

Developing multimedia mLearning for mobiles

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Abstract

This short paper presents a prototype multimedia learning object that has been developed for the mobile phone. It outlines the rationale for this work and then discusses the issues raised and the design solutions that resulted during the development process. It concludes with an overview of where this work is going, and some of the issues that need to be faced to make multimedia mobile learning objects available to students.

Introduction

The ability to produce effective multimedia learning applications for technology that is ubiquitous is very appealing. Mobile phones are becoming more technically sophisticated. They can create and play multimedia content: they have larger, high quality, colour screens; many models can now capture, edit and play back video, audio and photographs, and can run Flash-based interactive applications (through Flash Lite). They also have greater storage capacity and networking connectivity, can connect to the Internet and PCs, and have Bluetooth and WIFI. Surveys conducted with University students in October 2005 and February 2006 show that they own mobile phones that have multimedia and connectivity capabilities in increasing numbers (Cook et al, 2006). Harnessing the use of these devices for multimedia learning resources which are known to engage and motivate students (e.g. Boyle, 1997) could be a powerful way of providing learning materials to students who increasingly have other demands in their life and on their time and need more flexible learning solutions.

This short paper discusses developments that build on our previous work in developing multimedia learning objects, and our initial work into mLearning, in which we produced multimedia learning applications for the PDA (Bradley, Haynes & Boyle, 2005a). It explores the next step on the continuum, in designing learning resources for a more ubiquitous and portable device, the mobile phone. An existing learning object on Referencing Books was chosen for adaptation for the phone. This was chosen as it was a small and self-contained learning object that could be worked through in a few minutes, and was thus considered suitable for mobile learning, where short, bite-sized resources are most effective. The content development had already been done, and this simplified our task to re-designing this content so that it was appropriate for and took advantage of the characteristics of the phone. Our ultimate aim is to develop multimedia learning content for mobile phones, which is interactive, highly visual, engaging and effective for the learner, using Flash Lite version 2 for authoring and delivery (Flash Lite is a version of Flash for mobile phones). Small, self-contained learning objects that can easily be used by the student whenever they want to use them, wherever they are when they have the desire or opportunity to engage in some learning, taking advantage of this 'always there, always on' technology.

Design issues and solutions

We have started by adapting an existing learning object, to see what is feasible and effective on the mobile phone, in particular the Nokia N70. We decided to focus on one popular model of phone initially, in order that we can research the development and design issues involved and find solutions without needing to become involved in the wider technical issues inherent in developing applications that will work on a range of phones with different technical specifications and operating systems.

We had some initial concerns about the nature of the phone that might constrain our design and have a negative impact on user navigation, interaction and control of the learning resource. Crucial issues of application navigation, interface design and content breakdown had to be tackled. Screen size is smaller than we are used to designing for: 176 x 208 pixels on the Nokia N70, about the size of a matchbox. Input devices are limited: there is no keyboard, mouse, stylus or touch screen. Input and selection has to be controlled by the phone's keypad (the keys can be seen in Figure 1). The N70 has 2 'soft keys' at the top left and right, directly under the screen, and these can be programmed to perform specific functions, such as 'exit' or 'back'. In the middle is the 'five-way scroll key', which provides navigation in 4 directions (up, down, left, right) and a button in the middle to select items. User interactivity and selection is a more lengthy process on the phone, as you can't just point and click as you can with a mouse or a stylus. Selecting a button or area on the screen is a 2-step process. First you have to highlight the item by navigating to it, and then you have to use the 'select' key to activate it.

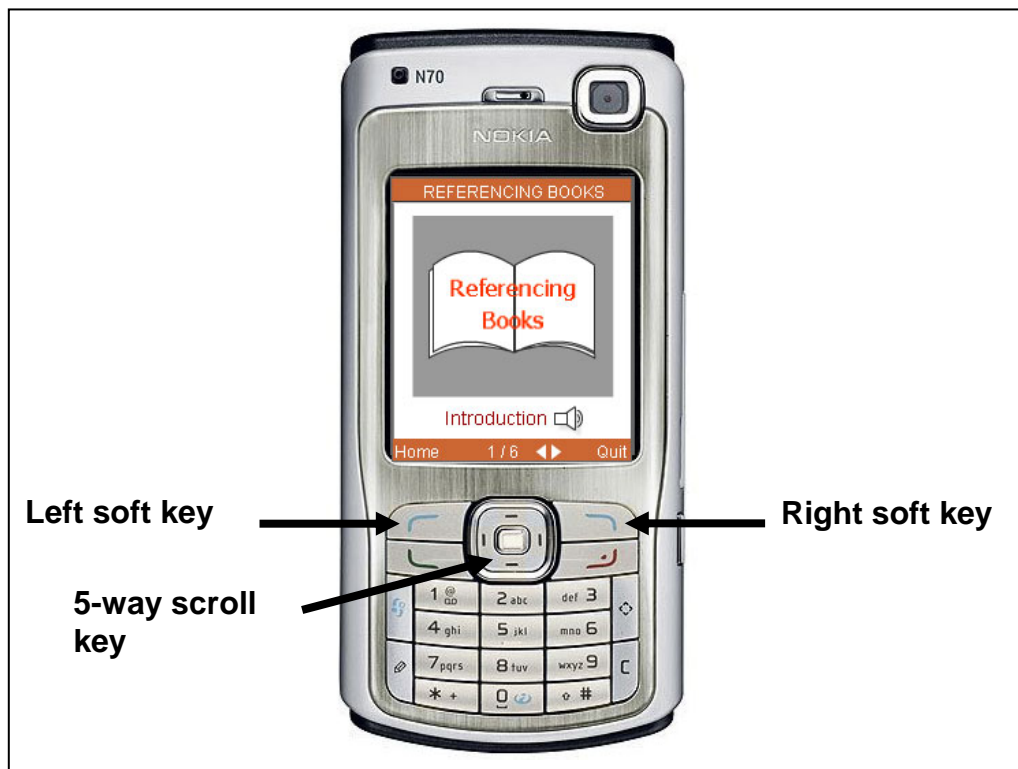


Figure 1: The Nokia N70 phone displaying Referencing Books

We were confident that Flash Lite 2 would be able to handle all the media components included in our learning objects (text, graphics, animations, videos and quizzes), but a number of tests were conducted to ensure that the desired functionality and performance could be achieved on the phone. Text could either be embedded within the Flash movie, or loaded in from an external XML file. Graphics needed to be in PNG format, and simple animations performed perfectly. Video files had to be converted into 3gp format, but there are free conversion programmes available from Nokia, that optimise the video file for the phone (Nokia Forum website). Self-test quizzes with feedback and scores could be included, as Flash Lite 2 supports ActionScript 2 and could provide this functionality.

The next stage was to tackle the issues of the user navigation controls. We looked at other applications that had been created in Flash Lite to identify if there were any emerging conventions. Examples are available from Adobe's website in the Adobe Flash Lite Exchange (Adobe website, a), although these are mainly games, and we also looked at tutorials created by Nokia for the N70 and N91 phones. We specifically looked at the functionality assigned to the 2 'soft keys'. The left soft key was used for a variety of functions such as 'menu' 'start' 'pause', and the right soft key was commonly used to 'quit' or 'exit' the application. We decided to use the left key for 'home', to go back to the beginning of the resource, and the right key for 'quit', to end the resource. We also found out that we could give 'focus to' or highlight items on the screen, such as icons and navigational devices such as arrows and areas of text. This functionality could effectively be used to help users navigate through the object, and make the selections of their choice.

To keep our Flash Lite designs modular, we designed a template for the build. This built on the guidance available at Adobe's website on Getting Started Developing for Flash Lite and the Macromedia Flash Lite 2 Content Development Kit (CDK) (Adobe website, b). The template had the chosen screen dimensions (176 x 208), the background colour (white #FFFFFF), and an outline border to the page. This basic template was enhanced by navigation controls and common elements such as the title bar and the navigation bar, and the addition of basic action scripts. This included FSCCommands for displaying the application in full screen, specifying quality, and `_focusrect` to remove given button highlights. Functions were added for the playing of external mp3 files, setting the page number (e.g 2/6), and the loading of 3gp video and xml text. The template therefore contained all the common elements that could be used for creating other Flash Lite 2 objects.

After we had researched and found solutions for the interface, navigation, use of the phone keys and designed the basic template, we began to develop the content of the learning object. An outline storyboard was developed, based on a thorough analysis of the existing PC-based object and how the content could most effectively be adapted for the mobile phone, and for use in mobile situations. One of the key considerations of this re-design process was the size of the screen (176 x 208 pixels). We learnt from our prior work in designing learning objects for the PDA that smaller screen sizes are not necessarily a design constraint (Bradley, Haynes & Boyle, 2005a). You just have to rethink the problem and find alternative solutions. One of these is to replace lengthy pieces of text usually used for instruction and guidance with short audio clips. This use of audio not only alleviates screen overcrowding, but is easier for people to assimilate in mobile situations. Our research has shown that students also find it easier to learn from audio (Bradley, Haynes & Boyle, 2005b). As the storyboard was developed, scripts for audio instructions and guides were drafted. These were then quickly recorded on an MP3 player, and passed to the developer to incorporate as 'guide' tracks as the resource was authored. They

would be more professionally recorded at a later stage when we were happy with the overall design and the efficacy of the scripts. Another solution for designing for the mobile phone is to present the content in small bite-sized chunks, over a larger number of screens. What would have been presented in one screen on the PC, was broken down into a greater number of steps over several screens. Creative alternatives were found for the presentation of content on the phone, so that it would fit on the screen and still be usable. An example of this is the ‘How to reference’ section. The PC version uses a large step-through 3D animation. For the phone, this was replaced with a simple step-through still-frame animation, resembling a cartoon strip. This solution reflects a change to a slower pace, where each screen is a cell in the animation. Where the PC resource has text introductions to each new screen, the mobile version has an audio introduction, which is given focus when user enters that screen. In the quiz, to avoid text feedback from cluttering the screen, the feedback was put on a second screen.

Figure 2 shows one of the screens and the interface design from the Referencing Books prototype. There is a title bar at the top of the screen, giving the title of the learning object. The bar at the bottom of the screen is for navigation and orientation. A ‘Home’ label is on the left-hand side above the left soft key, and a ‘Quit’ label above the right soft key. In the middle the user can identify which screen they are on within the object (in this case 2/6 – 2 out of 6), and there are left and right arrows to navigate to the previous and next screens. Above the navigation bar, the topic of the screen is displayed, and if there is an audio introduction, there is an icon to play the audio clip. The main area of the screen is reserved for content presentation. When the user enters a screen, if there is an explanatory audio clip, the audio icon is highlighted (given focus), and can be played by pressing the select button. In this screen, after listening to the audio, the user navigates to each of the text labels and selects them to hear a short audio clip that explains why they should make references in their written work. On completion of the screen, the user navigates down to the right arrow at the bottom of the screen, which will become highlighted, and presses the select button on the phone to move to the next screen.

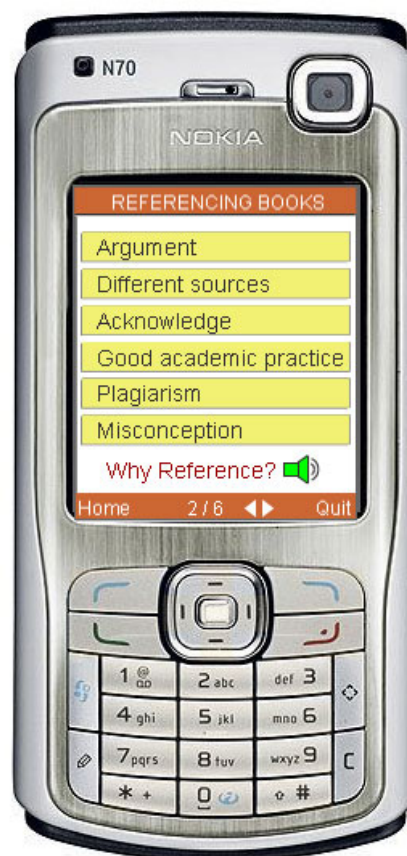


Figure 2: A screen from ‘Referencing Books’ on the Nokia N70

Conclusions

We have now got to the stage where we have developed a fully functional prototype, and have researched and tackled a lot of the issues involved in developing multimedia Flash Lite 2 learning resources for the N70. Next we plan to trial some alternative navigation strategies, so

that we can be sure that we have got this right. The next stage will be to conduct evaluations and usability studies with target students and peers to get user feedback on our design.

We also have to investigate and tackle a number of issues associated with how we could make such learning objects available to students. Do enough students have compatible phones to make the production of mobile learning objects a viable proposition yet? There are issues around how content would be presented on phones with different screen display sizes and resolutions (which currently varies widely). How do we deal with the licensing costs of downloading Flash Lite, and would students be prepared to foot the bill for this? Flash Lite version 1 now comes pre-installed on a number of phone models, but we have been working with Flash Lite version 2, which supports the authoring functionality of Flash 8, and has to be bought from Adobe at a cost of about \$10 (£7), and installed onto the phone. We have to determine how we can best package up the learning objects for easy transfer onto the phone (the current prototype consists of one SWF file, and a series of external assets for the audio and text files). And then determine how we could make available the packaged files for users to have on their phone e.g. by providing pre-installed SD or memory cards, by downloading from the Internet (a cheap option if it can be done via WIFI), transferring them via a PC, or sending them via Bluetooth. There are also opportunities to embrace the strengths that the phone can bring to mobile learning, for example in combining multimedia learning content with scenarios for learners to capture and contribute media files, dynamically upload content on the move, and communicate with peers and/or tutors. We have already found that we can build in the functionality within a Flash movie for users to make a phone call or send an SMS message, which could be used to contact a tutor, or have a discussion with another learner whilst they are accessing a learning object. The possibilities for incorporating multimedia learning resources into sociable learning scenarios on mobile phones is achievable, and that is one of the directions that we are interested to pursue in the next phase of development.

Acknowledgments

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