

# AN ANALYSIS OF TECHNOLOGICALY ENHANCED LEARNING ENVIRONMENTS IN THE AGRICULTURAL SCIENCES

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Explore. Discover. Become.



# *Introduction*

- Technology has grown extensively in a short period of time and for years educators have explored ways in which technology can aid with learning (Baguley, 2004).
- Globally, educators and professionals realize the importance of having students become independent thinkers, explore complex problems, and apply the knowledge to real-life situations, which can be optimized by utilizing technology within the classroom (Simonson & Thompson, 1997).
- With educators and professionals searching to find ways to incorporate instructional technology in education, many computer developers began to focus on creating tools that teach hands-on learning as well as provide an easier way to stay connected to the students both inside and outside of the classroom (Nah, Siau, & Sheng, 2005).





# *Introduction*

- These aforementioned concepts grew into what is now called mobile education or m-education.
- Mobile technologies have provided unique opportunities for educators to deliver educational materials efficiently and to support the cognitive and social process of student learning.
- Students can communicate and interact with peer students and educators in real-time using mobile technology.
- Mobile technology can also be integrated into curriculum design to improve interactivity in the classroom (Nah, Siau, & Sheng, 2005).





# *Introduction*

- The aforementioned topic of mobile technology plays a vital role within instructional technology today.
- Technologies such as tablet PCs, a form of instructional media, help to provide information literacy to educators, learners, and professionals alike.
- Released in 2002, the Tablet PC has grown tremendously in popularity, particularly among educators.
- These mobile machines run on a variety of platforms with an active screen for pen-based computing.
- The Tablet PC's screen allows the user to complete multiple interactive task (Mock, 2003).





# *Introduction*

- Educators and professionals alike have begun to utilize this technology in their fields.
- Educators use the Tablet PC as a hands-on learning tool that can travel both inside and outside of the classroom.
- Professionals are utilizing the mobility of the Tablet PC to assist in numerous tasks such collecting data or formulating GIS (Geographic Information Systems) maps directly into the Tablet PC.
- The ability to have access to technology outside of four walls is of great appeasement to those who use the Tablet PC. As time goes on and technology improves, it is safe to say that the Tablet PC use in society will increase (Hewlett-Packard, 2008).





# Theoretical Framework

## Constructivism through Instructional Technology

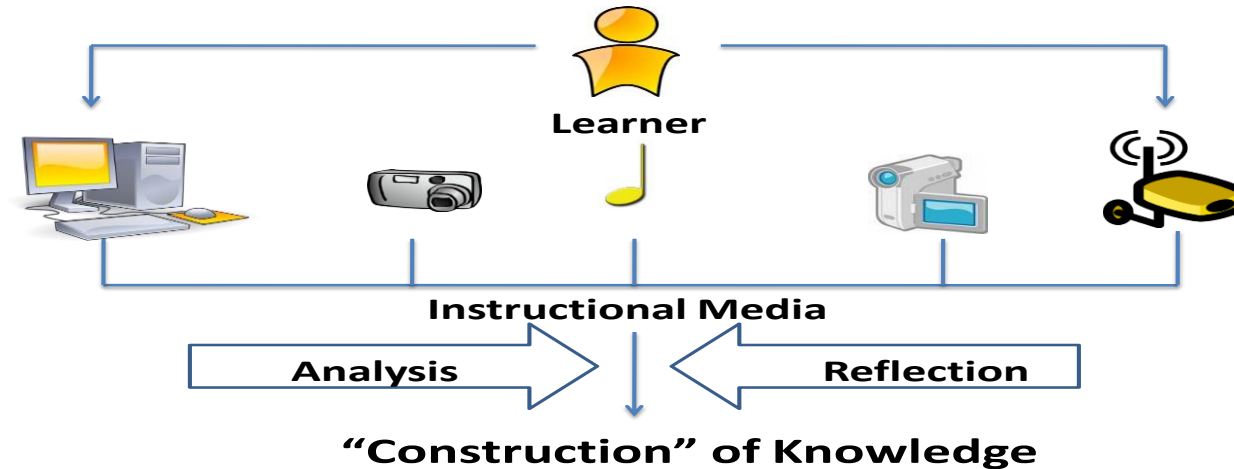


Figure 1. Constructivism through Instructional Technology Model

- Constructivism is founded on the belief that "there is a real world that is experienced but that meaning and understanding of the world are imposed by the person" (Simonson & Thompson, 1997, p. 43).
- Today, many cognitive theorists now portray learning more as constructing knowledge rather than directly acquiring it from the outside world (Ormrod, 2008).



# Theoretical Framework

## Constructivism through Instructional Technology

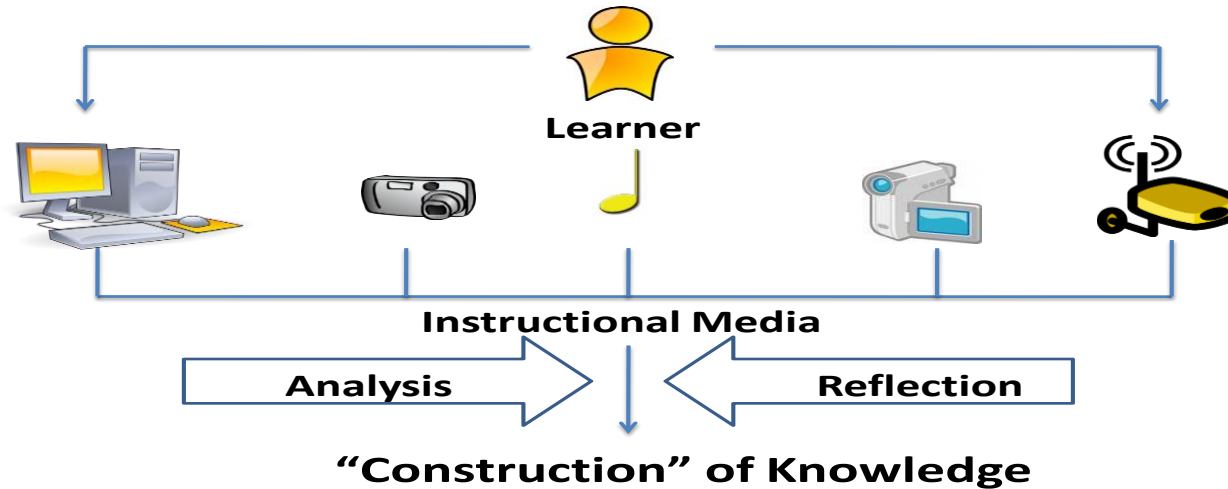


Figure 1. Constructivism through Instructional Technology Model

- Constructivists believe that learners create their own meaning from instructional activities and real-world experiences as described in Figure 1.
- Through these experiences with various forms of instructional media, meaning is gained, which can be utilized through the use of instructional technology (Simonson & Thompson, 1997).





# *Purpose*

- The purpose of this study is to determine the perceived impact on tablet PC utilization within agricultural science learning environments.







# *Research Questions*

1. What was the perceived impact of tablet PC utilization upon the instructional environment within a biological /agricultural engineering course as perceived by students?
2. What was the perceived impact of tablet PC utilization upon the instructional environment within a biological /agricultural engineering as perceived by instructors?





# Research Questions

3. What was the perceived impact of tablet PC utilization by demographic of the study participants?

To test the demographic research question the following hypothesis were identified:

H<sub>01</sub>. There are no differences in perception of tablet PC utilization by student's gender within a biological /agricultural engineering.

H<sub>02</sub>. There are no differences in perception of tablet PC utilization by student's major within a biological /agricultural engineering.

H<sub>03</sub>. There are no differences in perception of tablet PC utilization by student's classification within a biological /agricultural engineering.





# *Research Questions*

4. What were the demographic characteristics of the study participants?





# *Methodology*

- The population for this study consisted of students enrolled in a sophomore-level Geographic Information System course at a land grant university.
- Participants (n = 46) were recruited over a two-semester time frame in which the study took place.
- At the time of this study, surveys suitable to meet the research objectives were not found, therefore two separate survey instruments were developed by the researchers based upon the research questions for this study and with the aid of an exhaustive literature review.





# *Methodology*

- The first survey instrument was entitled GIS Tablet PC Evaluation.
- This survey instrument was comprised of one section of seven Likert-type questions consisting of the following responses: 0=Neutral, 1=Strongly Disagree, 2=Somewhat Disagree, 3=Somewhat Agree, 4=Agree, and 5=Strongly Agree.
- Combinations of both open and closed questions for demographic purposes were asked.
- The second survey was entitled GIS Tablet PC Utilization Professor Reflection Form.
- This survey was comprised of three open-ended questions about tablet PC utilization.





# *Methodology*

- A panel of experts at Land Grant University consisting of the researcher's with expertise in the content reviewed the survey instrument for content validity.
- The validity of these instruments was established by means of content and face validity.
- In order to establish the reliability of the survey instruments, a post hoc test was conducted with students enrolled in the GIS course.
- Reliability: The Cronbach's alpha reliability coefficient for the student survey was .88.
- Data collection: a post-course methodology was employed for students enrolled in the biological /agricultural engineering GIS course as well as the instructor.
- The data collected from the respondents were coded, entered, and analyzed using the Statistical Package for Social Science (SPSS),





# Findings

## (Research Questions One)

- In relation to the impact of tablet PC utilization, students agreed that the mobility of the laptop allowed them to complete GIS applications that stationary units would have not facilitated.
- Students agreed that the use of tablet PCs provided a more interactive learning environment.
- In reference to tablet PC utilization in the instructional environment, students agreed that the instructor provided adequate instructions about how to use the tablet PC in relation to GIS.





# Findings

## (Research Questions One)

- Students agreed that overall, the utilization of the tablet PC enhanced the learning experience in relation to GIS.
- In relation to GIS applications, students agreed that utilizing the laptop for GIS applications increased overall technological literacy.
- Lastly, students agreed that utilizing the laptop for GIS applications increased overall technological literacy.











# Findings

## (Research Questions Two)

- The second research question asked the instructors of the course to share their views about the students' utilization of the tablet PCs with respect to GIS instruction.





# Findings

## (Research Questions Two)

### **1. What are the most valuable aspects of incorporating the mobile technology into the GIS/GPS course?**

#### **Fall Semester**

“The students can immediately see the relevance of the lecture to field work. In the future classes, the mobile aspect will be introduced a little earlier so that students will be able to work with their own data (based on their major) to get a feel on how GIS/GPS can be applied to their field of study and thereby become more connected to the process. You can see the work instantly in a simpler process than with the alternate method.”

#### **Spring Semester**

“The mobile technology requires fewer steps to get a task completed. The students were more interested in using the tablet and its external device in a simple process rather than a more complex and tedious process. Students were exposed to current technology and tools that they will likely encounter in their jobs after graduating.”





# Findings

## (Research Questions Two)

### **2. What challenges have students faced with the mobile technology in relation to GIS instruction?**

#### **Fall Semester**

“There were a few issues with connectivity. It was also a bit rushed. The monitors of the tablet PCs were hard to read in the sunlight. The students did not realize that they could and should have deactivated the GPS component before and after taking points to avoid unwanted lines or courses. More time will be allocated to field techniques and other efforts in the future.”

#### **Spring Semester**

“It is difficult to see the screen on a sunny day. It was a challenge, though not insurmountable, to get the GPS unit “talking to” or seeing to the computer. The stylus is not user-friendly and not easy to set for one individual since several students will use a given unit in each semester. The mouse is tiny and difficult for large-fingered students to work with.”





# Findings

## (Research Questions Two)

**3. Overall what is your general impression regarding the incorporation of the mobile technology into the GIS/GPS course, particularly compared to past sections of the course?**


### **Fall Semester**

“The students appreciated the fact that several steps were eliminated in getting their data into shapefiles. It is the opinion that they (students) were more motivated as well because the tablets were fun to work with since using the hand held GPS units require several steps to get the data in the form of a shape file.”

### **Spring Semester**

“The instructors and students were impressed with the units. The PCs enable us to do more and do so faster since certain steps were eliminated or reduced. In comparison with a former approach, the students were able to undertake additional projects where in the former approach they were unable. In one case, one team was able to complete their project and was able to assist another group. This was not observed in past sections. In previous sections prior to the use of the tablet PC, students would struggle to complete a medium-sized task. The ability to teach at a faster pace through the utilization of the tablet PC is very beneficial to the course.”





# Findings

## (Research Questions Three)

Gender Perceptions	Gender	<i>M</i>	<i>t</i>	<i>p</i>
1. The mobility of the laptop allowed me to do GIS applications that stationary units would not have facilitated.	Male	4.20	1.561	0.126
	Female	3.73		
2. The use of tablet PC's provided a more interactive learning environment.	Male	3.71	2.102	*0.041
	Female	2.91		
3. The instructors provided adequate instructions on how to utilize the tablet PC in relation to GIS.	Male	4.09	1.228	0.226
	Female	3.64		

*Perceived Impact of Tablet PC Utilization upon the Instructional Environment by Gender*

- In the third question of the study, the researcher tabulated the perceived impact of tablet PC utilization by the demographic variable.
- Gender showed a statistically significant difference by gender. Males agreed that tablet PCs provided a more interactive learning environment in contrast to the females who only somewhat agreed.





# Findings

## (Research Questions Three)

Gender Perceptions	Gender	<i>M</i>	<i>t</i>	<i>p</i>
4. Overall, the utilization of tablet PC's enhanced my learning experience in relation to GIS.	Male	4.34	1.272	0.210
	Female	3.91		
5. Utilizing the laptop for GIS applications increased my overall technological literacy.	Male	3.69	0.643	0.523
	Female	3.55		
6. After the utilizing the laptop equipment with Arc GIS, I am now more knowledgeable of GIS.	Male	3.80	0.924	*0.038
	Female	3.09		
7. The use of tablet PC's improved my overall knowledge base regarding GIS.	Male	4.03	2.138	0.361
	Female	3.73		

*Perceived Impact of Tablet PC Utilization upon the Instructional Environment by Gender*

- There was also a statistically significant difference in responses by gender. Males agreed that after the utilizing the laptop equipment with Arc GIS, they were more knowledgeable of GIS. Females, however, only somewhat agreed.
- Based upon the aforementioned results, the researchers rejected the null hypothesis of no differences in Tablet PC utilization perception by student gender.







# Findings

## (Research Questions Three)

Class Perception	<i>F</i>	<i>Sig</i>
1. The use of tablet PCs provided a more interactive learning environment.	0.929	0.457
2. The use of tablet PCs improved my overall knowledge base regarding GIS.	0.292	0.881
3. The instructors provided adequate instructions on how to utilize the tablet PC in relation to GIS.	0.720	0.583
4. The mobility of the laptop allowed me to do GIS applications that stationary units would not have facilitated.	0.681	0.609
5. Utilizing the laptop for GIS applications increased my overall technological literacy.	0.886	0.481
6. After the utilizing the laptop equipment with Arc GIS, I am now more knowledgeable of GIS.	0.968	0.435
7. Overall, the utilization of tablet PCs enhanced my learning experience in relation to GIS.	1.046	0.396

- The perceived impact of tablet PC utilization upon the instructional environment by class was measured.
- The study participants were those students who were enrolled in the course over a two-semester time frame.
- There were no statistically significant differences based upon class, thus the researchers failed to reject the null hypothesis of differences by class.





# Findings

## (Research Questions Three)

•The perceived impact of tablet PC utilization on the instructional environment by major:

- Civil Engineering
- Biological Engineering
- Architectural Engineering
- Bioenvironmental Engineering
- Mechanical Engineering
- Soil Science
- Agricultural Business
- Construction Management
- Environmental Science
- Landscape Architect
- Technology Education

•There were no statistically significant differences based upon class, thus the researchers failed to reject the null hypothesis of differences by major.

Major Perceptions	<i>F</i>	<i>Sig</i>
1. The use of tablet PCs provided a more interactive learning environment.	.795	.634
2. The use of tablet PCs improved my overall knowledge base regarding GIS.	.762	.663
3. The instructors provided adequate instructions on how to utilize the tablet PC in relation to GIS.	.341	.963
4. The mobility of the laptop allowed me to do GIS applications that stationary units would not have facilitated.	.476	.894
5. Utilizing the laptop for GIS applications increased my overall technological literacy.	.593	.808
6. After the utilizing the laptop equipment with Arc GIS, I am now more knowledgeable of GIS.	.507	.873
7. Overall, the utilization of tablet PC's enhanced my learning experience in relation to GIS.	.935	.514





# Findings

## (Research Questions Three)

### •Demographic Data

- In relation to the semester in which students were enrolled, 54.3% of the students were enrolled in the fall semester and 45.7% of the students were enrolled in the spring semester.
- In relation to gender, 76.1% were males and 23.9% were female.
- In relation to the classification of students, 19.6% were freshmen, 39.1% sophomores, 30.4% juniors, 8.7% seniors, and 2.2% graduate level.

<b>Demographics</b>	<b><i>n</i></b>	<b><i>%</i></b>
Semester:		
Fall 2008	25	54.3
Spring 2009	21	45.7
Gender:		
Male	35	76.1
Female	11	23.9
Classification:		
Freshman	9	19.6
Sophomore	18	39.1
Junior	14	30.4
Senior	4	8.7
Graduate	1	2.2





# Conclusions

- Students who were enrolled in the GIS/GPS agreed that the incorporation of the Tablet PCs into the learning environment heightened their overall learning experience.
- These students agreed that the tablet PCs provided a more interactive learning environment and that the mobility of the tablet PCs allowed them to do GIS applications that stationary units would not have facilitated.
- Students can have access to educational materials through their mobile devices, which enables them to learn when the need arises and when the time is right for them, no matter where they are—even when they are on the move.
- This indicated that as perceived by students, tablet PCs have a positive impact upon the learning environment (Beam, 2008).





# Conclusions

- In this study, the instructor felt that the utilization of tablet PCs “enabled the class to do more and do so faster.”
- The instructor felt that the students were more motivated as well because the tablets were fun to work with since using the hand-held GPS units required several steps to get the data.
- The instructor also felt that students were more interested in using the tablet and its external device because of its simpler process to complete a task in the course.
- These findings indicate that instructors feel that the utilization of tablet PCs in the learning environment are positive.





# Conclusions

- In relation to gender, there were two statistically significant differences related to tablet PC utilization.
- Females “somewhat agreed” that the use of tablet PCs provided a more interactive learning environment when, in contrast “males agreed.” Females also “somewhat agreed” that after utilizing the laptop equipment with Arc GIS they were more knowledgeable of GIS, while males within the course “agreed.”





# Conclusions

- Though the perception of tablet PCs utilization within the learning environment varies by gender, overall, the utilization of the tablet PC in the learning environment is perceived to be positive.
- The demographic data showed that there were no statistical differences based upon major or classification.





# Recommendations

- With students who were enrolled in the GIS/GPS course agreeing that the incorporation of the Tablet PCs into the learning environment heightened their overall learning experience, teachers within the field of agriculture should create a foundation which implements methods for the infusion of instructional technology into the education curriculum.







# Recommendations

- Instructors within the biological /agricultural engineering program should develop evaluation plans to identify the impact that instructional technology has on their respective courses.
- Instructors within the biological /agricultural engineering program should develop and incorporate instructional methods of teaching that are not gender biased in the learning environment.





# Any Questions?



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