

1-1-2013

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Gitsaki, Christina; Robby, Matthew; Priest, Troy; Hamdan, Khaled; and Ben-Chabane, Yazid, "A research agenda for the UAE iPad Initiative" (2013). *All Works*. 247.

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A research agenda for the UAE iPad Initiative

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Introduction

Learners today have direct access to information through technology and the internet, they manage their own learning in informal settings, and they have progressed beyond being consumers of content to become producers and publishers. Traditional teaching and learning methods are becoming less effective at engaging students and motivating them to achieve. Mobile Learning and its applications have been utilized widely in the field of education; however, a recent UNESCO report on Mobile Learning in Africa and the Middle East (AME) acknowledged “the dearth of evidence-based research and the limited credibility and trustworthiness of available information on mobile learning in the AME region” while it recommended “case-building and evidence-development on mobile learning in support of teachers, teaching and teacher development” (Isaacs, 2012, p.7). New and innovative methods of learning through use of tablets are creating a new model of teaching and learning that can occur anytime, anywhere and at the student’s pace (Joshi, 2012). To improve learning with mobile technology new pedagogies need to be implemented, from the inquiry-based model to the challenge-based and the project-based model, to interest-based learning and an open content model as students take academic and citizen responsibilities to define their future learning interest and improve lifelong skills. This paper outlines a recent large scale mobile learning initiative in the United Arab Emirates (UAE), involving over 14,000 post-secondary students and faculty in three higher education institutions. The following sections present the context of the initiative and its research implications for each of the three institutions.

Background

In April 2012, the decision was taken by the UAE Ministry of Higher Education to equip all faculty and students in the Foundation programs of the three Federal Institutions, i.e. the Higher Colleges of Technology (HCT), Zayed University (ZU), and the United Arab Emirates University (UAEU), with iPads for the academic year starting in September 2012. The Foundation program at each institution aims to prepare high school graduates with the necessary academic skills for undergraduate study (including English language proficiency, IT skills, research skills, library skills, study skills). A National Steering Committee was assembled with representatives from the three institutions and the objectives of the iPad initiative were outlined as follows:

- Achieve individualized student learning consistent with ‘Post-PC Era’ trends.

- Introduce challenge-based learning or other progressive classroom pedagogy.
- Increase student participation and motivation.
- Enhance opportunities for cross-institutional collaboration between faculty members.
- Increase faculty collaboration through cross-institutional repositories of learning objects.
- Facilitate the migration to e-books.
- Empower faculty to engage students in authentic, enduring learning opportunities.
- Create practice-ready students who will lead their organizations into a post-PC era.
- Model 21st Century Learning by integrating relevant emerging technology in and beyond the classroom.

(Cochran et al., 2012, p.1)

The UAE iPad initiative meant that the nationwide launch of over 14,000 iPads was unique by all accounts for any nation around the world and its implications for the education of Emirati post-secondary students were expected to be far reaching. At the start of the project, the Steering Committee launched a collaborative website, *ipad.hct.ac.ae*, developed initially by HCT and later on badged as the one-stop shop for sharing learning tools. The aim of the website was to enable faculty to locate effective iPad apps or learning objects aligned with the curriculum, as well as to post teaching and learning materials on the shared portal along with specific information regarding the utility and relevance of specific apps (Cochran et al., 2012). The 2012-13 academic year was declared by the Steering Committee “a period of testing and innovation in which the full range of options and tools will be explored” (Cochran et al., 2012, p.5), while the three institutions were encouraged to move education into the mobile learning era, to ‘disrupt’ traditional notions of teaching and learning and align these with the needs of young 21st century learners. The following sections present the implementation of the iPad initiative in each of the three institutions and their research agendas for investigating the impact of the use of mobile technology on teaching and learning.

Case study 1: The Higher Colleges of Technology

The Higher Colleges of Technology (HCT) are the largest of the three Federal Higher Education Institutions in the UAE and comprise 17 campuses across seven emirates. The iPad initiative involved 6,172 students and 328 teachers in the Foundation program. Prior to the start of the semester, all Foundation teachers attended an intensive professional development program between May and August 2012 in preparation for the use of iPads in the classroom from September 9th, 2012. In order to monitor and evaluate the iPad initiative implementation, a formative applied research project was designed.

iPad project evaluation: aims and objectives

Effective program evaluation can be defined by a number of standards, many of which should always be considered when performing program evaluations in education: (a) *utility* – evaluations need to be timely and influential and serve the information needs of programs; (b) *feasibility* – evaluations should get the job done and be thorough, while being efficient in limiting impact on costs, teachers, and students; (c) *propriety* – program evaluations need to be conducted ethically, findings must follow from the evidence, and they must be honest and unbiased (i.e. data should not be primarily analyzed by the people responsible for ensuring that the program is a good one); (d) *accuracy* – evaluations need to produce sound, precise data, and objective information; (e) *relevance* – evaluations need to provide

results that are helpful in developing and improving programs or in better understanding program effectiveness (see Brainard, 1996; Chelimsky, 2007; Healy, 2000; Isaac & Michael, 1997; Yarbrough et al., 2011).

Effective program evaluation is based on careful design, hypothesis development, instrument creation, appropriate sampling, systematic data collection, and the use of appropriate quantitative and qualitative research methodologies to analyze data.

The formative applied research project at HCT was an attempt to provide scientifically-based research and evidenced-based measures of the extent to which the iPad initiative implementation has achieved the goals outlined above, namely:

- achieved individualized student learning consistent with 'Post-PC Era' trends;
- introduced progressive classroom pedagogies to enhance student learning and achievement of higher standards of success;
- empowered faculty to engage students in authentic and enduring learning opportunities;
- increased student participation, engagement and motivation in the learning process;
- enhanced opportunities for cross-institutional collaboration between faculty members through cross-institutional repositories of learning objects;
- facilitated the migration of the Foundation program to e-books and paperless resources;
- created students highly proficient in use of technological innovations to effectively lead their organizations in the future; and
- promoted 21st Century Learning by integrating relevant emerging technology in and beyond the classroom.

Evaluation design

The iPad project evaluation design followed quasi-experimental research designs and utilized rigorous and objective evidence-based procedures. These included the use of mixed methods, multiple measures, triangulation of results, replication activities as part of longitudinal research, and appropriate design and statistical controls, as well as analytical procedures such as descriptive and inferential statistics.

Data collection instruments and procedures

The project evaluation design sought to address questions in three main domains: pedagogy, content and infrastructure. A logic model was developed including inputs (resources), activities (actions to affect change), and outputs (products of the activities), as well as short-term, intermediate, and long-term outcomes (see Honeycut & Kegler, 2010). The logic model helped to clarify the key components of the program, intervention, strategies, or key practice/ activities; and helped to provide a visual of the process of a program and clarify the theory of action as well as the key performance indicators (see Figure 1). As project results cannot be accurately interpreted without knowing the required details of its implementation, supporting data from different sources helped to ensure the thoroughness and accuracy of the evaluation (see Isaac & Michael, 1997; King, Morris, & Fitz-Gibbon, 1987).

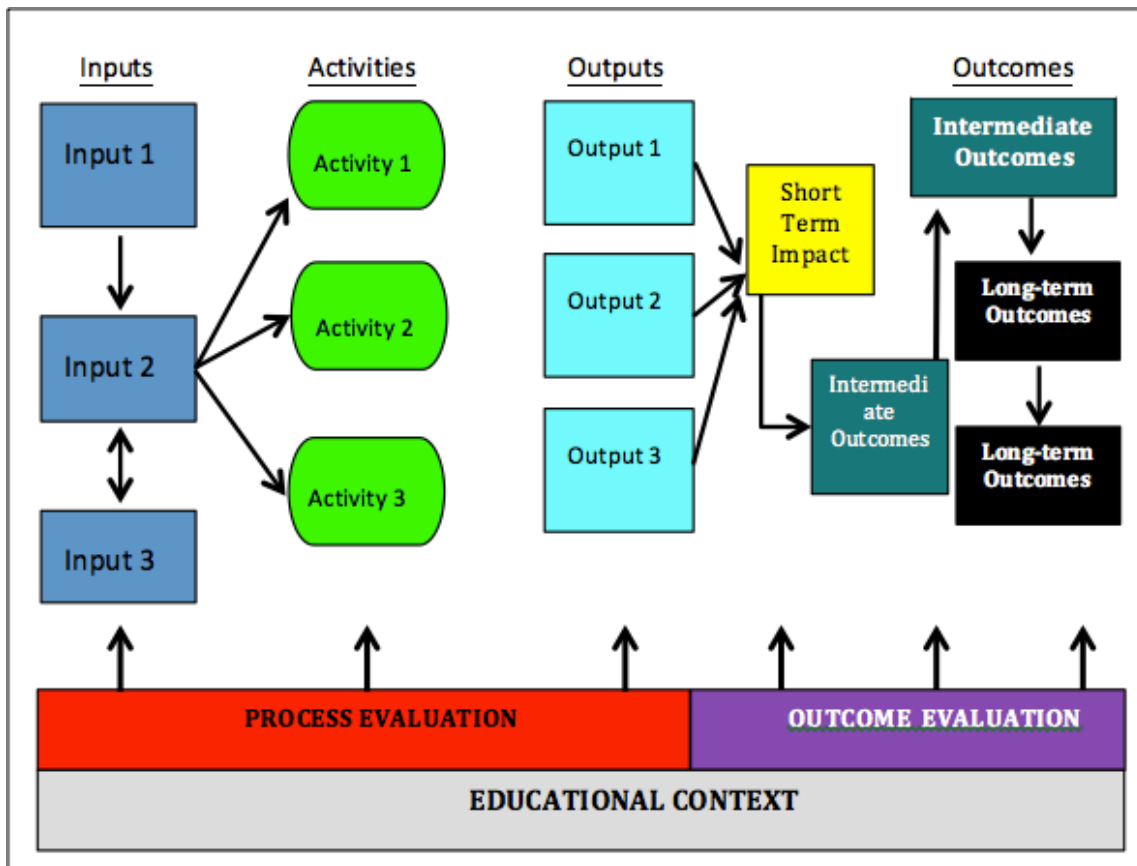


Figure 1: Logic model (adapted from Honeycut & Kegler, 2010).

In order to assess the use of iPads in changing pedagogy activities and practices, the evaluation project sought to define and fully describe the significant components and strategies built into the key applications hypothesized to produce changes in student motivation, English language development and academic skills. The analysis correlated the level of use of iPads and specific applications with changes in students' language development and improvement of skills such as reading, writing, grammar, and vocabulary. In cases where different Colleges were using different sets of iPad applications in their program, comparisons were drawn between student groups and classrooms engaged in the use of these applications.

The evaluation also examined the impact on rates of progression in the Foundation program using pre/post assessment changes in Foundation and HCT progression formulas. These results were disaggregated by level and group, controlling for baseline variability, extreme scores and threats to internal study validity.

In order to examine faculty and student attitudes towards the use of the iPad for learning English, the evaluation used pre/post student and faculty survey instruments with valid and reliable scales for measuring satisfaction, helpfulness and value of the iPad for enhancing language development. These surveys helped to investigate changes in student motivation, attitudes, self-efficacy and level of engagement in College and out-of-class learning activities.

Lesson observations, process surveys, focus groups and interviews with teachers helped monitor implementation of the iPad project and identify areas where modifications could occur to improve and

support delivery of the Foundation iPad program. These results helped to report on the initial impact of the iPad program and shape further developments and improvements in the use of the iPads.

The data collection procedures for the initial program implementation were driven by clear research questions including the following:

- How much variation occurs from site to site in the use of specific applications?
- What evidence is there that the iPad is being fully implemented and integrated in teaching and learning?
- How effective are the key applications used for teaching and learning?
- What are the best practices within HCT in the use of iPads?
- Has the iPad initiative been implemented at every site as planned?
- Have some components of the plan been dropped or modified?
- Have crucial activities in fact occurred as planned?
- What techniques are used in each College to monitor or modify operations?
- What planning or problem-solving meetings occurred?
- How do the activities fit the project goals and objectives?
- What is the value of the initial delivery information/data being provided?
- What is being done to motivate student participation and engagement?
- What do the critical activities of the program look like at different stages of the Foundation program?
- How can the program implementation and impact of application be improved?

In order to detect follow up effects of the program, a longitudinal approach to the evaluation of the iPad program was developed and adopted. Table 1 outlines the key objectives, questions, data collection instruments and measures for the evaluation of the iPad initiative in the HCT Foundations program.

Table 1: Key objectives in the evaluation of the HCT iPad implementation (Foundation program).

In-Class Level of Use of iPad to Enhance Learning			
Evaluation Objective	Evaluation Questions	Instruments	Measures
To determine the self-reported level of use of the iPad in-class and College for learning English.	What is the level of use of the iPad in class and College for: (a) doing English reading; (b) taking notes; (c) working on grammar; (d) using new vocabulary; (e) researching words; (f) practicing writing; (g) practicing listening; (h) doing presentations; (i) interacting with classmates; and (j) accessing materials?	1. Semester 1 & 2 Student Surveys 2. Valid and reliable survey items and scales	1. Survey Measures and scale scores 2. Frequencies 3. Graphs 4. Pearson Correlations, chi-square and phi statistics 5. ANOVA 6. Alpha Reliability
iPad and Out of Class Learning			
Evaluation Objective	Evaluation Questions	Instruments	Measures
To determine whether use of the iPad is associated with improving out of class learning activities.	Is the use of the iPad and/or specific apps associated with changes, differences, and/or increases in: (a) doing English homework; (b) reviewing English lessons; (c) reviewing new vocabulary; (d) writing practice; and (e) accessing learning resources?	1. Semester 1 & 2 Student Surveys	1. Survey measures and scale scores 2. Frequencies 3. Graphs 4. Pearson correlations, chi-square and phi statistics 5. ANOVA 6. Alpha Reliability
iPad Impact on Motivation and Engagement to Study English			
Evaluation Objective	Evaluation Questions	Instruments	Measures
To determine whether use of the iPad is associated with improving student level of motivation and engagement to study English.	Is the use of the iPad and/or specific apps associated with changes, differences, and/or increases in: (a) motivation to learn English; (b) motivation to attend class; (c) studying more; (d) improving study skills; (e) managing time; (f) increasing confidence to learn English?	1. Semester 1 & 2 Student Surveys	1. Survey Measures and scale scores 2. Frequencies 3. Graphs 4. Pearson Correlations, chi-square and phi statistics 5. ANOVA 6. Alpha Reliability

iPad Impact on English Language Development & Study Skills			
Evaluation Objective	Evaluation Questions	Instruments	Measures
To determine whether use of the iPad is associated with self-reported improvements in student English skills.	Is the use of the iPad and/or specific apps associated with changes, differences, and/or improvements in: (a) reading; (b) grammar skills; (c) vocabulary skills; (d) listening skills; (e) writing skills?	1. Semester 1 & 2 Student Surveys	1. Survey Measures and scale scores 2. Frequencies 3. Graphs 4. Pearson Correlations, chi-square and phi statistics 5. ANOVA
To determine how use of the iPad has positively impacted students' English language learning.	Has use of the iPad increased: (a) reading skills; (b) listening skills; (c) writing skills; (d) grammar skills; (e) vocabulary skills; (f) expressive language; and (g) engagement in independent learning activities?	1. Semester 1& 2 Teacher Surveys	1. Survey Measures and scale scores 2. Frequencies 3. Graphs 4. Pearson Correlations, chi-square and phi statistics. 5. ANOVA 6. Alpha Reliability
To determine how use of the iPad has positively impacted students' language development and study skills.	1. Is the use of the iPad associated with pre/post changes, differences, and/or improvements in: (a) classroom attendance; (b) rates of progression in Foundations; (c) rates of progression into BAS; and (d) skills in reading, grammar and vocabulary; and writing, listening and speaking?	1. Baseline and Semester 1 & 2 Assessments in Foundations (levels 1-3)	1. Scale Scores and Component Scores 2. IELTS Overall and Band Scores 3. Aggregate Scores and Coursework Grades 4. Attendance rates and withdrawal codes 5. T-tests, ANOVA, ANCOVA, and Regression

iPad Impact on Teaching English			
Evaluation Objective	Evaluation Questions	Instruments	Measures
To determine how use of the iPad has positively changed teaching.	How has teaching English in the classroom changed from the iPad? Has use of the iPad helped: (a) re-purpose teaching materials; (b) develop more teaching materials; (c) changed teaching; (d) produce a more student-centered approach; (e) manage classroom activities; (f) enhanced communication with students; (g) share materials more efficiently; (h) model activities better; (i) better assign homework activities.	1. Semester 1& 2 Teacher Survey	1. Survey Measures and scale scores 2. Frequencies 3. Graphs 4. Pearson Correlations, chi-square and phi statistics. 5. ANOVA 6. Alpha Reliability
Effective Teaching Activities & Strategies with iPad Apps			
Evaluation Objective	Evaluation Questions	Instruments	Measures
To identify innovative and successful examples of how teachers have incorporated the iPad into the classroom relative to use of apps, lessons, instructional strategies, and the effective use in the Foundation Program.	1. To what extent are teachers demonstrating the important skills required by the Foundation Program by integrating the iPad?	1. Teacher Interviews 2. Lesson Observations	1. Summary of interview notes and lesson observations at each College. 2. Description of key initiatives, teaching activities, best practices, and any key challenges. 3. Implementation monitoring with reports to follow.

Case Study 2: Zayed University

Zayed University (ZU) is an English medium university based on the American model, which is accredited by the Middle States Commission on Higher Education, one of the six US regional accreditors. ZU is a federal university with two campuses, one in Abu Dhabi and one in Dubai, serving a mostly Emirati population. The mobile learning initiative was implemented in the fall of 2012 with approximately 3,000 first and second year students in the university's language foundation program, or Academic Bridge Program (ABP).

The goal of the mobile learning initiative was to leverage the pedagogic affordances of the iPad to improve learning first in the ABP and then in ZU's General Education program, before being introduced to the various colleges and majors in the university. Since the implementation of mobile devices in the ABP we have been interested in measuring what effect the iPad has had on learning. We want to know how efficacious this tool is for improving language learning. We are also interested in exploring the pedagogic implications and in what ways mobile devices can be used to leverage student learning both inside and outside the classroom.

In the spring of 2012, prior to the implementation, the ABP conducted an exploratory pilot project to investigate the technical and pedagogical implications of the iPads in the classroom. The pilot involved over 90 students in seven sections with eleven teachers. The pilot lasted for 8 weeks and explored the technical and pedagogic implications of mobile devices while compiling a literature review on best practices and research associated with mobile devices in language learning contexts. We discovered that while there is an emerging body of literature available on mobile devices in education, especially in K-12, there is little large-scale research on the use of mobile devices in tertiary second language classrooms.

The ABP began to collect data in the following areas:

- Teachers were surveyed on their perceptions of iPads as a teaching tool, their readiness to use the iPad as a teaching tool and their perceptions of the training and support available to them.
- Students' perceptions of the use of iPads as a learning tool were investigated through focus groups.
- Anecdotal data was collected through classroom observations of lessons in which the iPad was an integral part. This has allowed the department to see (albeit in a somewhat artificial environment) how the iPad has been used in lesson design.
- Pedagogic implications of mobile devices are being explored through the formation of action learning groups. These groups allow teachers to explore and collaborate on effective use of mobile devices in teaching and learning.

There was very little large-scale research available on the best use of mobile devices in tertiary ESL contexts to build a pedagogical model ahead of the implementation of mobile devices. The ABP was also constrained by the lack of time to collect data and conduct research into the pedagogic affordances of mobile devices. In fact, where other institutions, such as Wollongong University in Australia, had two years to prepare, Zayed University had just five months from the announcement of the introduction of iPads to the implementation itself, and two of these months were taken up by the summer vacation of faculty and staff. With three months to prepare, the ABP and university decided to devote the limited time and resources available professional development opportunities for faculty, thereby helping faculty become comfortable with iPads and training them on the use of the device itself. After implementation,

and to avoid a *technology-driven pedagogy*, teachers were encouraged to use the iPad with students only when they felt it could help promote learning and add value to current practices. The bulk of resources went to training and familiarizing faculty with the device prior to implementation. Shortly after the implementation, ABP faculty were surveyed on how well prepared they felt for iPads as a teaching tool. Throughout the first semester, the ABP continued to offer iPad support through weekly just-in-time professional development workshops, a drop-in help center, ‘brown bag’ lunch gatherings, and one-on-one sessions. Table 2 shows teachers’ feelings towards their preparedness and comfort using the iPad as a teaching tool both at the beginning of the academic year and at the end of the first semester. By the end of the first semester, it appears from this data that approximately 75% of the faculty surveyed felt prepared and comfortable using the device as a teaching tool.

Table 2: Teacher survey results.

Survey Item	Pre semester 1	Post semester 1
I have had adequate training in technology use, including iPads.	54%	75%
I have a sufficient level of technical support at my campus for iPads and associated technology.	73%	76%
I feel comfortable using iPads for classroom instruction.	59%	77%
I feel prepared to effectively integrate technology (iPads) into the curriculum in my classroom.	46%	75%

Next steps

The university is now collecting the data needed to conduct a longitudinal study. The data we collect from within the department (exam results, speed of students progressing through the program) will only show the impact of the mobile devices over the course of a year and beyond. Over the next year or so, the impact of mobile devices on teaching and learning will be better understood.

As the implementation at Zayed University moves beyond language classrooms and into the content courses in the General Education program, research questions will likely broaden. Some of the more interesting research areas for the institution are:

- Can gamification (Zichermann & Cunningham, 2011) of curricula positively impact learning?
- Can existing materials be adapted for use with mobile devices? What impact does mobile learning have on the development of materials?
- If engagement increases due to mobile devices, how does that relate to short-term learning gains demonstrated by exam results and more long-term learning gains exemplified by the retention and transfer of skills in other contexts, development of problem-solving skills, etc.?

ZU is also pursuing a public-private partnership with the American Institute for Research (AIR) to research technology mediated learning activities that aim to enhance targeted academic English competencies. Some possible research questions focus on the extent to which mobile technology enhanced environments influence:

- students' cognitive load when processing academic English texts;
- students' level of engagement with and attention to specific features in academic English texts;
- students' interaction with peers, on extended tasks around the consumption and production of academic English texts (see Kam, 2013).

These research questions pose challenges for our institution in that they are longitudinal projects requiring sustained coordination and resources. One source of data for the longitudinal research will be test scores of IELTS exams and their sub-scores, which will be collected for every student exiting the ABP. The IELTS scores of students graduating from each of ZU's colleges will also be collected. The short-term gains can be measured by exam results; medium-term gains will be measured by the time taken by students to progress through the ABP program. Over the next academic year, mobile learning and its effect on pedagogy and learning, will be an area of great interest throughout the university.

Case Study 3: United Arab Emirates University

Using mobile learning and other technology is often challenging to students' capabilities and sometimes intimidating, especially for those who have never used it before. At United Arab Emirates University (UAEU), we explored how students' classroom use of mobile technology made a significant improvement when it was well integrated into students' personal skills, including organization skills, communication skills, assuming responsibilities, critical reading and writing skills, problem solving, class engagement, increasing learning interest, emphasizing community contribution and self-evaluation. The study also sought to examine the students' struggle, which is due as much to a lack of individual and personal skills as to the level of academic development.

The iPad initiative at UAEU

In the mobile learning environment of the UAEU new learning units, modules and activities were designed to support students in the new learning process both at an individual and at a collaborative level: individually to empower students' study and lifelong skills and in groups to help them take on the challenge of a group project to help improve their collaboration, communication, problem solving and critical thinking skills.

In this study we considered the factors that may affect students' performance and success, such as students' creativity and innovation skills, the technology used, collaboration and teamwork skills, thinking skills, communication skills, time management and organization skills. The use of technology is generally related to an increase in student performance when interactivity and other important features of instructional design are applied to its use: in the current study, we have already seen a significant improvement in students' performance for the above mentioned skills compared with previous cohorts. In this study we are also looking at teacher preparation, follow-up staff development, and technical assistance as critical prerequisites for effective technology applications. Planned integration of technology in education that directly involves teachers consistently allows teachers to engage students in meaningful educational experiences and allows more time for individualized instructional opportunities (Moeller & Reitzes, 2011).

The study at UAEU utilized a survey which was administered to the intervention group comprising 65 sections (1,253 students) and 15 teachers, as well as to the control group comprising two sections (30 students) and one teacher. Both groups, experimental and control, were attending the same foundation IT course, titled *iTechnology*.

Why this experience?

In the last two years, it has become vital to reform our current learning process under the theme of 'Re-think how students should learn in the 21st Century'. At UAEU we believe that we have reached a tipping point where making changes to the current learning process is inevitable for many reasons. For example, today learners have instant access to information through technology and the web, and they do not rely on the teacher as the only source of knowledge: an institutional Information Literacy survey conducted in 2011 found that 90% of our students used the internet as a knowledge repository, so the teacher's role clearly needs to be redefined. The teacher should play the role of the facilitator who guides and helps students not only to locate information but also to question the information, reflect on it and formulate an opinion. Another reason is the advent of mobile learning technology. Our institution did not hesitate to integrate the iPad as a primary learning and teaching tool; it was a great opportunity for us to transform the current learning process.

Mobile learning is defined as learning using mobile and wireless computing technologies in a way to promote learners' mobility (Shon, 2008). In our study we defined mobile learning as making content knowledge accessible anytime, anywhere at the learner's pace using a mobile device. We defined each component of the learning process as shown in Figure 2.

Active Instructor: facilitates learning inside and outside the classroom, engages students in the learning process, allows students to participate in designing their own content and contributes to the design of learning assessment.

Active learner: personalizes learning, accesses content anytime, engages with others in a collaborative environment, formulates opinions, interacts with other learning communities, communicates effectively, shares and publishes findings.

Creative pedagogy: both the instructor and the learners decide on what to learn and how it should be learned. The pedagogy promotes an inquiry- and challenge-based learning model where teachers and students work together to learn about compelling issues, propose solutions to real problems, and take action. This approach asks students to reflect on their learning, on the impact of their actions and publish their solutions to a worldwide audience.

Flexible curriculum: a core curriculum is designed, but the facilitator has the freedom to innovate and customize content accordingly based on the aspiration of the learners; this means that the learner's knowledge of the material will come mainly from his/her own investigation (of formal and informal content), creativity and collaboration with others (teamwork).

Community outreach: allow groups of students to formulate real-world context research questions, and connect students with their local learning and larger communities to find creative solutions to their problems. Create opportunities to connect students with international communities. These opportunities will foster students' social and leadership skills.

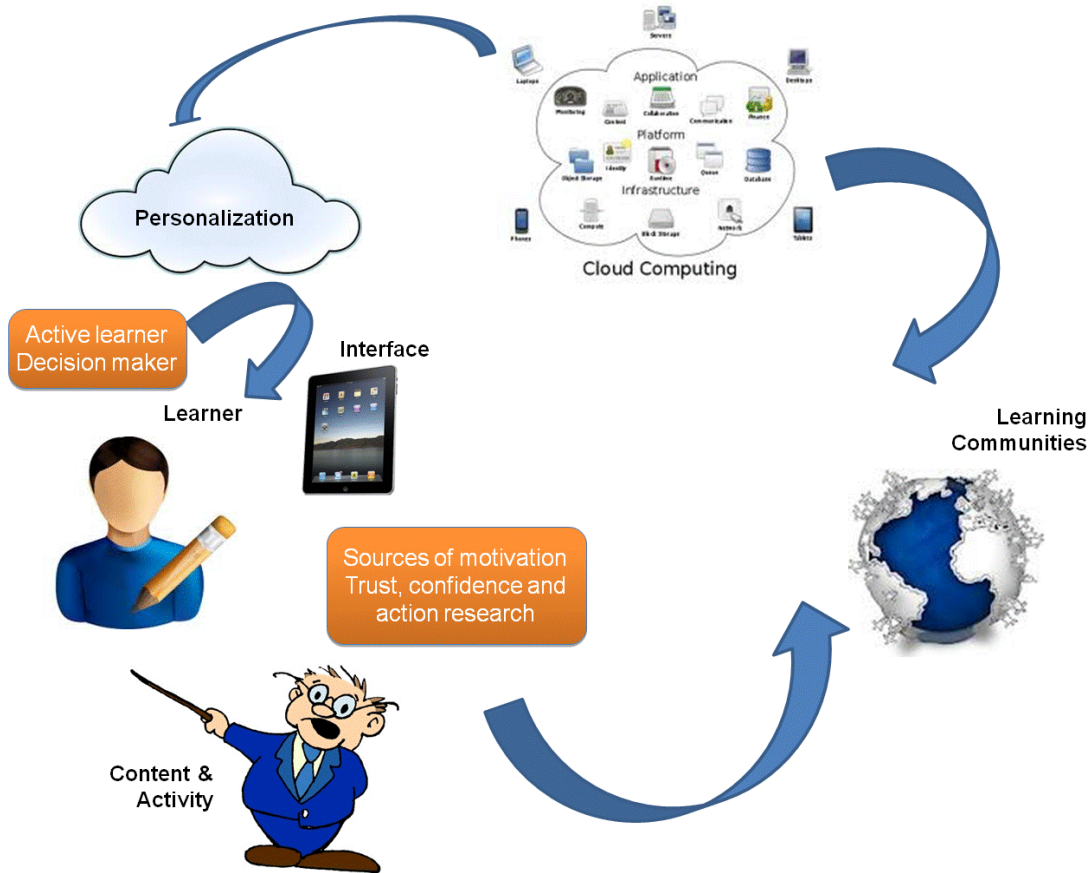


Figure 2: Mobile learning approach.

The integration of mobile learning into the curriculum raised several questions by instructors, curriculum designers and administrators, on topics from infrastructure to classroom teaching and assessment:

- Does the current IT infrastructure support this integration?
- What to teach and how to teach?
- What is an effective pedagogy?
- How should content be delivered?
- How should learning be assessed?
- What is the direct effect of the MLA on students' performance?

The ultimate objective of implementing a new learning process was to design a curriculum and a creative pedagogy oriented toward the cultivation of the creative person and the discovery and exploration of the creative idea. This objective led us to design a comprehensive learning experience with new learning outcomes where we deliberately infused new practical skills, which we call the *four C's*: Critical thinking and problem solving, Creativity and innovation, Communication, and Collaboration. Other skills were implicitly infused into the curriculum such as self-learning, interdependence, lifelong learning, flexibility and adaptability, and taking on academic responsibilities. UAEU is currently embarking on an empirical study to assess these changes.

Conclusion

The impact of mobile devices in the tertiary language classroom is a field ripe for research. However such research requires time and resources to conduct, which were lacking in the lead up to the UAE iPad implementation. The timeframe for the introduction of iPads in the three Federal Institutions was relatively short compared with other universities. For example Wollongong University, prior to their roll out of mobile devices, conducted a four-semester investigation into the pedagogical affordances provided by the devices and in order “to avoid a technology-driven pedagogy, the project investigated ways of designing and implementing teaching in authentic contexts that would enhance student learning with understanding” (Herrington et al., 2009).

Support for national research and development for technology applications in education is critical to keep up with the level of emerging technologies. However, less than one percent of government funding for technology research and development is dedicated to educational applications of technology. Evidence is mounting that there are still many unanswered questions about educational uses of mobile technology, and therefore, more research is needed to inform educators and software developers about the most effective and needed uses of mobile technology for teaching and learning (Hamdan & Asmar, 2012). The three case studies outlined in this paper serve as testimony to the need for well-designed longitudinal research, if we are to understand how large scale initiatives, such as the UAE iPad initiative, affect classroom pedagogy and learning.

References

- Brainard, E. (1996). *School Program Evaluation*. Bloomington, Indiana U.S.A.: Phi Delta Kappa Educational Foundation.
- Chelimsky, E. (2007). Factors influencing the choice of methods in federal evaluation practice. *New Directions for Evaluation*, 113, 13-33.
- Cochran, T., Ben Halim, T., Khalil, K., & Gilroy, B. (2012). *iPad implementation framework* (Version 1.67). United Arab Emirates University, Zayed University, Higher Colleges of Technology, UAE.
- Hamdan, K., & Asmar, M. (2012). Improving student performance using interactive smart board technology. Paper presented at the Innovations 9th International Conference in Information Technology, UAE University, Al Ain, UAE.
- Healy, M. (2000) Knowing what works: program evaluation. *New Directions for Student Services*, 90, 57-65.
- Herrington, J., Herrington, A., Mantei, J., Olney, I., & Ferry, B. (2009). Using mobile technologies to develop new ways of teaching and learning. In J. Herrington, A. Herrington, J. Mantei, I. Olney, & B. Ferry, (Eds.) *New technologies, new pedagogies: Mobile learning in higher education* (pp. 1-14). Faculty of Education, University of Wollongong, Australia.
- Honeycut, S., & Kegler, M.C. (2010). Logic models as a platform for program evaluation planning, implementation, and use of findings. Summer Evaluation Institute, American Evaluation Association.
- Isaac, S. & Michael, W.B. (1997). *Handbook in research and evaluation*. (3rd ed.). San Diego, CA: Educational and Industrial Testing Services.
- Isaacs, S. (2012). *Mobile learning for teachers in Africa and the Middle East: exploring the potential of mobile technologies to support teachers and improve practice*. Paris, France: UNESCO.
<http://unesdoc.unesco.org/images/0021/002163/216358e.pdf>

- Joshi, H. (2012). Towards transformed teaching: Engaging learners anytime, anywhere. *UAE Journal of Education Technology and Learning*, 3, 3-5.
- Kam, M. (2013). *A campus-wide mobile learning infrastructure for boosting academic English for college-level success*. Unpublished manuscript. American Institute for Research.
- King, J.A., Morris, L.L., & Fitz-Gibbon, C.T. (1987). *How to assess program implementation*. London: Sage Publications.
- Moeller, B., & Reitzes, T. (2011). *Integrating technology with student-centered learning*. Quincy, MA: Nellie Mae Education Foundation.
http://www.issuelab.org/resource/integrating_technology_with_student_centered_learning
- Shon, J.G. (2008). m-Learning trends in Korea. Paper presented at ISO/IEC JTC 1/SC36 Open Forum, March 2008, Seoul, Korea.
- Yarbrough, D.B., Shulha, L.M., Hopson, R.K., & Caruthers, F.A. (2011). *The program evaluation standards: A guide for evaluators and evaluation users* (3rd Ed.). Thousand Oaks, CA: SAGE Publications, Inc.
- Zichermann, G. & Cunningham, C. (2011). Introduction. *Gamification by design: implementing game mechanics in web and mobile apps* (1st ed.). Sebastopol, CA: O'Reilly Media.