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Creating an Augmented Reality App for an Enhanced Self-Access Tour

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Abstract

This article explores the development and implementation of the first iteration of a learner autonomy focused self-access tour app utilizing mobile devices and augmented reality. The authors first provide an overview of learner autonomy, augmented reality and Puente's SAMR model of technology in education, followed by an explanation of the project's considerations, limitations and lessons learned before concluding with future prospects for the application.

Keywords: learners autonomy, augmented reality, self-access tour, SAMR

Educators constantly strive to find a way to bridge the gap in formal education, where an instructor 'owns the knowledge', and self-directed learning, where the learner discovers the knowledge in an autonomous way. Scholars have argued the benefits of the latter claiming that autonomous learning is "grounded in a natural tendency for learners to take control over their learning" (Benson, 2011, p. 2). To a degree, every learner can be an autonomous learner given "appropriate conditions and preparation" (Benson, 2011, p. 2). However, within the definition mentioned above there is little indication of the method in which learners are to become autonomous. The field of self-access has a long history of taking the lead in promoting learner autonomy. Although self-access centers have been a feature of language programs for five decades, there have been significant shifts in the past few years. One recent definition is provided by Benson, Chávez Sánchez, McLoughlin, Mynard, and Peña Clavel (2016, p. 288) who define self access as:

facilities [that] are person-centred social learning environments that actively promote language learner autonomy both within and outside the space. Students are provided with support, resources, facilities, skills development, and opportunities for language study and use.

The recent addition of the social dimensions to the definition of self-access was made in order to develop ways for learners to take control of their interactions within a self-access center. In addition, Benson (2017) notes that mobile technology in particular is having an effect on how students are able to access learning opportunities outside the classroom. He sees the role of a self-access center - alongside the classroom and various technology tools - as one way in which a

learner might construct a personalised learning environment. Mobile-based applications built with the pedagogy of learner autonomy in mind could link the physical and digital worlds. One such example is an augmented reality (AR) platform designed to develop autonomous habits, where learners could take control over their own learning. For the purpose of the present project, the author chose to focus on providing this AR experience through the creation of a self-access tour of Kanda University of International Studies' Self-Access Learning Center (SALC).

AR Definition

Many have debated the true definition of AR. This paper will rely on the definition provided by Sheehy, Clough, and Ferguson (2014, p. 20) in which AR is an overlay of digital information or data, including text or images, applied to the physical world. Therefore, AR technology is vastly different from that of virtual reality (VR), where a user would be completely immersed into a digital world with no stimulus from the physical world. Milgram, Takemura, Utsumi, and Kishino (1994) highlight that AR technology can be considered as a 'mixed reality' since it is a blend of the virtual world with the physical one, however, for this paper the technology will be strictly referred to as AR.

Technologies for Promoting Higher-Order Thinking

It is believed that when learners are given a multimodal source of information to learn from, like AR, it can vastly change their thinking processes. Papert (1976) notes that "the use of computer metaphors by children will have effects beyond what is normally classed as 'cognitive skill' [which is expected] to influence their language, imagery, games, social interactions, relationships, etc." (p. 137). Although more research is needed, models such as Puentedura's (2014) SAMR model, Bloom's Digital Taxonomy (Church, 2014), and others might be employed in order to investigate how such tools might provide opportunities for thinking in ways that may be transformational, i.e. allowing a high degree of problem-solving leading to shifts in thinking (e.g. Hughes, Thomas, & Scharber, 2006). Savage and Barnett (2015) argue the SAMR model allows for "live interaction(s) unbounded by classroom walls" (p. 31) like that of an AR tour which certainly influenced the present project. The SAMR model also applies the idea of creation through a circular testing by creating new tasks and redesigning them with the enhancement of technology (Savage & Barnett, 2015). These theories allowed the researchers to reflect on the AR technology being used to best meet the needs of the app's stakeholders.

The SAMR model takes traditional learning and allows technology to change the way people interact with materials through four states (Figure 1).

Figure 1. The SAMR Model (Puentedura, 2014)

The enhancement phase of the model, which includes substitution and augmentation, moves learners away from paper based learning to utilize technologies to enhance engagement with the materials. However, enhancements do not vastly change the interaction with the materials, but rather allow for more technology to be used. The second phase of the model then moves to the transformation phase, including modification and redefinition. This leads to designing, developing, and incorporating digital learning which creates tasks that target higher-order cognitive skills, including analyzing, evaluating, and creation.

The AR self-access tour was designed to address the first three steps of the SAMR model: substitution, augmentation, and modification. The current app is missing the ‘redefinition’ aspect of the model as learners cannot add their own information to the tour. This is an issue that will be addressed in future iterations.

Designing the App

From April 2017, Kanda University of International Studies opened its new “KUIS 8” building featuring a new SALC, which quickly became a popular destination for a number of outside visitors seeking to learn more about its focus on autonomous learning and its integration of the latest technology. It was noted though that despite the theme of self-access learning and learner autonomy, the tours that visitors and new students took were very structured and lacked the autonomy that the SALC was trying to promote. As a result of this observation an investigation was

made into what other kinds of tours could be provided that would promote autonomy and, in keeping with the building's focus on the latest technology, provide the most technologically novel experience.

Mobile device AR was settled on as the target platform to provide these tours as the ubiquity of smartphones and tablets both among students and visitors made it the perfect tool for providing the self-access tour. AR content can be activated with very little digital literacy. Users need only point their in-app mobile device cameras at the clearly marked AR targets to activate the 3D model overlays. These overlays provide the relevant information for each location in the SALC. The decision to use a voiced and subtitled 3D modelled SALC mascot, "Saru the SALC Monkey" was made as it provided visual, auditory and textual content to the user without the large download costs associated with videos.

Implementation

Once the parameters of the self-access tour app were decided upon, a number of decisions were made as to what content would be provided to the users. Consultations with the SALC staff were organised and over a period of weeks a set of twelve locations were chosen that would best display the facilities and capabilities of the SALC to the greatest variety of users. Since the users would primarily be visitors and freshmen students visiting for the first time, the locations were also chosen so as to lead them around the entirety of the building, familiarising them with the SALC's layout and content.

The method of delivering the 3D content to the users was also taken into consideration as AR provides a number of different ways of placing information within a set physical space, including GPS-based, image, object and surface recognition, and more. Box targets were ultimately chosen as the five sides visible to users would allow for the widest range of viewing angles, and increase the likelihood of content being recognised by the app, especially when dealing with 3D content that needed to be accurately overlayed into the real world space (Figure 2).

Figure 2. Examples of the App in Use

Finally, the decision was made to trial the app at two upcoming conferences taking place at the SALC during 2017 before the arrival of freshmen students in the 2018 1st semester. After a development period of around 4 months and approximately 100 hours of development time including app development, programming, 3D modelling and creating voice overs, the app was published to the Apple App Store and Google Play Store (Appendix).

Observations and Lessons Learned

Overall the launch of the app, which had high adoption rates at both conferences with approximately 50% at the first and nearly 100% at the second, was well received with a tangible sense of awe as users moved about the facility locating the box targets. As Sheehy, Clough, and Ferguson (2014) point out “augmented learning create[s] the social, affective, and cognitive conditions that will allow individuals and groups of people not only to approach learning in a meaningful way but also to engage with it more deeply” (p. 2). This phenomenon was clearly observed as conference goers engaged each other during and after the tour and was a key part of the successful implementation of the app.

The user interface (UI) was kept simple, adhering to design principles that focused on providing intuitive controls and an effort was made to avoid as many UI elements that would

require instruction as possible. As a result it was observed that most users had little to no problems accessing all the content and determining what information they wished to hear and read about in the app. However, it was found that some specialty phones and older devices could not support the technology as they were prohibited from downloading the app from their respective app stores.

The AR interface made use of box targets rather than flat image targets to take advantage of the increased stability the targets on the multiple sides provided, allowing for users to navigate around the 3D model overlays and view them from multiple angles. This was noted to aid significantly when a large number of users were gathered around a single box target, enabling all users to view the 3D content without needing to be positioned in an optimal location for viewing. However, the boxes themselves posed a few hurdles to overcome. First, the dimensions of the boxes had to be made twice as large as originally intended to better fit the scale of the SALC and to allow users of the app to stand at a comfortable distance from the targets. Second, the durability of the boxes was very important, if the image warped due to heat or moisture or the corners curled some of the stability of the 3D model overlay was lost.

Future Implementation

The immediate plans for the self-access tour app are to implement it as a part of the freshman student SALC orientation during the beginning of the 2018 1st semester. Students will be encouraged to download the app before the orientation and be given the opportunity to discover its features and services for themselves as an introduction to the SALC's emphasis on learner autonomy.

Intermediate plans call for the reconstruction of the box targets using more durable and long lasting materials. This will reduce the image warping present on the color printed A4 paper used during the first implementation of the app during the conferences. In addition, Japanese voiceover and subtitle options will be implemented to aid visitors and freshmen students who would be more comfortable experiencing the SALC in their first language.

If there is continued interest in the app and it continues to be well received by students and visitors, there exists the possibility of an update with further functionality such as adding the option to leave tour comments for other users to read and even adding the ability for students familiar with the SALC to add content themselves. Options could be added to allow them to write or voice their own content for the 3D model mascot to read out and be made accessible to others through the use of an options menu or code entry.

Notes on the Contributors

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Erin Frazier is a lecturer at Kanda University of International Studies. She graduated from Edinburgh University with a Masters in Science and the subject of her research was Global Englishes. Currently she is interested in action research related to augmented reality and CALL.

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Appendix

Apple App Store for iPads and iPhones:

<https://itunes.apple.com/gb/app/the-kanda-university-salc-tour/id1304148923?mt=8>

Google Play Store for Android phones and tablets:

<https://play.google.com/store/apps/details?id=com.ChihippoCreations.SALCTour>