General Article

Does the Early Adopter Catch the Worm or Choke on it? A Reflective Journey of the Challenges of Technology Adoption in a Health Sciences Education Institution

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ABSTRACT

Background: Early adoption of technology is a struggle well known to early adopters and now to me. Since the demand to use and implement technology in health professions' education has increased, I have been led to adopt various technologies, leading to many headaches. **Methods:** This paper addresses my experiences in developing and implementing technology in health science classrooms in a setting not adequately equipped to do so. **Results:** After reflecting on my experiences, I conclude that it is crucial that systems help innovators and early adopters as they work to develop and implement teaching and learning technology. Technical decisions should address the needs of the higher education educator. **Discussion:** In addition, once an institution chooses a specific technological approach, such as using e-guides, there should be resources in place to support the forerunners of these initiatives.

Keywords: Blended learning, education, flipped classroom, innovation, technology-enhanced learning

Background

Literature supports the use of technology-enhanced learning (TEL) in classrooms with enhanced learning outcomes for students.[1-4] Today's students crave interaction with technology as they regard its use as important. As a higher education (HE) health science educator, I feel obliged to incorporate TEL in my teaching[4,5] as an effective teaching tool that can engage Generation Y students through a modality familiar to them.

The use of TEL in HE is a multifaceted undertaking.[6] I experienced this first-hand during my journey adopting TEL with my own students in South Africa. I discovered that few readily available applications suited my requirements. I opted to create contextualized digital learning products to augment my students' learning experience. I quickly realized that the teaching and learning environment of my higher education institution (HEI) was not ready for what I envisioned. Instead of an exhilarating journey, I faced obstacles, caverns of disappointments, and forests of uncertainties while trying to enhance my classroom-based TEL for Y-generation students.

While scrutinizing the literature on using TEL in HE classrooms, I realized that the challenges of adopting new technologies are not new. In 1993, Blignaut[7] pointed out that computer-assisted learning in South Africa involves much frustration with little

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gain. Now, 24 years later, it seems that although the mode of technology use has changed, the frustrations of adopting emerging technologies at HEIs have not.

South Africa is no longer a developing country, now 18 years postsegregation (apartheid), however, it is still regarded as a newly industrialized country. South Africa boasts pockets of excellence with still vast areas of disadvantage. This phenomenon is visible throughout various sectors, including HE. Too often, these pockets of excellence and disadvantages are found within a single institution and sometimes even within one classroom. This adds to the layers of complexity when addressing issues in health education, such as the use of technology in learning.

Rogers[8] provides a comprehensive explanation of the adoption of technology. He defines adoption as "the decision to use innovation as the best option." Adopting innovation just to be fashionable creates barriers to its adoption. However, rejecting feasible innovation simply because it is not fashionable is also a barrier. Therefore, the adoption of technology should be carefully considered.[9-11]

The adoption curve of technology for an individual's or a system's has been described according to four categories of innovation: early adopters, early majority, late majority, and laggards.[8] Initially, I branded myself as an innovator as the strategies I proposed were "new" to my institution. Rogers' theory, however, classifies me as an early adopter [Figure 1].[8]

My line manager, also a member of the early majority clan, supported me as far as institutional restrictions allowed. My challenges establishing TEL in HE classrooms stem from decision-makers who can be best described as the late majority, or even laggards, whose traditionalist views impede any attempt at innovation.

Theoretical framework

Van Deventer and Blignaut[12] propose a framework to explain the adoption of oncampus TEL [Figure 2]. This framework explains the interplay between the lecturer, student, and course content as well as the supporting technology as: (i) internet access (Wi-Fi, broadband, computer laboratories); (ii) e-communication (e-mail, learning management systems [LMS], Facebook); and (iii) comperacy (computer literateness). Comperacy designates students' and lecturers' ease with which they use computer[13] that is essential in the use of TEL in classrooms.

Students

The students involved in this reflective journey were studying toward a health professions degree. They belong to the millennial generation of Generation Y students who typically demand more choices, have high expectations, thrive on audio and visual stimulation, and become easily bored.[5] Millennials' have a low propensity to read, are constantly looking for entertainment, and thrive on social interaction. Although information is available at their fingertips through the Internet on their smartphones, they do question the accuracy of the information they receive.[14] To meet the digital expectations of students, many educators aim to meet them halfway to breach the generation gap. Davies and Graff[15] suggest, "success increases when students amalgamate into virtual student communities." In our work, we constantly pursued students' input on the products we created to improve their learning experience.

Course content

My first endeavor was to create a multimedia study guide with integrated content for entry level health science. We created a product that allowed students to interact with animations, videos, text, games, and frequently asked questions, complied to address intended course outcomes with the help of an instructional designer. The multimedia animations and minigames aligned with the learning objectives used text and pictures to enhance the content and voice-overs to explain

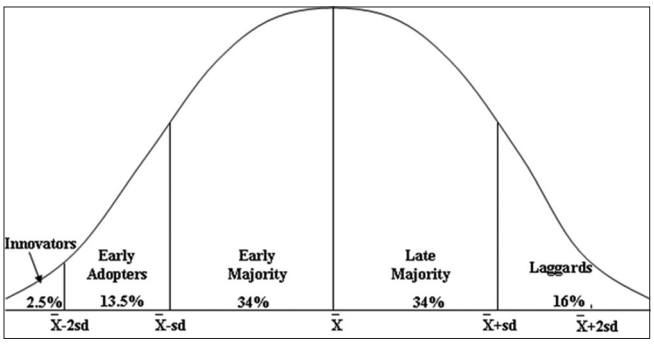

Figure 1: Adopter categorization on the basis of innovativeness (Rogers, 2003)

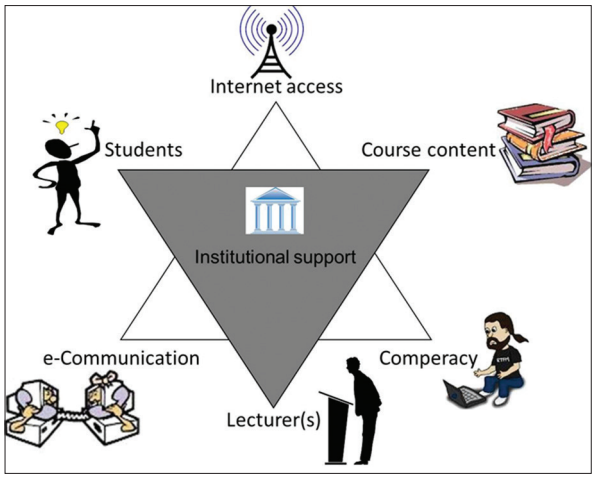

Figure 2: Framework for the design, development, and implementation on-campus technology-enhanced learning (adapted from Van Deventer *et al.*, 2013.)

pertinent course concepts.[16-18] The instructional designer welcomed our visualizations as they were in line with the institution's TEL strategic approach at that point of time. The digital product and teaching approach were eagerly received by students.[19]

Mason[20] identifies the role of online facilitators as creators of a learning environment that is conducive to student engagement and participation. Nagel *et al*.[21] created a fictitious character in an online learning environment. This facilitator, who only existed online and was really the lecturer, provided student support, and assisted in establishing of a social community of learning. I imagined how a virtual facilitator could guide my students through unfamiliar terrains and designed a virtual facilitator, Dr. Cupcake, [Figure 3] in the form of an avatar to guide students through the content. Student feedback indicated their craving for more interaction and animation like this and less static learning. The virtual character was created to evoke interaction. However, I was unprepared for the vast array of challenges ahead…

Lecturer

Porter *et al*.[22] argue that when lecturers adopt a multimodal learning approach in their teaching, institutional infrastructure, and support play an important role. Policy should not hamper the use of emerging technologies. Lecturers should be the makers of policy as they are the ones who implement them. Challenges that lecturers face are (i) lack of equipment, unreliability of equipment, lack of technical support, and other resource-related issues and (ii) organizational cultural beliefs and attitudes about teaching and technology and susceptive to change.[23]

Harris and Sullivan[24] identify the constraints of training, support, cost, and insufficient access to technology as key barriers to the integration of TEL in classrooms. Often, purchasing decisions are made without the consideration of the needs of the lecturers who use the technology in their classrooms.[25] Technologies such as learning management systems (LMSs), video-capture systems, and interactive white boards are often controlled from outside academic departments.[26] Nonacademic departments such as information technology (IT) control web and LMS standards for format and look-and-feel, which negatively affect education.[22,26,27]

Figure 3: Screenshot of the virtual helper, Dr. Cupcake, embedded in the study guide

Lecturers require technical and institutional support, including support staff.[6,28] However, innovating faculty can experience inadequate support from instructional designers and programmers needed to enhance innovations.

Internet access

At the departmental level, I received financial support for the development and evaluation of these products. I also received recognition and accolades for my work – I was hailed as setting the standard for the institution going forward! However, at this point of success, the technology euphoria bubble popped for me. After completing the initial stages of design and successful implementation, we required alternative modes of course delivery other than chalk-and-talk classroom approaches to make the products we were developing available to students. I transferred the digital learning content to DVDs to enable off-campus students to gain access. Our IT department does not allow products online due to password protection restrictions, and the only way to host digital material is to load it onto the learning management software (LMS). The local LMS could not stream videos, which took forever to download. Students could also not store them locally, which meant repeated downloads for revision. In South Africa, bandwidth is not adequate and students complain of the cost of commercial data bundles.[29,30] Soon, the DVDs we were developing became redundant as most laptops and desktop computers in the HEI's laboratories no longer had DVD drives. We consequently provided the content on a memory stick – a solution that addressed only some of our challenges.

The multimedia study guide, designed for classroom-based use, was the next hurdle. The multimedia learning content was not compatible with mobile devices. Students generally carry technology in their pockets (i.e., cellphones and tablets) instead of in satchels. I, the subject matter expert with a myriad of ideas on how to promote quality classroom TEL, could neither engage in the choice of delivery platforms for interchangeable software nor did I have adequate technical knowledge. Eventually, I found someone who could convert the content for my products to Android.[31]

It later became time to upgrade the initial multimedia study guide with interactive content as well as to develop new applications. I became less ignorant regarding the communication between devices and platforms, and I was ready to create learning content that could be used on various devices in the pockets of students.

In the meantime members of the early majority clan at the institution became interested in the concept of TEL and started requesting assistance – as Rogers[8] predicted. Consequently, the Academic Development and Support (ADS) department had too little human support to offer faculty due to the flood of requests for multimedia development. The ADS addressed this challenge by adopting a process of rapid design where products

would be created according to a rigid template – no more unique multimedia development! Design elements outlined in literature and end-user input were no longer supported as they did not match the rapid design mode.[32] In my work, I had "to collect a number" while standing in line and conform to a downgraded solution of my first innovation that we no longer regard as optimal. I was at a crossroad: do I conform to the new boundaries or do I seek assistance elsewhere?

I chose to remain within the system and managed to convince the ADS to integrate the animated virtual helper into their template, without my input. We received useful student feedback on the virtual helper [Figure 3] indicating that the helper is not optimally applied. As content experts, we no longer had a say in the development of customized multimedia development for health science courses.

I was obliged to make use of institutional programmers and multimedia developers and could not contract someone outside of the institution for help complete my projects. Waiting in line for products that were not meeting my standards, I applied for seed funding to buy the technical expertise I so desperately needed.

At this point in time, Wi-Fi was not available in lecture rooms and students could not use their own devices. This defeated the purpose of bringing TEL into the classroom as bringing your own device was not supported at the HEI. This brings me to the final limitation – technical support. There was readiness for the use of online education, but technical support was simply not available for new inventions. Local rules were steering education instead of education steering the use of TEL.

Comperacy

I developed a game for learning with the aim to teach soft skills to health science students. While I interacted with gaming experts about developing the game, I realized that I did not understand Game Speak! I was unable to communicate my needs to the programmers and repeatedly found myself entangled in technical jargon. If I was going to play the innovating game, I had to become well versed in Game Speak. I learned as much as I could and my insights on technical aspects improved. However, when I suggested literature-based solutions, the programmers reverted to familiar strategies without even considering other possible other solutions. In their defense, they had extensive workloads and a limited capacity to learn new software programs.

A first wire-frame test of the game with students showed a need for higher game fidelity in terms of the use of sound, better graphics, and more choices.[14] We managed to secure funds for version 3 of the game and embarked on a new game design to address our needs. At last, a quality game could be produced enhancing students' learning experiences.

E-communication

Good communication with students is essential. The HEI's LMS provides a platform for sending messages to students through a chat room. The chat rooms are tricky to navigate to and students seldom visit unless they are aware of postings. I reverted to the use of social media to communicate with my students. Facebook™ is popular with students as it provides in-time feedback in a familiar environment. It elicits peer learning when students direct a question and a debate follows in the safe environment. I also created a YouTube™ channel where students upload their videos they made as class assignments as well as a WhatsApp™ group for instant communication.

Institutional support

The central theme of these TEL endeavors is that of institutional support. At the HEI, decision-makers actively promote the use of technology in classrooms. However, when one attempts to experiment with emerging technologies to penetrate the glass ceiling of implementation, these decision-makers restrain support from individuals. I wholeheartedly believe that Rogers[8] is indeed correct when he maintains that innovators and early adopters should be prepared to survive unsuccessful innovations. They need to breach gatekeepers and bring innovations from outside to the system. I had to downgrade and abandon some of my initiatives. My attempts at Scholarship of Learning investigation of students' TEL learning experiences suffered.

Discussion and Recommendations

Being an early adopter, I am in the minority and face trying conditions and challenges. I often found myself alone in such struggles, but I tried to maintain perspective by meeting the Generation Y students on their level and feeling I was enhancing their learning experience. My mentor who negotiated many disappointments during his extensive TEL journey pronounces, "I wear the scars on my body to pave your way." Being aware of the barriers can help one anticipate them and find solutions before commencing with the innovation. I learned that I had to stay one-step ahead and keep abreast of the latest literature. Being able to share my experiences, ideas, and needs according to precise terminology increased the opportunity to communicate my needs. Looking back, I realized that as a subject matter expert with many ideas I regularly needed technical support. I had to accept my limitations and had to downsize my big dreams, which led me to embracing change and be adaptable. Was it worth it? Absolutely, as I gained more skills and the challenges forced me to be innovative in different ways, which in the end made me a better lecturer.

Institutions are by nature bureaucratic in their control of processes that can consequently block one's innovation

attempts. Turning digital product development into research projects provides opportunities for collaboration and funding for innovation. The project approach I learned allows for sandbox exploration of emerging TEL and solutions to HEIs while I built my credibility with peers and the HEI.

If I could have any say in institutional policymaking, putting systems in place to support innovators to develop and implement digital technologies would be my first request. This would benefit the institution as well as the innovator. Furthermore, I would ask for technical decisions to incorporate the needs of lecturers. Once a decision is made to advocate a specific digital approach, institutions should provide the necessary resources to support innovators who are at the cutting edge of using TEL in classrooms. I summarize my journey with the words of W. Paul Young: "I have moments that aren't too bad, but there's always something I'm struggling with, or feeling guilty about. I just figured I needed to try harder, but I find it difficult to sustain that motivation."

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Conflicts of interest

There are no conflicts of interest.

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