Educational technologies in a personalised learning environment (PLE): an overview

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ABSTRACT: A personalised learning environment (PLE) is focused on Web 2.0 tools as a way of integrating learning processes in a digital and technologically dynamic environment. The PLE helps in the preparation of future teachers to lead the way in the development of educational approaches that encourage knowledge building. The PLE represents a new, wide-ranging evolution in educational practices by integrating information and communications technology (ICT) applications to create wall-free schools capable of meeting the demands of the information society. In this article, the authors overview a range of PLE tools based on Web 2.0 technologies. The main aim is to assist in the transformation of learning and teaching in higher education, and to prepare learners for future work in a dynamic context with a high degree of digital and technological influence. The key findings could be used as instructions for PLS tools to facilitate structured learning by both teachers and students.

INTRODUCTION

Technology is running people's lives these days, and it seems indispensable to them. The technological explosion and the related user dependency have occurred over a relatively short time. In the 21st Century, educators also face younger generations, who are ICT savvy and exposed to diverse information sources. The use of ICT in education provides students with more learning possibilities. In light of the changing teaching and learning landscape, this article aims to explore new educational approaches in the 21st Century learning environment to enhance the teacher's ICT capacity [1]. Students mainly use the Internet for interactive asynchronous events, including social networks, e-mail, discussion fora, on-line chats and shopping, particularly at Web sites for auctions. Technological developments, such as artificial intelligence (AI), big data and the Internet of Things (IoT) are the core of new ideas, infrastructures, applications and tools to facilitate learning in various modes, places and time [2].

Personalised learning experience (PLE) is one of the most common ideas in education since the mid-2000s. The PLE concept has been successfully introduced into courses in higher education by cooperation with scholars, instructors, administrators and students. A highly constructivist and student-centred approach is not without problems in the context of formal education. Pedagogy, technology, students and teachers must be considered when discussing the opportunities and challenges emerging from this approach. The PLE is not a technical transition, but a pedagogical shift in the usage of technology. The tools involved do not differ much from those of an LMS: blogs, wikis and office on-line. Therefore, educators have been exploring ICT options since the beginning of the 21st Century to respond to conventional pedagogical problems, such as personalisation.

The primary purpose of this article is to explore personalised tools for PLE students. Their experiences as students and the influence of PLEs upon their learning will impact on the graduates' first steps in the professional world outside the university education system. PLEs plays a crucial role in transforming the monolithic central structure that dominates formal education. In addition to facilitating the use of new strategies and techniques, PLEs also help prepare students to adjust to a job environment that will expose them to constant change in the future. The article focuses on the evidence of a specific teaching and learning context, and considers its applicability in a different context, which is both the challenge and the guideline of this study.

PROBLEM STATEMENT

A course that would meet each student's individual needs is challenging to design, given the high number of students with different learning styles. Some platforms use different configuration frameworks to solve this issue. Personalised learning increases the engagement of students and results in better performance. Teachers are expected to engage in the evolving resources, and implement technology in classroom. Web-based learning services are available to teachers to

improve students' learning. Such tools may be used individually or in collaboration with other students and educators. However, teachers need to be technologically aware of the latest developments to consider implementation.

PERSONALISED LEARNING ENVIRONMENT (PLE)

PLEs have emerged as a new e-learning development and attracted media attention as an increasingly more robust platform for e-learning students. The PLE approach started in 2001 when the Northern Ireland Integrated Managed Learning Environment (NIMLE) was set up. The PLE theory explains in a very specific, new way how students learn and educators teach. Although there is no generally adopted, common definition, the PLE refers to a community of Web developments with various interaction rates, so that individual users and learners can seamlessly access information related to learning, developing expertise and enhancing skills. Personalised learning, personalised navigation, guidance, personalised assessment and customised reviews constitute the customised learning requirements [3]. The PLE is well known as a convenient, self-sustaining learning environment. The PLE is focused, in particular, on student-based self-regulated learning. PLEs can be used as a possible way to make learning personalised. The PLE ideas are based on the premise of Web 2.0, a continuation of the original Web and its services, with an increasing range of applications and resources.

PERSONALISED LEARNING ENVIRONMENT (PLE) TOOLS

Many teachers have used Web services to build their students' Web sites, especially in cases where there was no Web hosting available or where Web posting restrictions impeded teachers' efforts to provide students with the appropriate resources. Teachers, schools and language companies should tailor the curricula for specific types of students. Recently created homepage services offer greater flexibility and functionality than previous options. The ability to incorporate flexibility is one of the core principles of PLEs. Many available tools and services, such as wikis, fora, Twitter, social networks, bookmaking, etc, are designed to promote the content created by individual users to be distributed by involvement, engagement and collaboration. These tools can help to improve engagement and performance through customised learning. Various types of PLE tools and services, adapted from a publication by Bartolomé and Cebrian-de-la-Sernaare, are included in Table 1 [5]:

Table 1: Frequently used PLE tools - examples [5].

Tool	Services
Blogs	Blogger, Wordpress
Social bookmarking	Delicious, Diigo, Digg, Zotero
Social networks	Facebook, LinkedIn, Academia, Plurk, Elgg, Basecamp
RSS	RSS Reader, Feedly, Bloglines
Microblogs	Twitter
Search engine	Google, Yahoo
Image sharing	Flickr
Videoconference	Skype, FlashMeeting
Video/repository	Youtube
Email	email
Wikis	Wikispaces
Online office	Google Docs
LMS	Moodle, Sakai, Blackboard
Mail lists/news	Mail lists/newsletters
Slidecasting	Slideshare
Wikipedia	Wikipedia
Start pages	Netvibes, Protopage, iGoogle, Windows live (discontinued)
Chat/IRC	MSN
Calendar	Calendar
Podcast	Podcast
Music	Music
Curriculum documents	Curriculum documents
Virtual worlds	Second Life
Fora	Fora
Portfolios	e-portfolios
Files/document repository	Dropbox, Drive
Physical objects/sites	Libraries, books, etc
Books store	Amazon
Databases	Databases
Courses	Free courses
Address books	Address books
Webinars	Webinars
Drawings	Drawings

Other media	TV, radio
Maps	Google Maps
Analytics	Google Analytics

From a technical point of view, solutions are required to facilitate:

1. design of personal spaces with different levels of advertising. Students can collect resources, use instruments, access spaces of learning and content in these spaces;
2. sharing and cooperation, shared libraries of resources and tools, innovative and knowledge-building cooperation;
3. connection with peers and local communities, recognition of individuals who have common interests and work in related fields.

Currently, the society is immersed in what is known as a global network, which has the following characteristics:

1. The Web as a platform: dynamic applications, collaborative applications, and simple intuitive tools.
2. Programming and composition are simplified: AJAX, XML, architecture, content separation; interoperability facility, standards and applications not limited only to one device.
3. Service software: Web apps and on-line facilities, inter-service interoperability, standards.
4. Allow access by most of the community.
5. Anyone can publish: networks read and write, easy tools (blogs, wikis, photographs, videos, podcasts, etc).
6. Content management: knowledge generation and exchange, micro-content, metadata, syndication, tagging and folksonomy.

TECHNOLOGIES THAT SUPPORT PERSONALISED LEARNING

Technology is becoming a major trend in education through personalising learning. Technology allows students to choose what they learn, how they learn and how their learning is demonstrated. Formative research, assisted by digital resources, helps teachers and students to respond to vulnerabilities and to develop strengths during the learning process. Examples of adaptive learning tools with explanations have been adapted from Groff and are included in Table 2 below [4].

Adaptive Learning

Table 2: Adaptive learning tools - examples [4].

Tool	Explanation
ALEKS - aleks.com	Adaptive Web-based, artificial intelligence assessment, and learning programs that use an appropriate, open response question for students to evaluate their basic guidance on learning.
Area9 - area9learning.com	A platform suitable for learning and content creation.
Brightspace - d2l.com	IBM Cognos® technologies integrate an adaptive learning platform with embedded predictive analytics.
Core Learning Exchange - core-lx.com	A set of teaching tools to build personalised learning materials in the classroom, find resources (Core Collection™) and use them on the mastery learning
DreamBox Learning - dreambox.com	An adaptive training framework for continuous learning assessment analysing over 48,000 data points per student per hour to ensure the correct time for the
Enlearn - enlearn.org	An adaptive platform that takes various problems and generates new content based on each student's requirements.
FrontRow - frontrow.com	A platform to support mathematics, English language and social sciences students in adaptive learning.
Gooru - gooru.org	Easy, teacher-optimised search engine using digital tools, learning analytics platforms and K-12 lesson plans.
Inquire - inquireproject.com	An improved on-line textbook with interactive features that enable deep integration of AI technology.
Knewton - knewton.com	An adaptive educational platform to fit student requirements.
Lexia - lexialearning.com	Adaptive assessment and customised training in literacy.
Redbird Advanced Learning - redbirdlearning.com	This collection of resources is built to complement the individual speed and level of understanding of a student and builds on 25 years of research at the University of Stanford.
Sparkx - sparx.co.uk	A time-efficient platform to generate data on the unique learning of each
Teach to One: Math - newclassrooms.org	A customised early secondary mathematics program.
Thinkster Math - hellothinkster.com	This tablet-based mathematical learning software integrates instruction with a real-life teacher and AI personalisation to monitor the child's response.

Authoring Tools

Table 3: Authoring tools - examples.

Tool	Explanation
Acrobatiq - acrobatiq.com	A digital framework for digital in conventional or skill-based interactive courses in higher education for software as a service (SaaS).
FishTree - fishtree.com	Alignment of content and main learning goals, skills and real-time feedback on learner improvements and outcomes, innovative training systems and versatile authoring tools to streamline course creation.
SmartSparrow - smartsparrow.com	A designer learning network for vibrant, immersive and adaptive e-learning programs.

Classroom Management Tools

Table 4: Classroom management tools - examples.

Tool	Explanation
Class Dojo - classdojo.com	A platform to foster constructive learner behaviours and cultures, on-line classroom management and conduct.
Gradescope - gradescope.com	Helps grade assessments or examinations through an on-line teacher grading process. It also helps teachers to monitor the entire class's statistics and inform students on their studies.
LiFT - schoolhack.io	A classroom management platform connected with competency-based graduation requirements for personalised student training plans.
MassiveU - massiveu.com	A network to promote collective learning based on projects.
Watson Element for Educators - https://www.ibm.com/us-en/marketplace/education-insights	A platform to transform teaching offering best education approaches, skills development, challenges and much more that teachers can use to develop comprehensive teaching strategies in real time.

Cognitive Tutors/Intelligent Tutoring Systems

Table 5: Cognitive tutors/intelligent tutoring systems tools - examples.

Tool	Explanation
AutoTutor - autotutor.org	An intelligent education system that interacts in language with users; it demonstrates improvements in the learning process in various fields (computer literacy, physics, etc).
Carnegie Learning - carnegielearning.com	Smart mathematics tutorial tools, a suite of tailor-made learning and data processes.
DeepTutor - deeptutor.org	An intelligent, advanced teaching system that encourages students to understand complex scientific issues by interaction and training in quality processes.
Wayang Outpost - wayangoutpost.com	A digital intelligent training program for preparing students for standardised mathematical tests, including SAT, MCAS and CA-Star.

Learning Management Systems

Table 6: Learning management systems tools - examples.

Tool	Explanation
Altitude Learning - https://www.altitudelearning.com/	This platform provides education providers with personalised services to assist student-centred learning.
Agilix Labs - agilix.com	Encourages mixed classroom instruction.
Instructure - www.instructure.com	An open source on-line LMS designed for the whole classroom management.
Schoology - schoology.com	Includes an integrated evaluation framework on-line.
Spark Matchbook Learning - matchbooklearning.com/methodology/spark	A platform for the extraction and handling of mastery progression learning knowledge.
Summit Learning - https://www.summitlearning.org/	This personalised learning platform, developed by teachers, combines contents and technologies for on-demand assessment; it includes personalised instruction and guidance for projects.

CONCLUSIONS

This article provides an overview of PLEs through the examination of relevant tools. The identified customisation criteria are personalised feedback, personalised education, custom evaluations, customised navigation and recommendation systems. Students tend to prefer less complex platforms that allow for learning resources to be individualised. Thus, the *simplest and the best* general rule is a good indication of what software students will use. To select and organise resources, students apply practical criteria. Thus, they are not afraid to lose some elements if they can make a more effective use of their learning environment.

Students usually use other than their university subject-related software and platforms to organise their tasks and resources for a particular topic. This article indicates that future PLE research should consider digital literacy as a foundation for personal space building. However, that should be the student's initiative and a personal duty, not the teacher's.

The PLE definition is relatively new, so more work on strategies for using PLEs in the classroom needs to be conducted. Innovative educators can also upgrade digital content quickly and allow students to understand and use the 4.0 technology involved. Personalising learning will significantly enhance the use of technology in education if the technology is regarded as a smart support device for individual and collaborative learning. There are many opportunities for individuals to improve their learning capacity. This is important that PLEs allow for the formation of deep and meaningful links to fine-grained learner qualities, and make it possible for students to learn their lessons in a better way.

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