**International Journal of Information and Communication Technology Education**
Volume 17 • Issue 4

# Web-Enhanced Computer Science Course: College Students' Experiences

Hoda Baytiyeh, The American University of Beirut, Lebanon*
https://orcid.org/0000-0003-2909-2191

Shady Elbassuoni, The American University of Beirut, Lebanon

## ABSTRACT

Information and communication technologies have changed the way students learn, and higher education institutions in the Middle East region strive to attract professors who use technology in their daily teaching and learning practices. This study examines students' experiences in a web-enhanced computer science course. In an online survey based on the technological pedagogical content knowledge (TPACK) model, 132 students' responses to 31 items were measured and analyzed. Factor analysis revealed three pre-dominated factors: technology, pedagogy-content, and TPACK; of these, technology was found to exert the strongest influence on students' educational experiences. The findings are discussed in relation to the TPACK model, along with implications for theory and practice. This investigation provides insights into current initiatives in the Middle East region that encourage higher education institutions to implement technology in teaching and learning. It contributes to the literature by deepening understanding of how new approaches in education are implemented and adopted.

## KEYWORDS

Digital Learning, Middle East, TPACK Model, Web-Enhanced Course

## INTRODUCTION

The integration of technological tools and applications in the classroom has become an essential component of education reform. In these circumstances, professors in higher education institutions are encouraged to develop their digital literacy and adopt relevant technologies for their own professional development and, crucially, to engage effectively with the digital generation of students.

Implementing technology in the STEM fields has proved effective both for instructors' teaching and students' learning. As well as improving instructors' attitude and confidence (Sorensen, Twidle, Childs, & Godwin, 2007), using technology enhances creative reflection on scientific concepts (Baytiyeh & Naja, 2017; Jang, 2009; La Velle, McFarlane, & Brawn, 2003; Rodrigues, Marks, & Steel, 2003). From the student's perspective, the use of technology promotes constructive reasoning in scientific investigations and helps to connect learning to practical work (Baytiyeh, 2017; McFarlane & Sakellariou, 2002).

Researchers in Europe and the US have urged higher education institutions to provide academics with the necessary training and support to integrate technology into their daily teaching practices and

DOI: 10.4018/IJICTE.20211001.oa2 *Corresponding Author

to understand the relationship between technology, pedagogy and subject matter content(Ebert-May et al., 2011; Rienties et al., 2012; Stes et al., 2012).

In the Middle East, initiatives to adopt technology in teaching and learning in higher education institutions remain tentative, and few universities have adopted electronic learning (e-learning). Among the barriers to e-learning in the region, it is commonly assumed that Internet penetration is low, with poor quality connectivity, and there is a fear that Web content will promote immoral values among young people (Al-Kahtani, Ryan, & Jefferson, 2006; Mirza, 1998). Additionally, governments' failure to specify quality standards for blended and online programs has led to a loss of credibility in relation to such degrees. The consequent lack of recognition of e-learning has discouraged academic institutions from offering blended and online programs (Dirani & Yoon, 2009).

As one example, the American University of Beirut (AUB), Lebanese American University and American University in Cairo (AUC) launched a joint professional postgraduate diploma in green technologies in the spring of 2015. The program offered three specializations: renewable energies, green buildings and water resources (Baytiyeh, 2018). The ultimate goal was to offer this program in countries and universities across the region, so enabling engineering and architecture professionals to enhance or complement their technical and decision-making skills in relation to green technologies. Although the program has proved successful, it is still regarded only as a professional diploma recognized by the Middle States Commission on Higher Education in the United States and remains unaccredited by any of the higher education bodies in the hosting countries.

To address the trade-off between technology adoption for teaching and learning and assuring academic quality and governance, university administrators have launched initiatives to encourage professors to use technology in the classroom. In the Fall of 2019, as part of an agreement between Al-Ghurair Foundation for Education, AUB, AUC and MIT, the AUB course Introduction to Programming (CMPS 200) was implemented in Web-enhanced format, along with other courses at AUB and AUC. The motivation for this collaboration was to use e-learning to complement and enhance the student learning experience and to exploit MIT resources available through the edX platform. The course involves face-to-face lectures on AUB campus and a weekly lab; in addition, students enroll in a version of MIT course 6.0001 (Introduction to Computing and Programming using Python) on the edX platform that was created specifically for AUB. Through edX, students can access lecture videos by MIT professors, along with course slides, discussion forums and various finger exercises and problem sets. The finger exercises are very small Python programming problems that students attempt online after each topic. They are designed primarily to help students affirm that they understand specific programming concepts. The finger exercises are automatically graded, the students are allowed to attempt several times and therefore check if they have provided the correct answers.

The objective of the present study was to use the TPACK model to investigate students' experiences of this Web-enhanced computer science course.

## USE OF WEB-ENHANCED COURSES

Wingard (2004) gathered and analyzed detailed qualitative data from up to 56 faculty with experience of teaching instructionally-rich, Web-enhanced courses in seven Learning Technology Consortium institutions: Virginia Tech, Delaware, Florida, Georgia, Notre Dame, Pittsburgh and Wake Forest. Data were collected using two methods: an online survey and individual customized interviews. A significant number of participants reported that Web enhancement of their courses improved both teacher and student preparation for class, contributing to greater student engagement and more active learning in the classroom. Participants commonly felt they had a better sense of students' academic progress during the term, and they reported a growing expectation that students could take more responsibility for independent learning of the fundamentals based on the readily available Web resources. Significantly, more than a third of participants reported improved levels of instruction in the classroom and higher expectations for students.