My teacher is an Android: Engaging learners through an Android application

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This concise paper describes work-in-progress research that examines the development of an Android "app" for a topic in a first year Statistics paper. The Android platform was chosen as Android devices are the top-selling mobile devices, outselling Apple iPods/iPhones/iPads. In addition, the operating system is open-source and development can be done through the Android AppInventor programme, accelerating the development process by providing a point and click interface to bypass much of the programming. The paper briefly examines the literature relating to student engagement and the use of mobile devices in teaching, before describing the process of developing the app. It is concluded by describing future research that will be presented at the conference.

Keywords: Android app, student engagement, teaching statistics, mobile learning

Introduction

The demographic profile of students at many universities in Australia has changed in the last decade (Department of Education, Employment and Workplace Relations, 2010). As has the balance of campus-based, blended learning, and distance education programmes, with universities vying for different target markets and student profiles. One of the more recent demands, from both campus-based and distance students, is for the integration of mobile devices into education programmes (Hoskins, 2011). Although tools, technologies, paradigms and student cohorts continue to change, one thing that stays the same is the need for learner engagement, and learning resources that encourage this.

This paper will examine the development of an Android app for a topic in a first year Statistics class. It details the decision making process for choosing the Android operating system, a review of literature on app development and mobile learning, and some reflections on the process. This is followed by a brief description of how the app will be implemented with the students and evaluated. The ultimate goal of this research will be to quantitatively and qualitatively measure the student engagement and improvement from using the app. The plan for this will be briefly discussed at the end of the paper, and discussed further at the conference.

The ability to correctly identify the statistical test that is required for a given number and type of variables is a technical skill that students commonly struggle to master. In the past students have been provided with flow charts or decision trees to help select the correct statistical test. However, this has only had limited success, mainly due to students not using them (particularly as an ongoing resource). The goal of this app is to translate these flow charts into a mobile application that students can refer to and practice with. By using an app rather than a javascript on the web, students can access the content on their phones even when they are unable to connect to the internet or do not have credit for data on their phone.

Literature Review

Last year, Brand and Kinash (2010) decried the paucity of published research on the effectiveness of mobile devices in higher education learning (as well as the lack of detail regarding the learning functions, and the different blends between face-to-face and mobile learning). However, they did note that it was a relatively new research area, and further literature has been published in the area since then, with publications and presentations of note including Yau and Joy (2011) and Searson (2011). In each case it was argued that mobile learning platforms were an important part of learning, particularly with younger members of Generation Y, and even more so with Generation Z (aka the Internet Generation (Blanchard, 2009)). Bullen, Morgan and Qayyum (2011) found that in fact generation was not as relevant to the effectiveness of a resource for digital learners as the familiarity, cost, and immediacy of the resource. The benefit of mobile devices to learning was echoed in another recent publication, with Williams and Pence (2011) describing how smart phones had added a new dimension to the teaching of chemistry. However, even the additional research in the area has focused on the use of existing apps, or the use of regular web services via mobile devices, rather than on the development of a new custom-made app. This area is still emerging and has little literature outside of computer science, where the focus is on learner created apps.

The specific purpose of the app is to help students better understand the application of which statistical tests are most appropriate for a given type of data. It is an area of increasing importance in first year Statistics courses, as they move from a technical focus to a more critical and conceptual focus (Gould, 2010). Statistics is a subject that many students find challenging. This is especially the case for first year service courses. Chance, Ben-Zvi, and Medina (2007) describe how technology has driven numerous changes in the content, pedagogy and course format of statistics. They emphasise the potential of enhancing student learning through new technology, but do provide the caveat, "…technology has an impact on education only if it I used appropriately". Everson and Miller (2011) talked in broad terms about increasing student engagement through technology, including clickers, "Poll Everywhere" and mobile technologies.

Although there is a plethora of websites and literature regarding the development of mobile software and apps, there is less specific to developing learning materials, and even less about the Android operating system. Matos and Grasser (2010) describe the Android operating system as a "rich platform", for development and programming. Although their article is about having students develop Android apps, they provide helpful advice on the technical aspects of the development process. According to Shanmugapriya and Tamilarasi (2011), the key to good pedagogical development is to consider the "where, what and how", which correlates with the previously mentioned "familiarity, cost, and immediacy" from Bullen *et.al.* (2011), and one of the key findings of Herrington's (2008) student interviews on smart phone digital teaching resources, that a key benefit is the possibility of "spontaneous use". The recurring theme of these articles is that the app must be easy to access, easy to understand and easy to use. If students consider the marginal cost, in terms of effort, to be greater than the marginal benefit to their learning, they are unlikely to engage with it.

Application Development

Choice of OS

The decision of what operating system to use was a fairly simple one. The two main systems are Android and the Apple iOS. The differences between the two systems are well covered by Goadrich and Rogers (2011). The Android platform was chosen as Android devices now outsell Apple products (Nielsen, 2011), and are becoming increasingly prevalent amongst students due to the broader range of phones and plans that they cover. The Android platform is open-source and the process for developing applications is more user friendly than the competing platforms. The distribution of applications is also more flexible in the Android development. Apple

apps can only be downloaded via the Apple Apps Store, whereas Android application files can be distributed independently of their App Market. In addition, Android is also more inclusive, with students who do not have access to an Android device still able to use the applications through a computer based Android emulator. Although this would not be mobile, it would mean that no student missed out on access to the app. In the long term, the preference will be to develop for iOS and Android in tandem in order to have applications reach the greatest number of students.

Development interface

One of the advantages of the Android operating system is the opportunity to use the AppInventor site (http://appinventor.googlelabs.com) to create Android apps without having to program. Figure 1 shows the main AppInventor window. The main advantage of using AppInventor was that it accelerating the development process through a point-and-click interface and a series of tutorials to help train developers. The main downside to using the AppInventor is that it limits the flexibility of the development. In the short term this is not a large issue, however, in the long term, developing future apps will be developed in Java, using the Eclipse IDE (Integrated Development Environment). During the review process the Google announced that it was going to discontinue the AppInventor. However, shortly after that MIT announced that they would take over the support and development of AppInventor in their newly formed Center for Mobile Learning (MIT New Office, 2011).

App content and design

As previously discussed, the app itself had to be easy for students to use, but at the same time, it needed to do more than just replicated web-based content. Otherwise there would be little motivation for the students to use it. The app has buttons for students to select the types of variables and scenarios from drop-down lists. The app will then provide the most appropriate statistical test for the scenario, together with a brief text description of that test. Additional functionality that has been suggested but not yet implemented include a description of how to conduct the statistical test in analysis software, and the addition of a brief audio commentary about the test. At the time of writing this article, beta testing of the app had not been completed, so further detail, and any changes, will be provided at the conference.

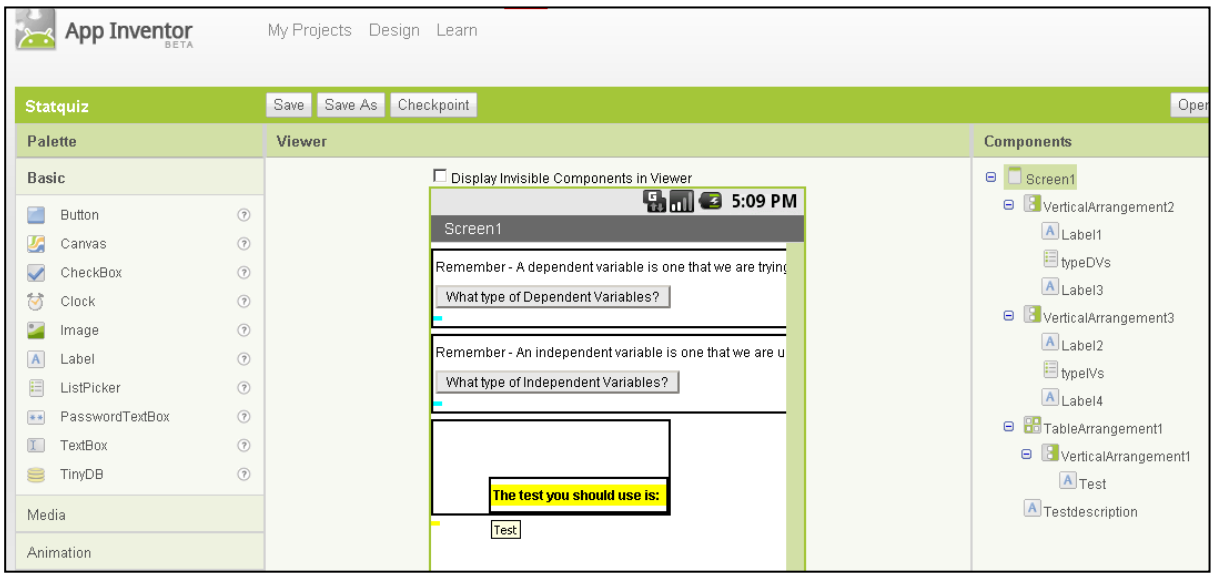

Figure 1: Google AppInventor

Reflections on the Development Process

An important component of any development process is to reflect. There are several points of reflection from the development process to-date. The first is that software development, even with the programming mainly removed, always takes longer planned. The original time-line for the project had the beta-version of the app

complete in time for initial user testing before the publication of this article (and initial user feedback and evaluation). However, this will now take place over the coming months and be presented at the conference. One of the key decisions in the process was to use AppInventor rather than programming the app from scratch. This sped up the development process, but it also limited the flexibility of the development. Although it was a good starting point, further updates to the app, and any new apps will be developed from scratch. This will allow for future apps to be more graphically appealing, which is an important component of designing engaging software. For this initial foray into application development, the Android operating system made more sense. However, given that both Android smart phones and iPhones appear to be popular among students, simultaneous development on both platforms would be preferred, despite the additional time that this would take.

Future Directions

This article has shown the development of a simple Android app for a first year statistics course. The next step will be to "beta test" with some students and tutors for the subject, before making the app available to students. This will be followed by an evaluation of the app, which will be two-pronged, collecting quantitative and qualitative data from the students. This will be supplemented by a student survey.

Post-article research tasks:

4. Beta test app with tutors and former students
5. Make app available for semester two students
6. Survey students on usage and feedback on the app

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