An educational platform for all: The e-Hoop approach

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Nowadays, a plethora of learning environments is available through World Wide Web with the intent to cover learners’ and educators’ different needs. However, despite significant progress achieved over the past decades, many educational methodologies still discriminate between learners failing to take into consideration that learners have different cultural background, or they prefer different learning styles, or they face learning difficulties. The e-Hoop learning platform has been developed in order to place focus on individual needs and eliminate social exclusion. E-Hoop introduces a new conceptual framework of education via a unified way to address “differences”. E-Hoop learning platform is a universal, dynamic and adaptable environment which educators can use, modify and expand according to their needs. The platform provides diagnostic tools, which are used in order to evaluate and identify learning preferences and abilities of individual learners (in ways they can learn best, i.e. auditory, visually), and it delivers educational material in the form of Learning Objects. In this way, learning differences can be eliminated. This paper presents the pedagogical approach of e-Hoop concept and an overview of the e-learning platform.

Introduction

E-learning educational approaches have numerous advantages compared to the conventional learning settings (Zhang 2004). An e-learning environment provides educational material via the web and in this way overcomes any distance obstacle. Another advantage is that, learners’ activity within an e-learning educational platform can be tracked and monitored. This information can be used in order to improve the learning procedure and experience (Dawson 2010). Nowadays, a vast of variety of different learning environments is available, that can be used in order to help educators deliver better educational services and address the demands of the learners, which are the actual end users. However, the selection of the appropriate e-learning platform still remains a difficult task, especially when the main goal is to suit the needs of learners with different learning profiles and needs.

During the last years, there are many pedagogical approaches which have shown that the learning process is directly connected with the learning environment. Also, different types of environments may change radically the way of learning (Bransford, Brown, & Cocking, 2000). In the conventional way of teaching in schools, the educational tool usually is a book which contains text and images. Web technologies increase the use of various types of educational content and e-learning platforms change their learning material from the plain text and images to a more multimedia form. According to Steve Wheeler (Wheeler, 2010) “Multimedia brought the world into the classroom, smart technologies will take the classroom into the world”. Additionally, the teacher-centered approach of learning shift towards to a student-centered procedure (Smeets & Mooij, 2001).

Learning environments follow a user-centered approach due to the aims that they cover, which in some cases could be the education of students independently from their age. In this sense, there are many educational environments which are focused in one or more target groups of learners. The main difference of the e-Hoop from the other environments is that e-Hoop is an educational tool for all, an umbrella which cover many educators and learners profile needs. E-Hoop evaluates user’s learning abilities and provides to them the appropriate view of the educational content. By using multimedia and support interactive educational content e-Hoop could be a powerful tool for the educators in order to overcome obstacles of the conventional way of teaching in the classrooms.
Literature review
Learning is the process of attaining new knowledge, behaviours, skills, values or preferences and may involve the processing of different types of information, which is performed by different areas of the brain. Learning depends on the mental capacities of the individual, the type of knowledge that needs to be acquired and the environmental circumstances. International research evidence (Blease & Wishard, 1999; Lewis, 1999) exists to indicate e-learning’s potential to address key elements of effective learning and raised achievement. Its benefits include: intrinsic rewards (increased motivation, more enjoyment of learning, increased concentration on tasks); challenge (e-learning enables differentiation boosting the less able); user control (increases independent learning skills shifting the locus of control to the learner); increased self-esteem (increases attention to presentation and detail, increases and improves spelling); higher order thinking (learning is made easier, students are able to do more and learn more); zone of proximal development (work is made easier, learning is speed up); improved curiosity (immediate feedback is provided, there is engagement with the student and learning is speed up). Additionally e-learning enables sensitivity as well as responsiveness to the individual learners’ needs and profiles, crucial aspects for individualized learning.

A range of learning theories has been throughout the years proposed with the most prominent ones being (Cooper, 1999):
- **Behaviourism** – a learning process focusing solely on the aspects of learning that are objectively observable.
- **Cognitivism** – a learning process that goes beyond behaviour to explain learning based on thinking and mental activities.
- **Constructivism** – a learning process in which learner actively constructs new concepts or ideas.

Behaviourism is one of the oldest educational methods and is described as a developmental theory operating on a principle of “stimulus-response” i.e. behaviour caused by external stimuli unrelated to internal mental states. The learner uses low level processing skills to understand information and material is often isolated from real-world situations. The learner is hence essentially passive to learning responding solely to environmental stimuli. The theory of behaviourism concentrates as a result on the study of overt (obvious) behaviours that can be observed, discarding any independent activities of the mind. In behaviourism the teacher has the sole responsibility for the learner’s training/education and learning takes place in a highly controlled environment, through repeated practice.

Cognitivism focuses on the inner mental processes where mental activities such as thinking, knowing and memory are the focus of attention. Cognitive theories attempt to answer questions such as how and why people learn, by attributing the mental process to cognitive activities as well as adopting the standpoint that students actively process information as learning takes place. Learners acquire hence novice knowledge by linking it to old knowledge and the individual learns by listening, watching, touching, reading, or experiencing. Whereas behaviourism regards learning solely as an observatory process, cognitivism takes into account changes in an individual’s behaviour, but only as an indication to what happens in a learner’s head. It has been additionally argued that cognitivism is the reason for the separation of schools into different discrete levels (i.e. pre-school, primary and secondary levels) and that it regards the mind as computer where the learner is the information processor.

Constructivism focuses exclusively on the meaning-making activity of the learner’s mind and learning is based on the individual’s active participation in problem-solving and critical thinking regarded as relevant and engaging. The theory adopts to the idea that individuals construct their own meaning (knowledge) and that the new knowledge is gained when linked to pre-existing intellectual constructs. In constructivism, learning is as a result the search for meaning and the two dynamic principles that constructivism follows, are that education focuses on the learner and that there is no such thing as knowledge (in the form of an entity). It is important to
mention that in constructivism theory, the attention is shifted from the educator to the learner and that the students are encouraged to learn independently whereas the educator’s role is to understand the mental models that students utilize.

With the emergence of e-learning, new teaching and learning practices have moved towards the constructivism theory underpinning the more effective use of e-learning. E-learning shifts the emphasis from teaching to learning (Loveless et al. 2001), and from the product to the process of learning. There is additionally a shift from the teacher-centered instruction towards the facilitation of learning and particularly towards student-centered learning (Smeets & Mooij, 2001).

One of the great claims for e-learning is its ability to provide differentiation by task, process, materials, routes through learning, outcomes, pacing, timing, learning styles, abilities, kinds of knowledge, difficulty of material and personal involvement of the learner, enabling as a consequence student choice, assessment and individualized learning. Table 1 table depicts the differences between traditional learning and new learning paradigms (Morrison, 2004).

<table>
<thead>
<tr>
<th>Table 1: Differences between traditional learning and new learning paradigms</th>
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<tr>
<td><strong>Traditional roles</strong></td>
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<td>Teacher-transmission to passive learners who obey and receive Teacher oriented</td>
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<td>Teachers as task setters for individual learning An organiser of learning activities Dictating the learning Technology as a tutor</td>
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**E-Hoop overview**

E-Hoop platform has two separate features; the educators’ environment and the learners’ environment. More specifically, the platform provides to educators an administrative control panel, in the back-end as it shown in figure 1, in which they could upload their learning material (any multimedia type of content). Furthermore, a media library is available for storing all such multimedia content and is used as a pool of objects by educators, in order to design and create their courses. Additionally, educators are allowed to create lessons and quizzes, manage groups of students, and students’ and teachers’ individual profiles. As regards the learning environment, the learners are educated by using e-Hoop learning platform in a personalized manner, utilizing auditory and visual features to their benefit. As figure 1 presents the front-end is the learners’ side of the learning platform. Also, learners have the opportunity to attend a course in a more appropriate way tailored to their individual learning needs that will combat differences attributed to social exclusion. Additionally, learners are allowed to participate in courses and quizzes and they are informed about their progress and can provide feedback as they are an active part of the educational process.

E-Hoop learning environment provides the educational material in the appropriate way in order to suit learner’s individual needs. The development of the e-Hoop platform was based on the choice of innovative and open source tools, which are used as the base of the learning platform. These tools have been customized, extended and enhanced with the appropriate algorithms, programming code scripts and database extensions in order to enrich the adaptability and personalization of the learning environment. The core algorithm, which is presented in following section is called Learning Object Sequencer (LOS) and is used to select and provide the educational material in an appropriate mode, based on: (a) Diagnostic/Profiling tools results, (b) Educators’ predefined constrains, and (c) Learning progress. The platform is a combination of Web 2.0
technologies, diagnostic tools for learning abilities and profiling the end user, components used for delivery the educational content to learners in a personalized manner (the Learning Object Sequencer algorithm).

In conclusion, key activities for educators are briefly: (a) Use, modify and expand e-learning environment, (b) Delivering e-Learning material in the form of Learning Objects and (c) Provide equal learning opportunities. Also, e-Hoop learning platform main advantages for learners are: (a) Evaluate learning abilities and preferences, (b) Deliver educational content to learners in ways they can learn best (i.e. auditory, visually) and (c) Eliminate the differences (i.e. learning disabilities, dyslexia).

**E-Hoop added value**

The added value of e-Hoop platform is a multidimensional issue, which includes an alternative pedagogical aspect through mapping of users’ profiles with the appropriate educational content. Another dimension is the integration of various diagnostic tools concerning users’ learning abilities, which are: MAPS (Mental Attributes Profiling System), VARK (Visual, Aural, Read/Write and/or Kinesthetic) and Honey/Mumford. Each diagnostic tool focuses in different aspects of user’s preference. After Logging in, every participant-learner goes through a short assessment process, which is composed of a number of tests. The results of the various tests are subsequently combined to derive requirements imposed on the functionality of the learning environment. MAPS (Laouris, 2009) cognitive test is a battery of video-game-like tests that assess the learning abilities of pre-elementary and elementary age school children. Profiling cognitive mental attributed, include short-term visual and auditory memory and visual and auditory discrimination. Their results are used to differentiate between those who perform better using the audio, the visual or the combination of the two channels. MAPS can be used for learners 6-12 years old. VARK (VARK, 2015) profiling learning preferences similar to MAPS but using a short questionnaire instead of video game like tests, it can profile learners’ visual, aural, read/write and/or kinesthetic preferences and also it can be used for all ages. Honey/Mumford (Honey/Mumford, 2015) learning styles questionnaire differentiates between activist, reflector, theorist or pragmatist. Even though there is criticism in the literature, the assessment of learning styles is used widely. It distinguishes between: (a) Activists: who are ‘hands-on’ learners and prefer to have a go and learn through trial and error, (b) Reflectors: who are ‘tell me’ learners and prefer to be thoroughly briefed before proceeding, (c) Theorists: who are ‘convince me’ learners and want reassurance that a project makes sense and (d) Pragmatists: who are ‘show me’ learners and want a demonstration from an acknowledged expert. Moreover, the platform uses a self declaration option for visual-impaired, hearing-impaired person that no testing is required. In addition, children with diagnosed Dyslexia or ADHD could self-declare their difference. The aforementioned diagnostic tools provide information about the special learning needs of each learner in order to conclude in an individual profile. Their results are fed into LOS, which is the main algorithm delivering the educational content. LOS unique adaptability allows learners to learn according their specific...
requirements, in their individual way by using the appropriate educational material. It is thus an innovative and practical plugin which fosters an inclusive learning environment by specifically targeting at socially and educationally disadvantaged groups.

Methodology
Learning material
The process of designing and developing the educational material based on e-Hoop conceptual approach is presented in this section. Teachers can organize their educational material into courses, while each course represents a complete series of learning objects that can be delivered during a specific period (i.e. a semester). Courses belong to a Course category, which describes the thematic orientation of the course. Each course is consisted from modules and each module represents a complete set of learning objects that can be taught during a class.

![Figure 2: Learning Material Hierarchy](image)

Learning objects that belong to the same module are organized into groups. Groups of learning objects are grouped together by the educator, who defines the proper educational material sequence as a conventional lesson in a classroom. The learning material hierarchy is shown in figure 2 above. The learning objects that belong to the same group contain the same educational information, but each learning object presents this information in a different way, which is more suited for learners with specific learning preferences. Additionally, the learning objects that belong to the same group may use different language. So far, 5 languages are supported from the e-Hoop learning platform, which in alphabetical order are the following: English, Finnish, German, Greek and Lithuanian. Each learning object must have at least one tag, which describes the type of the interactivity that can be achieved between the specific object and the learner. According to this categorization a learning object can be: a) Theoretical, b) Hands-on, c) Demonstration or an d) Educational Game. Furthermore, to each lesson can be applied one or more tags of the following list: 1) Talking Book, 2) Audio Recording, 3) Large Print, 4) Amplified Speech, 5) Sign Language Video, 6) Lip Reading Video, 7) Subtitled Video, 8) Special Structure, 9) Multimedia, that are indicating the educational type of the specific learning object. If two learning objects belong to the same group they cannot have the same combination of educational type, type of interactivity and language tags.

The e-Hoop unified methodology defines which educational material view is the most appropriate for each user taking into consideration, the user’s profile extracted via multiple diagnostic/profiling tools, such as MAPS and the educational types, the type of interactivity that the available educational material belongs to and the preferable by the learner language. The diagram of figure 3 explains, in a simply way, the preparation and the presentation of the educational material for all possible users.

**Figure 3: Prepare Educational material for all possible users**

**Platform functionality**

A Content Management System is a bundled or stand-alone application that provides the appropriate functionality in order to allow users to design, create, manage, store and deploy various types of content on web, such as text, images, video and audio. Furthermore, a web CMS provides client control over HTML, which selects, assembles and delivers all the content at runtime to specific end users based on the demand (Boiko, 2005; Rockley, 2003; White, 2005). A Free and Open Source Software (FLOSS) can be used as the base of the desired learning platform, in order to concentrate the efforts on the main objectives of the study, develop something totally new and avoid consuming of effort and time on already solved problem (e.g. web content management). An extended research on open source Content Management Systems (CMS) and Learning Management Systems (LMS) was performed, in order to select which is the best choice of open-source software according to e-Hoop objectives. There are hundreds of CMS and LMS solutions licensed under GPL that they can be used for developing new platforms and tools. By using prior knowledge and provide new as well, e-Hoop achieve to be a part of developers’ community with the aim to spread a new educational approach.

In order to decide for the learning platform that best fits the purposes of the e-Hoop project, an extensive research was conducted. Based on the results of this research it was decided that the best solution is to use the Joomla CMS (Joomla, 2015) combined with its LMS extension, named Guru (Guru, 2015), as the base of the e-Hoop learning platform.

Joomla is an open source framework CMS with a huge community of developers and support forums. Joomla CMS allows customization, provides a useful admin tool to manage the content, and has many available components and modules. Also, web developers are allowed to extend its main functionality by designing and developing new components, modules and plugins. E-Hoop platform is an innovative learning platform build on Joomla framework following the Open Source Software paradigm. The Joomla framework at the back end of e-Hoop, is used for handling the content management functionalities fulfilling the e-Hoop requirements. The creation of a new platform by using, modifying and integrating proven and tested open source components helps to proceed successfully to fulfill the project’s purposes. Guru is an open source LMS...
component, which allows the creation of online educational courses, modules, lessons and quizzes. Joomla CMS combined with Guru LMS provide a powerful combination that is the most appropriate choice to be used as the underlying system of e-Hoop learning platform. The Guru LMS can be extended and customized, so as to accomplish the requirements of the e-Hoop project for a unified and adaptable learning environment. This new learning approach proposes the learning platform as an innovative educational tool, but also the pedagogical aspects of an alternative way of learning. Also, it will be easily extendable in order to meet future and potential needs of the learners.

The aim of the “Learning Object Sequencer” (LOS) is to provide personalized educational material, in the appropriate form, to learners based on their individual profiles. LOS is running in the back-end of the e-Hoop platform and its presence is invisible to the learners. It is implemented as an extension of the Guru LMS component in order to extend its functionality. Furthermore, LOS algorithm affects both the data stored in the platform database and the logic executed on server by using dynamically scripts and functions. The algorithm decide for the appropriate form of the learning objects, which are parts of a specific course, by taking into consideration learner’s profile according to the results of profiling tests (MAPS, VARK, etc). The purpose of LOS is to select, combine and present the educational content in an appropriate manner to the learner. LOS combines the results from diagnostic tools and also takes into account the learning progress achieved so far by the learner. Actually, LOS decides for each group of learning objects, which objects can be displayed to the learners based on learning preference. Figure 5 presents the functionality of the actual delivery algorithm, “Learning Object Sequencer”.

Furthermore, learners could participate in one or more courses, educators could teach many courses and each course includes many learning objects, as it explained in the previous section. A media library entity is used in order to store a large number of learning objects which can be reused from the educator in various courses. LOS algorithm “uses”, results from the diagnostic tools, information from learners profile and their group and also recommendation for the learners and constrains from the educators and in this way decides the appropriate view of the learning material in order to present it to the learner.
Conclusions and future work
This paper presents the pedagogical approach of e-Hoop concept and an overview of the e-Hoop e-learning platform. This platform has been created envisioning to support different learners with various learning styles and differences and to be able to suit their individual needs. Currently e-Hoop platform offers a set of courses available in five languages and it is expanding by adding new content. An extensive usage of the platform has already planned in the forthcoming months, where it will be presented on various schools in five countries.

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