his or her ability to use the interactive whiteboard.

Despite the dramatic increase in the purchase of IWBs as classroom resources and the strong evidence of their effectiveness as a tool in the teaching and learning process, additional evidence points to the reluctance of veteran teachers to use IWB effectively in classrooms (Heath & Judd 2009; Schneckenberg 2009). Given the potential effectiveness of this instructional tool, resistance to infusing it into classroom instruction is perplexing, at best. In exploration of the root causes of this resistance, Shen and Chuang (2009) worked with 340 fifth and sixth grade students in Taiwan to determine the impact of attitudes and behaviors on IWB usage. In a design that incorporated the use of online surveys, the researchers determined that use of the IWB as a tool is highly correlated with attitudes regarding interactivity and ease of use, as well as perceptions of usefulness.

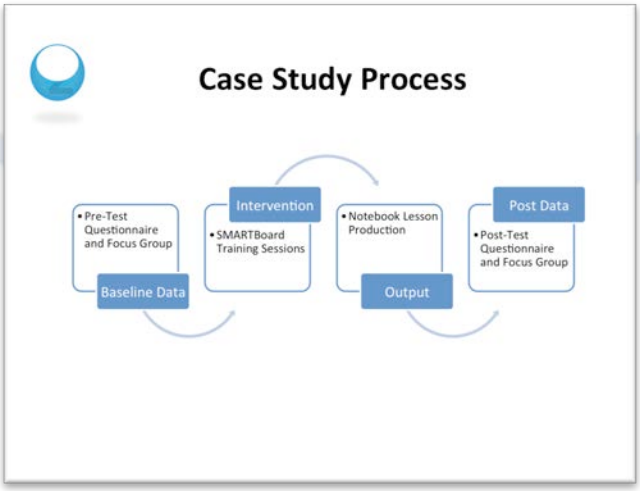
A review of the literature suggests the need for further exploration of the attitudes and behaviors on IWB within the dynamics of the veteran teacher and the pre-service

candidate within the classroom. Will our pre-service teaching candidates, as digital natives (students who have grown up in the age of digital technology), have more positive attitudes and behaviors related to the use of the IWB? Will they bridge the gap in the classroom between the resistance of the veteran teacher and the instructional needs of the children? Will a symbiotic relationship develop in which the veteran teacher provides instructional methodologies and the pre-service teaching candidate demonstrates the technological applications in support of those best practices using the IWB? *Integrating Interactive Whiteboard Technology on Pre-Service Teacher Preparation: Process and Outcomes,* provides documentation of this exploration.

Purpose and Methods

This study describes the process and outcomes of integrating interactive white boards (IWB) specifically SMART Boards in pre-service teacher preparation programs at a private university. A case study approach utilizing a cohort of School of Education (SOE) students assigned for fieldwork at an identified high needs/low resources public elementary school was used. A questionnaire determining baseline technology perceptions, attitudes and skill level was administered at the start and end of the semester. This data was supplemented by focus group discussions to contextualize SOE students' perceptions, attitudes, confidence, and satisfaction levels of using interactive whiteboards in P-12 classrooms. Furthermore, the "*Notebook*" lessons and field-based teacher observation forms will be analyzed to determine connections, relationships, and concerns emerging from interactive whiteboard classroom technology use and learning outcomes among P-12 students. Figure 1 describes the case study process and the points of data collection. It is important to note that after the baseline pre-test and focus groups were conducted, the cohort of SOE students were required to attend the zero credit SMART Board training sessions (Intervention) and produce a lesson plan using *Notebook*, the SMARTboard software (Output), then post-test and focus groups were again conducted.

Figure 1



The **i5 framework: student factors only** (Groff & Mouza 2008) was used to guide the development of questions used in pre-test/post-test and focus group discussions in describing students' technology beliefs, attitudes and skill level. The Individualized Inventory for Integrating Instructional Innovations was developed as a framework to address challenges in classroom technology use. The student factors include: experience and background, technology proficiency and attitudes and beliefs. Based on this framework, the following variables were included in this study: student beliefs, attitudes, self-rated general technology skills, SMART Board skills and technology integration skills.

The 5E framework in instruction (Martin, Sexton, & Franklin 2009) was the framework used in both the SMART Board training sessions and the lesson plan structure. This framework is an inquiry based approach that guided the teaching and learning process during the training sessions and during the creation of the lessons plans using *Notebook*, the SMART Board software and delivery of their lessons using SMART Board. The framework has 5 components namely: Engage, Explore, Explain, Expand and Evaluate. The following table (1) is an example how the framework is used in a lesson plan using SMART Board and *Notebook*.

Table 1: 5E Framework

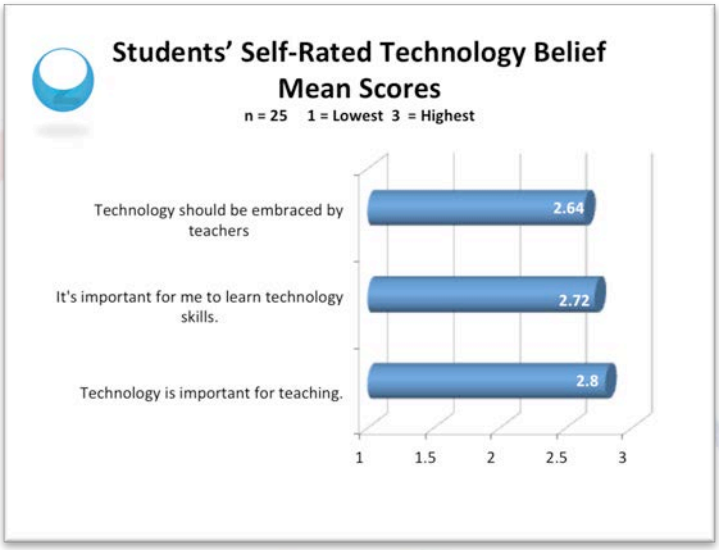
5E Component	**Sample Lesson Plan Guide Questions**
Engage	What is your motivation to engage the students? Set the purpose of the exploration. Discuss the inquiry.
Explore	Discuss the materials and safety procedures with students. Have students conduct their experiment.
Explain	Have students tell you what they did and what they found out. Ask why they reached those results and if they were the expected results.
Expand	Have students record their reflections in their science journal (journal book). Pictures are a starting point for all grade levels. Guide students to include inquiry, materials, procedures, observations, and conclusions using age appropriate language. Encourage students to make real world applications of their concepts.
Evaluate	Informally assess student journal records by having students share

Preliminary Findings and Discussion

The cohort of SOE students going for fieldwork at an identified high needs/low resources public elementary school were composed of 20 females who were enrolled in 2 fieldwork based methods classes.

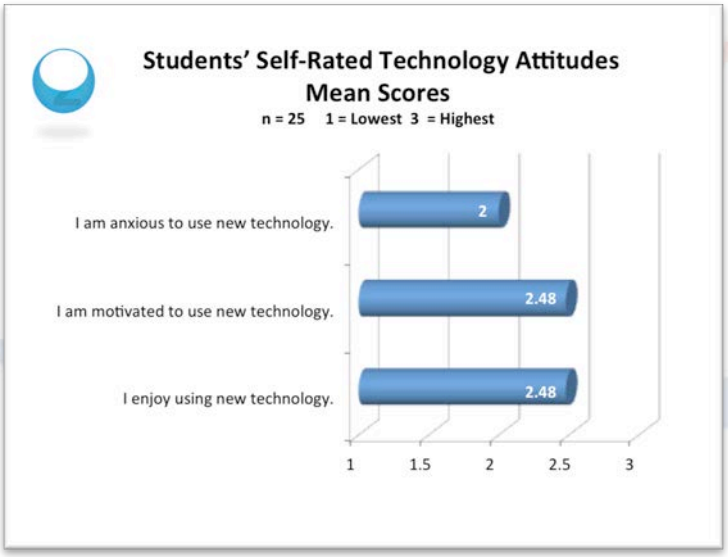
Students' Beliefs. Three questions in a scale of 3 were used to get a perspective of student's beliefs. Students revealed positive technology beliefs with "technology is important for teaching" rating the highest, followed by "it's important for me to learn technology skills" and "technology should be embraced by teachers" (Figure 2).

Figure 2



Students' Attitudes. Questions addressing attitudes included anxiety, motivation and enjoyment. "I enjoy using technology" rated the highest followed by "I am motivated to use new technology". The students expressed some amount of anxiety. (Figure 3)

Figure 3



These attitudes and beliefs were corroborated by the focus group responses as described below:

"I enjoy using technology because...

- It's more efficient

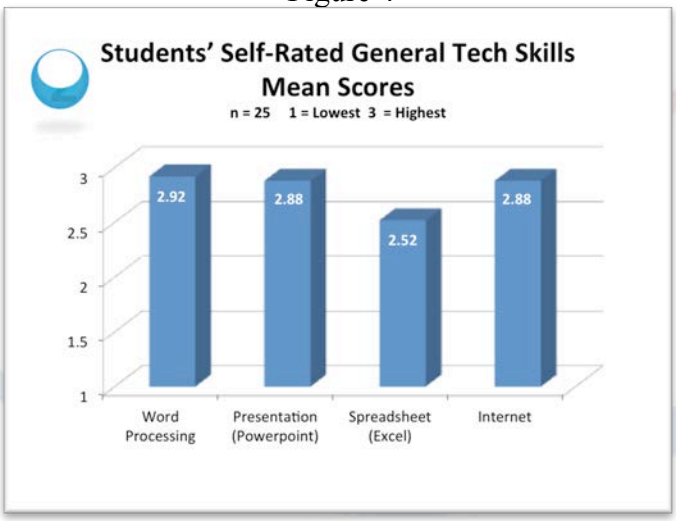
- It's entertaining
- It's engaging"

"I enjoy using technology in my teaching because...

- The kids enjoy it
- It reaches all types of learners
- I think that it is important life skills for the future, for us to be able to learn how to use technology at a young age
- It something that I'm comfortable using so it would be… make my teaching more efficient if I use it rather than writing on the board
- it's engaging and I think that it's a great tool, probably a lot more cost effective; rather than having tons and tons of manipulatives, you can just have the manipulatives on the board for you ready, You don't have to spend time in the classroom pulling out paper things, where it is already on the board; you can just pull up a ruler or anything that you need to use"

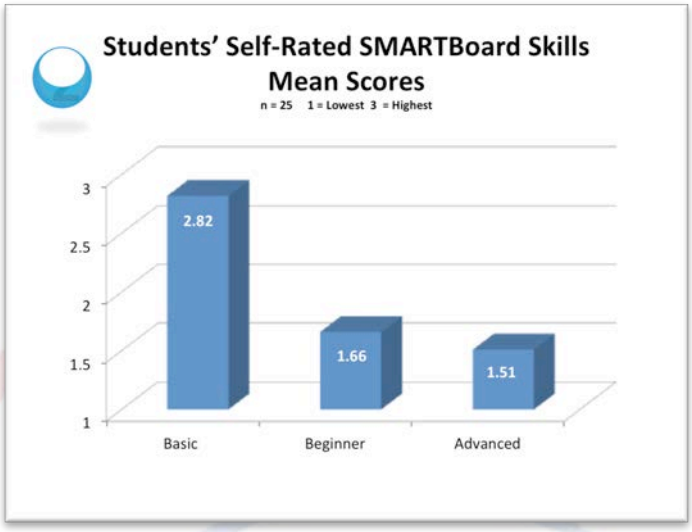
Students' General Technology Skills. Overall, student participants rated themselves as possessing a comfortable level of working with technology. (Figure 4)

Figure 4



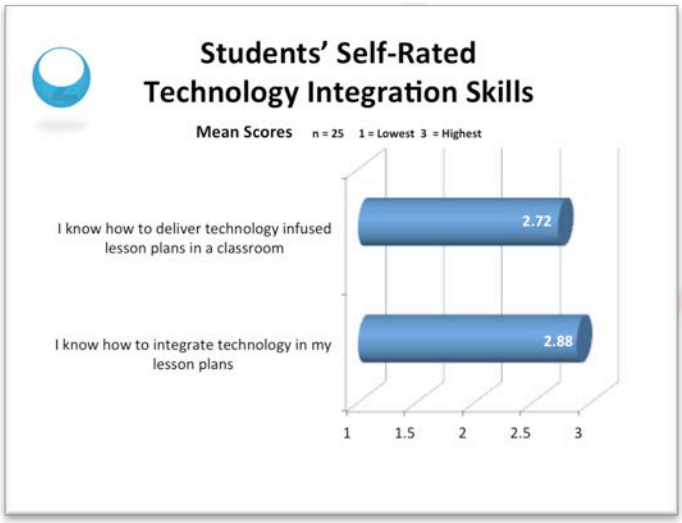
Students' SMART Board Skills. Most of the student participants rated themselves at the basic level of SMART Board skills. (Figure 5)

Figure 5



Students' Self Rated Technology Integration Skills. Student participants were confident of their skills to integrate technology into their lessons in the classroom. (Figure 6)

Figure 6



The focus group responses revealed some interesting insights from student participants in how technology could be successfully integrated in the classroom. They have confirmed the lack of technology integration in the classroom and believed that there is urgency to address the need.

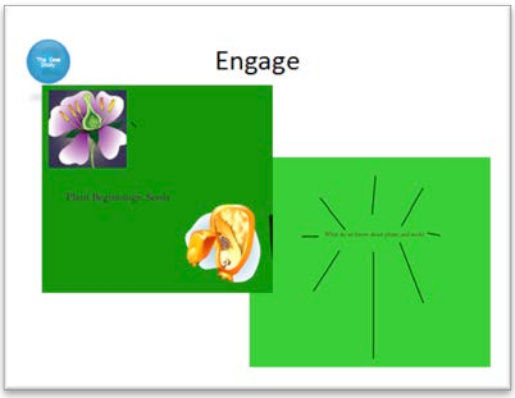
- "Well, that's how I feel like, too, is right now there is kind of a big gap with the kids that are in elementary grades right now and those that are teaching them, … And I feel that with our generation coming up…that we would be able to help bridge that gap a little bit, because we kind of understand more and I feel that maybe we can tap into it, because I feel like some teachers maybe feel helpless because they are just not informed

themselves that they can't really help them (children) in that sort of sense, while I think someone of the younger generation could."

- "She (my mentor teacher) actually tells me, "You really need to make sure that you are always on top with your technology. It's changing and most teachers, the old teachers, they don't like it; they don't like the change, but she's like, "You're messing with the kids then, because kids, they are natives, and technology is a big thing now, and so like you have to go on with it whether you like it or not." And she takes workshops and she's always like updated about everything."

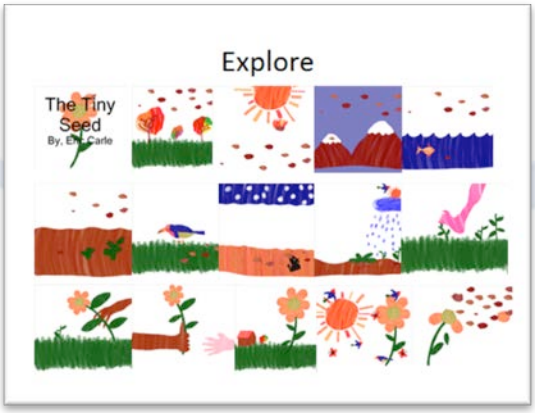
Use of 5E in a sample *Notebook* lesson. The following slides shows what a student has created using the ***Notebook*** software following the 5E framework:

Figure 7



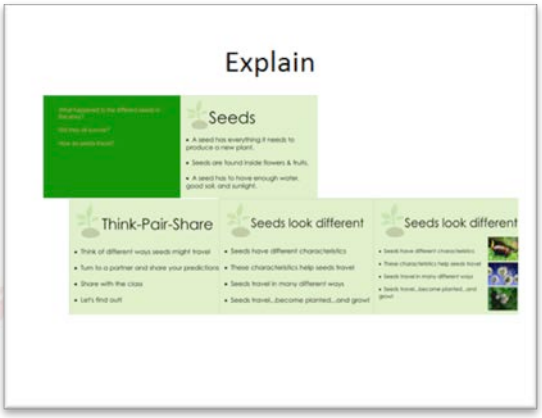
The student participant chose to use a word web to elicit prior knowledge and excite children.

Figure 8



The student participant scanned a picture book into the ***Notebook*** software to read along with the children as they explored the concept of seeds.

Figure 9



The student participant used various interactive slides to provide opportunities for the children to explain their understandings of these concepts.

Figure 10

The student participant used interactive slides with many opportunities for children to interact to expand upon the concept.

Figure 11

The student participant used interactive slides to evaluate the understanding ofconcepts at various points in the lesson.

Conclusions

Student participants have positive beliefs and attitudes toward technology and its importance and use in the classroom. Furthermore, their general technology skills and their willingness to use them to support teaching and learning is evident. Most of them have basic SMART Board skills but are open to learn the technology. The ***Notebook*** lessons are evidence of the ease with which the student participants are able to not only learn the skills but to apply it effectively within a limited amount of time.

The attitudes and beliefs of the student participants appear to support their understanding and willingness to bridge the gap between the digital natives (students) and the digital immigrants (K-12 veteran teachers).

Future Directions

This study is the initial phase of a series of projects that will be implemented as the School of Education at Adelphi University integrates the use of interactive whiteboards in classroom instruction. For this particular presentation, only the results of the pre-test and focus group responses were shared. Therefore, it will be interesting to see the post-data and focus group discussion at the conclusion of the semester. Further, only a sample of the ***Notebook*** lessons was shared. Therefore, the analysis of the "*Notebook*" lessons and field-based teacher observation forms to determine connections, relationships, and concerns emerging from interactive whiteboard classroom technology use and learning outcomes among P-12 students will be illuminating.

The study is a part of a bigger project that will use the **i^5 framework** in integrating technology in Adelphi University's Teacher Preparation Program. The Individualized Inventory for Integrating Instructional Innovations (i5) was utilized as a framework to guide integration of interactive whiteboard technology to Adelphi University's teacher education program. The framework addresses challenges through identifying potential barriers and seeking solutions as institutions navigate through the process of technology integration. The framework was originated by Groff and Mouza based on a comprehensive review of existing literature. The framework identifies six critical factors, each with each own variables as illustrated in Figure 1: (a) legislative factors, (b) district/school-level factors, (c) factors associated with the teacher, (d) factors associated with the technology-enhanced project, (e) factors associated with the students, and (f) factors inherent to technology itself.

Figure 12: The i[5] Framework

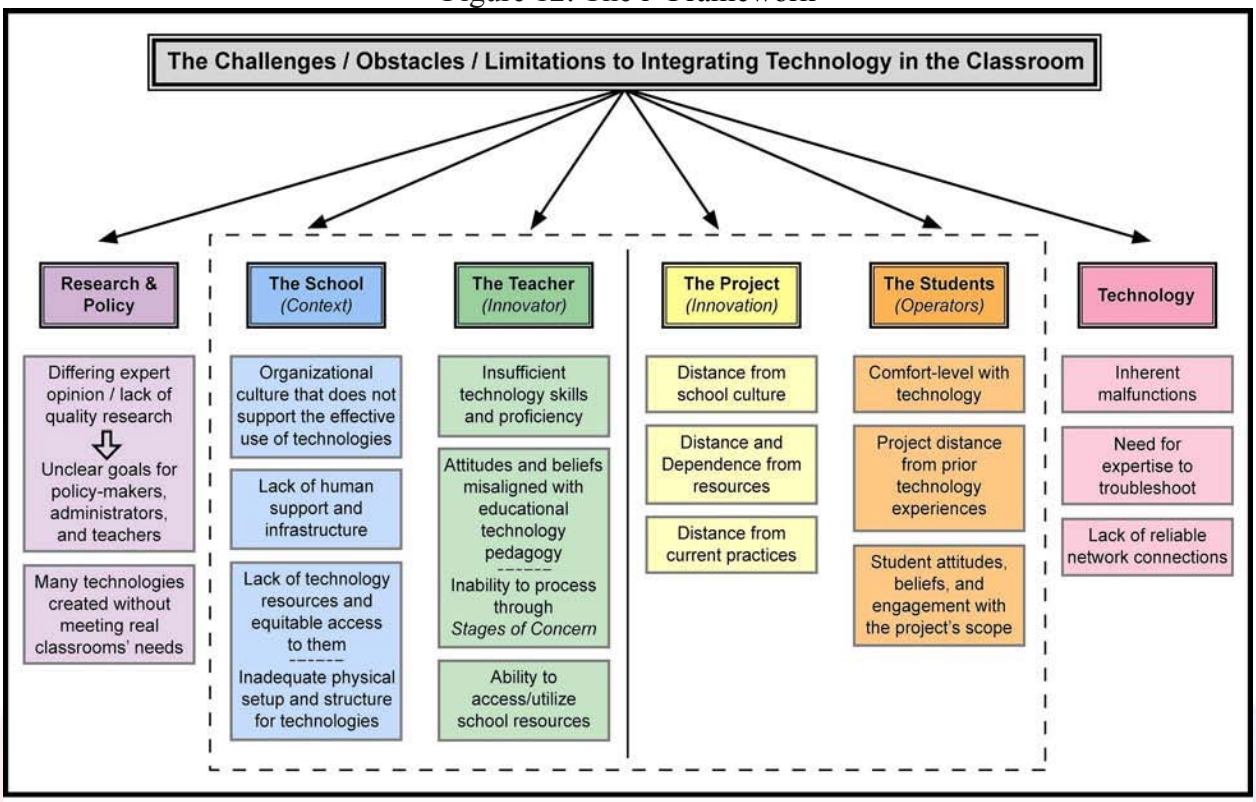


Figure 1. Challenges to Classroom Technology Integration Based on Existing Literature

In this initial phase of the project, the students (operators) of the i5 framework were the focus of the study. The following semester, the focus of the next project will be the teacher (Innovator). As the project moves along, it is hoped that a comprehensive report will be generated that will give helpful insights and concrete strategies about integrating interactive whiteboards in the classrooms, specifically in Teacher Education Programs.

References

Carpenter, L 2010, 'Effective SMART Board integration: Evaluating and coaching effective SMART Board instruction for the classroom', *SMARTTech.com,* Retrieved May 10, 2013, from http://www.stritch.edu.

Dostal, J 2011, 'Reflections on the use of interactive whiteboards in instruction in international context', *The New Educational Review,* vol. 25, no. 3, pp. 205-220.

Gatlin, M 2007, 'The impact of the interactive whiteboard on student achievement', *A dissertation submitted to the graduate faculty of the University of Georgia in partial fulfillment of the requirements for the degree Doctor of Education,* Retrieved May 10, 2013, from http://athenaeum.libs.uga.edu.

Groff, J & Mouza, C 2008, 'A framework for addressing challenges to classroom technology use',
AACE Journal, vol. 16, no. 1, pp. 21-46.

Heath, I & Judd, D 2009, 'Implementing innovative, interactive technologies among teacher
Candidates to enhance understanding of the impact of cultural diversity on learning',
Journal of the Worldwide Forum on Education and Culture, vol. 1, no. 1, pp. 1-9.

Leneway, L 2012, 'Educating the digital tribe: Are interactive white boards dead?', *Blogspot.com,* Retrieved May 10, 2013, from http://eddigitaltribe.blogspot.com

Manning Awards(2002). 'Interactive computer whiteboards create winning combination', *Innovatis,* vol.3, no.7.

Martin, R, Sexton, C & Franklin, T 2009, *Teaching science for all children: Inquiry methods for constructing understanding*, Pearson, New York.

McNeese, M 2007, 'Evaluation of SMART multimedia classrooms: Impact on student face-to-face participation and e-learning', *SMARTTech.com,* Retrieved May 10, 2013, from http://www.smartech.com/media/sitecore/en/pdf/research_library/higher_education/evaluation

Mechling, L, Gast, D & Krupa, K 2007, 'Impact of SMART Board technology: An investigation of sight word reading and observational learning', *Journal of Autism and Developmental Disorders,* vol. 37, pp. 1869-1882.

Morgan, H 2010,'Teaching with the interactive whiteboard: An engaging way to provide instruction', *Focus on Education,* vol. Spring, pp. 3-7.

Preston, C & Mowbray, L 2008, 'Use of SMART Boards for teaching, learning and assessment in
kindergarten science', *Teaching Science- The Journal of the Australian Science Teachers'*
Association, vol. 54, no. 2, pp. 50-53.

rAVe Staff 2013, 'One million interactive whiteboards sold in 2012'*, rAVe Publications*, Retrieved May 10, 2013, from http://ravepubs.com

Schneckenberg, D 2009, 'Understanding the real barriers to technology-enhanced innovation in higher Education', *Educational Research,* vol. 51, no. 4, pp. 411-424.

Shen, C & Chuang H 2009, 'An investigation on user communication behavior in an interactive whiteboard technology environment', *WSEAS Transactions on Communications,* vol. 8, no. 1, pp. 184-195.

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