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Responding to the challenge of providing learner-centred, accessible, personalized and flexible learning

Elaine Pearson
University of Teesside
e.pearson@tees.ac.uk

Steve Green
University of Teesside
s.j.green@tees.ac.uk

Voula Gkatzidou
University of Teesside
s.gkatzidou@tees.ac.uk

Abstract

Common definitions of a Personal Learning Environment (PLE) encompass personal systems and tools. This paper proposes a model for the development of a framework for an open source Adaptable Personal Learning Environment (APLE) that takes the PLE concept a stage further. In our definition an APLE is also adaptable to the needs and preferences of the individual learner, and to the environment in which they are working. The starting point for this study are three current or recently completed research projects; an adaptive, symbols based VLE for students with severe disabilities, self adapting interfaces for mobile devices, and a Transformation, Adaptation and Substitution Service (TASS) for the definition of adaptable learning objects. The outcomes of these projects taken together can evolve to produce an APLE.

1. Introduction

A Personal Learning Environment can be described as one that replaces the tools of a standard Virtual Learning Environment (VLE) with tools that are personal to the learner and integrated with the student's own personal systems and tools [6]. The interface and tools are the personal choice of the learner rather than the prescription of the institutional VLE. That description can be extended by adding the concept of adaptability as defined by the IMS *AccessForAll* [5] group to produce an Adaptable Personal Learning Environment (APLE). This progression would facilitate participation particularly for those students those with disabilities for whom access may currently be difficult or impossible.

The starting point is a recently completed research project on a symbols-based accessible VLE [3] developed as part of a large cross institutional European funded initiative, self adapting interfaces for mobile devices, and a Transformation, Adaptation and Substitution Service (TASS) for the definition of adaptable learning objects. Linking all of these is the concept of anonymous personal profiling. This paper

provides an overview of the specialist VLE and the TASS and explores how they can be integrated to produce an APLE.

2. The Portland Virtual Learning Environment

The Portland Partnership project funded through the European Social Fund's 'Equal' initiative sought to develop innovative ways of ensuring participation in lifelong learning for young adult learners with a range of physical disabilities and associated learning difficulties. The differing needs and requirements of these learners make it difficult to portray a typical learner, however DfES describe these students as being "capable of learning, but they will have profound intellectual impairments and will require very specialised teaching" [1]. The varying abilities and disabilities of this learner group means that each learner has unique access needs for learning.

The Portland VLE [3 op. cit.] took a specific and pragmatic approach to the development of an adaptable learning environment. The required adjustments to the interface, learning resources and interactions are made according to the learner profile derived from baseline observations and formal assessment of student needs. These adaptations are necessarily selected by the tutor or administrator rather than by the student. However, it facilitates accessible and autonomous learning. It includes the standard features found in most mainstream VLEs, (e.g. a secure login system, communication tools, timetable and access to tailored learning resources), but the interface is personalised to support the screen display, layout and symbol set (PCS, Rebus or Makaton) to match the learner's profile. It meets the needs of those learners with low literacy levels through symbol-supported text and speech output. Interaction is tailored to meet students' physical requirements through compatibility between the VLE and their preferred input device (e.g. mouse, switch, scanning).

Portland’s unique functionality and features has resulted in an accessible and adaptable learning environment that meets the needs of learners with severe learning difficulties and physical disabilities. The design encourages independent access by ensuring compatibility with the required input device, language tools and layout for each individual user (Figure 1).

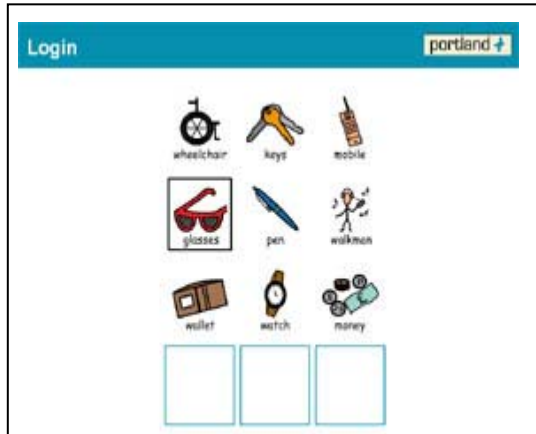


Figure 1: The Portland VLE Symbolised Log-in Screen

The Portland application demonstrates the viability of an environment that is adaptable to the needs of a particular group of learners with complex physical and cognitive disabilities and is currently in use by those students and tutors involved in its development.

An APLE would extend these aspects of adaptation further in that every aspect, including the functions of the environment are actively selected by the individual. Re-engineering the framework of the Portland VLE to provide an open source tool, adopting the concept of a PLE and incorporating aspects of adaptability would result in the creation of an APLE that could be used by many other learner groups with particular needs and preferences.

3. The Transformation Augmentation and Substitution Service

To achieve an accessible relationship between a resource and the user, descriptions of user needs and preferences are checked against descriptions of resource components until they match. This process involves a description of a user’s control, display and content needs and preferences being matched with a description of the components of the learning object [7]. The delivery of the appropriate component will form an accessible relationship between the user and

the learning object. According to the *AccessForAll* metadata overview, accessible systems should be able to adjust the user interface of the learning environment, locate needed resources and alter resource properties to match the needs and preferences of the user. For our purposes we have developed a transformation, augmentation and substitution service (TASS) which represents a special instance of an *AccessForAll* service.

Applying the TASS to learning objects to make rich online content match individual needs and preferences requires a basic resource to be created from existing or newly authored components, and the appropriate adaptations (transformations, augmentations and substitutions) need to be identified and applied (Table 1).

Table 1: Examples of Transformation, Augmentation and Substitution

	Primary Resource	Adaptation
Transformation	Text	Sign language
Augmentation	Video	Captions
Substitution	Visual Components	Audio components

In this context we define the relationship between a user and a resource as accessible when the characteristics of the resource as delivered match the user’s needs and preferences [8]. Accessibility, therefore, is the ability of the learning environment to adjust to the needs of all learners and is determined by the flexibility of the environment (with respect to presentation, control methods and access modality) and the availability of adequate *alternative-but-equivalent* content [4]. The needs and preferences of a user may arise from the context or environment the user is in, the tools available (e.g., mobile devices, assistive technologies etc.), their background, or a disability. According to the *AccessForAll* vocabulary, descriptions of needs and preferences are separated into display, control and content characteristics. Declared needs and preferences may change according to context [7].

4. From adaptable resources to an APLE

One way of achieving an APLE is to extend the concept of the TASS to deal with the features of the learning environment as well as the content (Figure 2). Using a variant of IMS *AccessForAll* [5], the TASS works on available metadata and user profiles to generate alternative, equivalent learning experiences relating to a user’s declared needs, preferences and learning styles [2]. It is a small step to extend the

TASS to be more accessible by adapting both content and functions to the needs and preferences of our users.

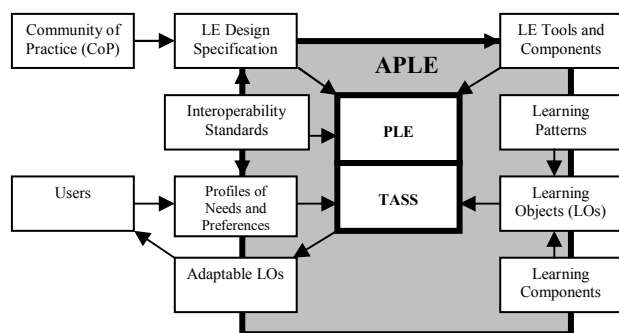


Figure Two: An Adaptable Personal Learning Environment

5. Further work

Further research is needed on user interface and component aspects of adaptability before a fully adaptable open source PLE becomes a reality. We are pursuing three specific areas of development.

The first task is to re-engineer the current Portland VLE to produce a framework for an Open Source Adaptable Personal Learning Environment. Concept designs based on user requirements gleaned from sample profiles of typical users (e.g. learning disabled; hearing impaired, vision impaired, learners with English as a foreign language) are being used to set and test the adaptability features. Secondly the profiles are mapped against the TASS to produce a set of sample learning objects adaptable to users' accessibility requirements, personal preferences, device or environmental needs. This is being achieved by analysing the existing sample profiles and mapping them against Dublin Core and IMS Profile of Needs and Preferences. In addition, structured authoring templates can be identified to support adaptability requirements. Thirdly, in order to support effective adaptability, the existing standards pertaining to each component of a PLE for interoperability must be established. Clearly, gaps and inconsistencies will need to be identified in order that standards for APLEs can be achieved.

6. Conclusion

The component elements of content, user needs and preferences are all considered equally important with respect to the definition and development of an Adaptable Personal Learning Environment. However

central to all of this work is the learner and the resulting enhancement of the learner experience. We may not be able to guarantee an improved experience in all cases but we believe we are providing for a more inclusive definition of a PLE. This project will bring together our work on a personal profiling tool, an adaptable learning object authoring environment, a specialist VLE and an exploration of appropriate standards to produce an open source Adaptable Personal Learning Environment - that is an adaptable model able to grow and change according to the needs of the user.

7. References

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