LESSON D6_EN. THE CREATION OF eLearning MATERIALS FOR MOTOR DISABLED USERS

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After learning this lesson you will be able to reach more with the following knowledge:
- You will have more understanding of the basics of mLearning: what it is and how it is applied.
- On the specific ins and outs and benefits for motor impaired persons
- On the production process of materials, taking into account the accessibility requirements of handheld devices

CONTENT OF LESSON
1. mLearning: Introduction
2. mLearning for eLearning Content
3. mLearning for the target persons
4. The do's and don'ts of mLearning Facilities

LEARNING OBJECTIVES:
After learning this lesson you will accomplish the ability to:
- Start creating usable and accessible mLearning materials.
- To select and advise applications for the target group, also taking into account specific advantages and disadvantages of mLearning materials.

1. mLearning: Introduction

The term mobile learning (m-learning) refers to the mobile use of mobile and handheld IT devices, such as PDA's, mobile phones, laptops and tablet PCs, in teaching and learning. mLearning is often about 'on the spot' learning: the IT solution supports learning in real life, outside the classroom. Examples are learning fine arts in a museum supported by a device, or biology in the field guided by mLearning content.

As computers and the internet become essential educational tools, the technologies become more portable, affordable, effective and easy to use. This provides many opportunities for widening participation in and access to Information and Learning Technologies (ILT), and in particular the internet. Mobile devices such as phones and PDA's are much more reasonably priced than desktops, and therefore represent a less expensive method of accessing the internet (though the cost of connection can be higher), and the introduction of tablet PCs now allow mobile internet access with equal, if not more, functionality than desktops (1).

If we are to believe the advertising, and tentative research findings, the next revolution in technology to affect education and training will be mobile communication devices and palmtop/handheld computers (2). The use of a specific, well introduced and widely available piece of equipment for mobile access to data and information, to be used for mLearning, is promising and has numerous advantages. We are now speaking about the cell phone. Within education and training there is an increasing expectation for immediate feedback from assessments, instant communication with teachers/tutors and access to learning materials on demand.

For learners the mobile telephone has become an essential piece of technology. The use of text messaging is now accepted as part of the 'youth' culture. As the price of mobile communication technology falls, and the functionality increases, to include digital cameras, video and sound recording, conferencing, MP3 players, Internet access etc their popularity is set to increase. It is not clear, at this point in time, how much education can be attributed to the use of mobile devices but they have certainly been effective with regard to the introduction, and use, of sophisticated technology especially by young people.

2. mLearning for eLearning Content

Generally, PDA's offer greater functionality than mobile phones and similar advantages to tablet PCs, though tablet PCs are more robust than PDA's and offer additional features. PDA's and tablets, and to some extent mobiles, can be used in many educational settings and accomplish many different educational tasks. Most mobile devices are useful in education both as administration, organization and teaching aids for practitioners, and also as learning support tools for students. Advantages of mobile devices in general are the following (from: 'Introduction to Mobile Learning, K. Wood, 1) :

- Students can interact with each other and the practitioner instead of hiding behind large monitors

- Much easier to accommodate several mobile devices in a classroom than several desktops, as require far less space
- PDA's or tablets holding notes and e-books are lighter, less bulky and easier to carry than bags full of files, paper and textbooks, or even laptops
- The handwriting recognition software in PDA's and tablets have been found to help improve students' handwriting skills
- Handwriting with the stylus pen is more natural than using keyboard and mouse
- Can draw diagrams, maps, sketches directly onto a tablet, using standard software
- Can take notes directly into the device during outdoor lessons or on field trips, either typed, handwritten or voice
- Electronic registration and inputting data in practical lessons or outdoors where desktops are not appropriate or too cumbersome e.g. science experiments, kitchens, farms
- Shared assignments and collaborative working, so several students and the practitioner can pass the device around a group, or "beam" the work to each other using the infrared function of a PDA, or a wireless network such as Bluetooth
- Practitioners can more easily and naturally annotate work using the pen
- Can be used anywhere, anytime, including at home, on the train, in hotels - such places are conducive to learning because you cannot be disturbed by meetings, you are often alone, it might be quiet - this is invaluable for work-based training
- Stylus pens are much more natural for web browsing - click directly on links etc with the pen instead of using a mouse
- Can trace an image directly onto the tablet's screen
- Engaging learners - young people who may have lost interest in education do like mobile phones, gadgets and games devices such as Gameboys
- Increases motivation and personal commitment to learning if a student can "own" a device and take it with him/her wherever he/she goes, and encourages responsibility
- May contribute to combating the digital divide, as generally cheaper than desktops, especially mobiles and PDA's
- Just-in-time learning/reference tool for quick access to data in the field eg. accessing step-by-step guides to help you achieve a task.
- SMS can be used to get information (eg. timetable changes) to staff and learners more easily and quickly than phone calls or email, for example
- As assistive technology for learners with learning difficulties and/or disabilities - see accessibility below.

Disadvantages

mLearning has to be a comfortable and practical way of studying. The ordinary mobile units today are equipped with a small screen with rather poor quality. The next generation units provide true color, great resolution and can present crisp clear color images and movies as the more advanced models do today. These units also come with speakers and can play music in compact disk quality or even better. For mLearning students this means the opportunity of a great audiovisual learning experience.

The problem today is that these multimedia units are rather expensive and only limited amounts of supporting services are available. We believe that in a few years the situation will be quite the opposite. Mobile multimedia units at reasonable prices will probably dominate the market, not the ordinary GSM-phones. There will be a broad range of services available for the users: Hopefully also educational services.

Battery capacity is a critical factor for any mobile device. There is no use offering mLearning courses if batteries run out after a short duration. Today mobile devices do have quite good battery capacity, but it is still not common to stream live video/music and display high-resolution graphics, which drains much more power than playing simple games on a GSM-phone.

Mobile units suitable for mLearning have to be equipped with a wireless communication device of some sort. Bluetooth, GPRS and similar technologies use radio waves to transfer data without the need of a physical link between the units that are communicating. A concern is the extent to which users of mobile units are exposed to dangerous radiation. (3)

Specific disadvantages of mobile units for motor impaired persons mainly have to do with their limited size and consequently the relatively high demands on coordinative skills and dexterity. Thus motor impaired persons wishing to use such devices should not be too limited in their hand function and mostly are limited solely in locomotion. Moreover, specific solutions (like hardware adaptations or adaptive software) for motor impaired persons are hardly available. To some extend the appropriate choice of a specific mobile device will enable use in spite of existing dexterity problems. Examples are the use of additional small keyboards or key guards. Small touch screens often are very challenging for persons with dexterity problems

and should be avoided. Speech input software could be very beneficial in the near future but is now putting too high demands on memory and processor capacity of small systems. Its application on tablet PC's is a reasonable option. More detailed information about accessibility and usability of mobile devices for the target group is given in the next paragraphs of this chapter.

3. mLearning for the target persons

Accessibility

The size, shape, weight and portability of mobile devices make them particularly effective for users with disabilities. For example, they can be attached to wheelchairs with the use of small brackets. However, many of the other features are not so accessible. The small buttons can be difficult for people with little manual dexterity to manipulate, though some mobile phones have tactile buttons which are great for visually impaired people. The stylus pens are often narrow and small, and require accurate use to work correctly. PDA keyboards are also small and options for switch or mouse access are limited, though the collapsible keyboards have several advantages as they are normally larger in size, have tactile and deep keys, and are very portable. They can however be a little flimsy and are awkward to attach/detach. The small screen sizes of PDA's and mobiles are also unhelpful, as the display tends to be cramped, though it is possible to purchase a hardware screen magnifier which can be clipped to almost any PDA to magnify the screen. The small screen sizes often cause text to be abbreviated and PDA language is often jargonistic, which is unhelpful for people with dyslexia and other learning difficulties. Also software screen magnifiers are now available. However, screen magnification will always lead to a more li0mited overview of the screen content, which is a real disadvantage for a device already having limited capacities in presenting a whole screen.

The restricted functionality of the operating systems used by PDA's also add to problems, as users with disabilities need to be able to customize clicking, color, text size, font etc. There are, however, several software applications that can be installed to allow customization of some features. The organizer functions included in mobile devices, particularly Guidelines for interactive content and mobile phones, are extremely useful for learners with learning difficulties to help them organize their own lives and achieve some independence. Many PDA's and mobiles include vibrating and visual alerts, which learners can use to remind them when to attend lessons and appointments, carry out tasks, and meet a homework deadline. PDA's often also incorporate dictionaries and thesauruses which, combined with the portability of the devices, provide handy reference tools for learners with learning difficulties.

Left-handed users often encounter problems using PDA's, as their hand tends to block the screen while they are scrolling text on the right-hand side. There are some applications designed to counteract this, but they are not yet very effective. Tablet PCs have much larger screens and therefore do not present the same magnitude of difficulty, and the handwriting recognition software included with tablets can be set to recognise a left-handers particular style of writing.
The operating system used in tablet PCs is Windows XP, which includes text-to-speech, a valuable tool for users with disabilities or learning difficulties. However, text-to-speech is not always available for all languages. The text-to-speech feature can assist users who have visual impairments and find it difficult to read the screen, and also help learners who may have poor reading skills.

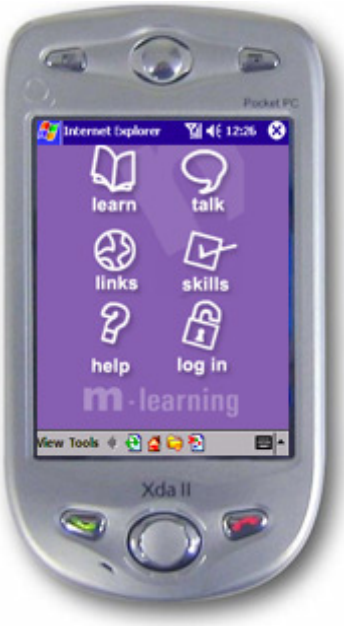

Fig. 1: M-Learning using a PdA (picture from www.m-learning.org).

4. The do's and don't's of mLearning Facilities

mLearning may have very attractive and unique advantages. However, from a technology point of view mLearning still also has to overcome major disadvantages. The Fernuni at Hagen (4) stated the following in 2002: 'M-Learning has been slow to grow because most wireless devices have small screens, low resolution, slow processing, and limited storage capacities. Likewise, difficulty connecting various types of devices to the same network is a real limitation. It seems likely that m-learning is better suited to such specific content areas as sales or language skills. Also, current WAP technology makes it best suited to particular aspects of e-learning courses such as:

- Quick reminders and alerts
- Communication with peers and managers,
- Multiple choice quizzes with immediate feedback,
- Daily tips,
- Glossary information,
- Browsing e-learning course materials,
- Searching for specific information within a topic,
- Links to WAP sites,
- Course registration.

At the time of writing, 2005, technology has improved considerably and present hardware allows for faster connections, better storage capacities and improved processing capacities. However, due to the nature of the products used, which in their nature should be very portable and light, a number of disadvantages remain. In relation to the target groups, especially motor disabled persons, the small dimensions of the devices used will affect their usability and accessibility. Small screens and keyboards (if any) will remain, limited battery capacity still is an issue. With reference to the specific characteristics of mobile devices also specific accessibility guidelines will apply. So far, no such formal guidelines are developed. However, from research in practice (5) first additional/ specific accessibility guidelines can be mentioned that will apply to the use to motor handicapped users and will contribute to the convenience of use of all users.
To create an accessible user interface, apply the following guidelines:

- Avoid using fixed font sizes and small font sizes
- Enable accessibility options such as font size and idle time settings.
- Ensure that the user interface elements are clearly visible in low light
- Ensure effective and easy-to-read colour combinations
- Group related objects on the screen
- Ensure that the user interface is predictable
- Ensure that the tap region and size of the user interface elements are ergonomic.

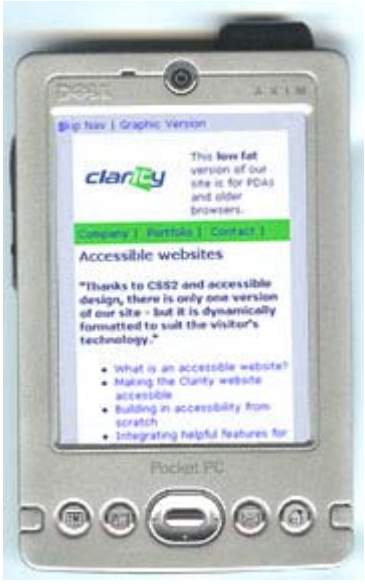

Fig. 2: Example of an accessible website for PdA and Windows K2 (From: Clarity Net).

Key Point Summary Conclusions and Recommendations

Mlearning will only be possible if content designers count with accessibility issues and physical capacities of the devices used.

Study Guide

ESSENTIAL QUESTIONS FOR THE VERIFICATION OF THE ACCOMPLISHED KNOWLEDGE

1. What types of devices (platforms) are suitable for mLearning applications?
2. Mention some operating problems that motor impaired persons may meet using small handheld devices used for mLearning purposes.
3. Mention some of the advantages of building accessible/ scalable websites that can be applied using various operating systems.

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RESPONSES TO THE QUESTIONS

1. Essentially all platform are suitable if but accessibility is offered to all users. In practice however, platforms using Windows based types of browsers are more common in Europe (in contrast to Palm based systems).
2. Icons may be too small, menu's may be complex to open and handle, typing may be a problem.(if no additional keyboard is used).
3. Downward compatibility to smaller systems, less costs, availability to users using various types of platforms.

WORDS TO THE LEARNER:

Working with mobile devices for eLearning purposes is a relatively new development for persons with disabilities. Developments for this target group always lag behind mainstream developments a bit since adaptations have to be done based on existing systems. We may expect new generations of hardware- and software adaptations, and the coming of additional guidelines. If you are involved in the development of content, please check related resources regularly.