Incorporation and full integration of iPad technology with a biosciences focus in a Biology Honors classroom to document students’ engagement in virtual laboratory experiments

Craig Tench
Biology Honors
Lake Highland Preparatory School
ctench@lhps.org
Abstract

Lake Highland Preparatory School is implementing a one-to-one iPad initiative. Beginning in August 2012, all Upper School students will have the advantages of using the most powerful individualized learning tool available. Every student will have an iPad. The iPad at LHPS will enhance educational resources, enrich learning, and expand students’ skills, efficiency, and effectiveness.

In order to incorporate and fully integrate the iPad technology, students and faculty will be saving school related documents to the cloud, therefore if students are careful and aware of capacity and manage their device, capacity should not be an issue. LHPS is updating to Moodle 2, which integrates with the iPad. LHPS will use a Learning Management System to perform every day activities such as a Biology iBook, note taking, assignment uploads, research, and homework.

Virtual laboratory experiments using the iPad will be used all year in my Biology Honors classes. The purpose of this action research project is to document the student engagement during the virtual laboratory experiment using the iPad technology. The data collection will include the use of Student Engagement Direct Observation by the teacher to determine participation i.e. time on task and the use of a Student Engagement Questionnaire to measure identification i.e. if the student values learning.

Rationale

LHPS has been investigating the use of personal learning devices for almost ten years. Until now, the technology was not mature enough and the costs exceeded the benefits. The iPad offers significant advantages – the iPad is easy to use, has expansive capabilities, and its mobility provides unsurpassed convenience. The available applications and functionalities are compelling, and it will be a valuable teaching and learning tool for faculty and students. Adopting the iPad now means Lake Highland is one of the first schools in Florida to adopt one-to-one iPad use as a significant component of the student learning experience.

Lake Highland’s Upper School faculty members received iPads in December 2011 immediately engaging in extensive research, experimentation and training on the best classroom applications. Apple conducted multiple faculty training sessions on campus and hosted a team from LHPS at their California
headquarters. The entire faculty is motivated and enthusiastic about incorporating these powerful tools into their everyday teaching. LHPS has expanded the computer network and bandwidth, learned about the iPad capabilities, explored new modes of instructional delivery, and experimented with the best apps on the market to prepare for the official iPad Initiative launch in August 2012. The broad use of the iPad across all subjects at Lake Highland enhances the learning resources the students currently enjoy. It also adds a powerful personal learning tool that every student can utilize to optimize their learning. The students will gain easy and swift access to the vast digital resources available to the 21st century learner. The LHPS 2009 Strategic Plan directs the teaching of collaboration, creativity, problem-solving, productivity, innovation, and communication. The iPad provides the learning platform for these skills so essential in the 21st century.

With the launch of this exciting one-to-one iPad Initiative, Lake Highland Preparatory School enhances its reputation as one of the preeminent college preparatory schools in the nation.

In a study on iPad usage and engagement there was a reported increase in engagement when using the iPad, but there was not a corresponding rise in achievement. In fact, among the lowest quartile of readers, their comprehension scores actually decreased. Teachers reported that at times it served as a distracter and it frustrated attempts to absorb the students in “offline” discussions. Teachers will need to alter the way they teach to accommodate the new iPad technology (Sheppard, 2011).

Student engagement is a concept that has changed over time (Chapman, 2003). Student engagement has grown from time-on-task to an in-depth study of student behavior and the psychological foundation upon which those behaviors are constructed (Spanjers, Burns, & Wagner, 2008). Researchers have studied the way time is used in the classroom. Researchers have measured the amount of time spent in the engagement of tasks, or simply time-on-task. Learning time has been measured through direct observation. So the predictor of student achievement was the amount of time spent engaged in tasks in the classroom. As a result, time-on-task has been equated to learning (Berliner, 1978). Student engagement has evolved to include a psychological facet. The previous studies on student engagement focused on only one component such as time on task or willingness to learn. Student engagement has expanded to include two separate components. Finn demonstrated that student engagement was comprised of participation and identification. Participation can be described as behavioral engagement and included participation in class and school. Participation is similar to the traditional concept of time-on-task. Identification is related to psychological engagement. Identification includes school identification, belonging, and the degree to which the student valued learning (Finn, 1989).

The purpose of this study is to describe the incorporation and full integration of iPad technology with a biosciences focus in a Biology Honors classroom to document students’ engagement in virtual laboratory experiments by Student Engagement Direct Observation and the use of a Student Engagement Questionnaire.

Action Research Intervention

I plan on a three-part approach for every virtual lab using the iPad. The three parts will all incorporate pieces from Bench to Bedside. The first part of the lesson will include an overview of the subject matter
using the Powerpoint presentations and videos from Bench to Bedside. Students will be expected to take notes on the iPad, complete homework assignments and upload assignments for grading. The second part will be an introduction to the virtual lab with specific concepts and techniques to be mastered during the lab experiment itself. Some issues such as pipetting and basic lab techniques learned at Bench to Bedside will be covered during this section. The third and most important part will be the Virtual Lab itself and the accompanying lab report and/or assessment.

The data collection will occur during the following virtual labs:

Create a Stem Cell Line
Click and Clone
Virtual PCR
Viral Quest
Microarray Virtual Lab
Connections to Bench to Bedside Summer Institute
Powerpoint presentations and videos from Bench to Bedside.
Concepts and techniques such as pipetting and basic lab techniques learned at Bench to Bedside.
Virtual Labs from Bench to Bedside. Including but not limited to:
Create a Stem Cell Line
Click and Clone
Virtual PCR
Viral Quest
Microarray Virtual Lab
Data Collection and Analysis

During this study, to describe the incorporation and full integration of iPad technology with a biosciences focus in a Biology Honors classroom to document students’ engagement in virtual laboratory experiments, data collection will include Student Engagement Direct Observation by the teacher to determine participation i.e. time-on-task and the use of a Student Engagement Questionnaire to measure identification.

Qualitative research will make use of inductive logic by using a teacher specific observation checklist to look for patterns, aide in developing a hypothesis, and analyzing the data. I will use a Student Engagement Direct Observation checklist to measure the qualitative data. The intention is to supplement the qualitative data with quantitative data. The Quantitative research will make use of deductive logic. I will use a Likert Survey (Student Engagement Questionnaire) to collect quantitative data. Students will provide data from Biology Honors classes to determine the degree to which the student valued learning. The data collection will measure the same students more than once i.e. during multiple virtual labs using the iPad.

My hypothesis is that students who use the iPad for virtual labs from the Bench to Bedside institute will be more engaged.
Literature Cited


Budget and Budget Justification

Parents have three options regarding iPads for their students.

OPTION #1: School issued iPad 2. The school will issue the student a school-owned iPad 2 (16gb, Wi-Fi). The school-owned iPads will be collected at the end of the school year. The Student’s account will be charged a $25 insurance fee in case the student loses or destroys the school-owned iPad. The insurance policy will contain a $200 deductible as an incentive to encourage the student to be extra diligent in the
care and custody of the school provided iPad. NOTE: These iPads will be delivered to students at the iPad Orientation Meetings.

OPTION #2: Student owned iPads. If a student owns an iPad and the parent declines the school issued iPad, the school will credit the student’s account $100 which can be applied toward book purchases or other charges incurred on the student billing account. Parents will continue to receive the $100 credit annually for three years as long as use of a school iPad is declined. Over a three-year period, parents would receive $300 in credits, plus avoid the $25 per year insurance fee. The iPad 1, iPad 2 or the new iPad just released are all acceptable models for use at LHPS.

OPTION #3: Purchase iPad 2 from LHPS. If parents would like to buy a new iPad 2 (16gb, Wi-Fi) from the school rather than accept a school issued iPad, LHPS will offer the same $100 student account credit in Option 2 and sell you an iPad 2 for $379. The $379 is LHPS cost, and represents a slight discount off the price for the same iPad in the Apple store or through an on-line purchase. LHPS will be paying the sales tax on the iPad. NOTE: These iPads will be delivered to the student at the iPad Orientation Meetings.

Permissions

No permissions are needed.