Task 3.1 – Analysis of current state-of-the-art e-learning tools

Deliverable 3.1.

Description: A systematic literature review to identify platforms and tools described in the literature including their pro's and con's in relation to the required learning needs of the target groups

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Contents

List of figures

List of tables

1 Introduction

This document intends to serve as a background reference to build UnderstAID e-learning web and mobile platform models. Besides giving a general picture of the matter and of the state-of-the art e-learning platforms and tools, we will focus on what we believe will be the most adequate, in terms of availability, usefulness, accessibility and response to user needs and characteristics. Given the characteristics of this project, free or Open Source solutions will be closely looked for.

Scholars (REF) have pointed out that adults learn in a different way from children. Their learning is voluntary and intentional, they have experience in learning since their young age. Adult learners are autonomous individuals, looking for meaningful learning that responds to their needs and interests.

"*Andragogy (adult education) calls for program builders and teachers who are person-centered, who don't teach subject matter but rather help persons learn*" (Knowles).

The social element in adult learning is also a relevant aspect. As adults, we learn from our experience and from others' experiences. The learning process becomes as important as the learning outcome, and this links adult learning to *informal learning*. Adults don't necessarily engage in learning to obtain a formal certificate, but because they need/want to learn something to apply it directly to their lives.

There are many theories regarding the distinction between *formal*, *nonformal* and *informal learning*. We will follow the criteria from EU Cedefop, as stated in 2001 in its glossary[1].

Formal Learning: learning typically provided by an education or training institution, structured (in terms of learning objectives, learning time or learning support) and leading to certification. Formal learning is intentional from the learner's perspective.

Informal Learning: learning resulting from daily life activities related to work, family or leisure. It is not structured (in terms of learning objectives, learning time or learning support) and typically does not lead to certification. Informal learning may be intentional but in most cases it is not-intentional.

Non-formal learning: Something in between formal and informal learning. learning that is not provided by an education or training institution and typically does not lead to certification. It is, however, structured (in terms of learning objectives, learning time or learning support). Non-formal learning is intentional from the learner's perspective.

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[1] http://www.cedefop.europa.eu/EN/about-cedefop/projects/validation-of-non-formal-and-informal-learning/european-inventory-glossary.aspx

2 Learning Online. Learning Management Systems

A learning management system (LMS, or also known as ILS -Integrated Learning System-, VLE -Virtual Learning Environment- among other terms) is a term used to describe an online software tool which facilitates to conduct learning processes. From the early days of Computer Aided Learning systems, in the 60s and 70s, where learning contents were deeply rooted into the software solutions. In 1997, a company called CourseInfo, born at Cornell University, presented the first sofware that could be called an early LMS, "Teachers Toolbox". Later on, this company formed part of Blackboard Inc., one of the big LMS providers in the market.

Depending on certain technical, theoretical or formal considerations, we could describe an LMS in a number of ways. However, for the sake of being practical, we are going to list the most common criteria that define the majority of LMS, as considered by Dr. Zapata[2] in 2003.

An LMS:

- Enables remote access to both students and teachers using TCP/IP protocol through the Internet.

- Uses a web browser application to display its information, using http / https protocol.

- Has a server / client structure. The server is where the software is installed. It is generally hosted in a learning institution, Internet provider, or such.

- It has different types of access for different types of users, which allow the access to different tools and usages: students, teachers, tutors, administrators, coordinators, instructional designers, etc.

- Uses common standards, and it is platform independent. (Users can access it from any Operative System and computer). An important note should be made here, as from 2010, when the first Apple tablets (iPad) revolutioned the tablet market, many LMS have worked hard to adapt their interfaces to these new mobile operative systems IOS and Android OS. So we can safely say that all LMS are desktop OS compatible, but not all are mobile compatible/friendly yet.

- It has a restricted / selective access. Users access the contents through login /password (although some alternative public resources in the LMS may not need them).

- It allows access to multimedia resources and external hiperlinks refered. Some of these resources may be downloaded.

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[2] Zapata Ros, Miguel (2003). *Evaluación de un sistema de gestión del aprendizaje.* Universidad de Murcia. [from http://www.um.es/ead/red/9/SGA.pdf visited 2-9-2013]

- It allows (at least to some degree) the adaptation and updating of html information stored in the LMS through internal editors/tools.

- It allows course administrators to structure information and learning areas (to a certain extent), to facilitate and clarify access to contents by the users.

We could analyze LMS according to the main functionalities that they allow:

- User registration and management. According to a variety of roles: administrative, teacher, student, tutor, etc.

- Course management: This includes all tools and procedures supporting course general characteristics: students/teachers enrollment and role management, language, interface, general mailing options, configuration of course tools, etc.

- Communication: This covers all means of communication among students and teachers within the course, being synchronous or asynchronous. The most common are discussion forums, chat, announcements, internal email, although some included other more advanced options such as audioconferencing or videoconferencing.

- Learning resources management. This functionality covers tools that allow to upload and organize learning contents, as well as (basic) authoring tools within the LMS, generally to create contents in HTML format.

- Evaluation and student progress control. Tools that facilitate students to handle and send reports and other tasks assigned. Online tests are also included in this category, as well as a more or less automatic way to analyse results and student interaction with the course.

- Other functionalities present in some LMS may include certification and reporting,

In the Open source world, the list of available LMS is huge, although, if we take a short list of the most popular, in terms of number of users and community around them, the chosen few would be:

Moodle, Sakai, Chamilo, Atutor, .LRN

Moodle v2.5.2. (www.moodle.org) The most famous e-learning platform in the open source world has traditionally been in the front of innovation implementation. Its based on pedagogical theory of constructivism. Moodle has more than 46.000 registered sites worldwide, and more than 100 modules built by developers from its community. In terms of social features, it provides a good integration of wikis, blogs, forums, external RSS sources, multiconferencing features in its courses. However, there is not an easy way

to have horizontal communication and networking features outside a given course, at platform level. Some pilot implementations of this feature are being explored by projects such as MoveIT http://moveit-project.eu/ (EU Leonardo TOI UK project) with an integration of Elgg within Moodle.

Sakai v2.9.3 (www.sakaiproject.org/) Sakai, an open source project by Michigan, Indiana, Stanford Uni and MIT, offers many similar functionalities, using JAVA as its main language. In addition to the course management features, Sakai is intended as a collaborative tool for research and group projects. To support this function, Sakai includes the ability to change the settings of all the tools based on roles, changing what the system permits different users to do with each tool. It also provides wikis, mailing lists, RSS reader. The core tools can be augmented with tools designed for a particular application of Sakai. Examples might include sites for collaborative projects, teaching and portfolios. In this sense, Sakai looks like the strongest platform when it comes to collaboration and social learning when compared to traditional LMS.

Chamilo v1.9.6 (www.chamilo.org) is a relatively new e-learning platform, born in 2010 from Claroline and Dokeos teams and philosophy. While it shares most of the basic functionalities already mentioned, it counts on a well developed *social networking* feature built within the course management system, making it available to all users, regardless of their role or participation in different courses. Group work is also a feature present in all this "family" (Claroline, Dokeos, Chamilo) of LMS, and it provides group tools within an online course (sharing documents, links, communication tools, etc.).

Atutor v.2.1.1 (http://atutor.ca/). ATutor started as a LMS with a strong focus on usability and accessibility as opposed to other LMS available. It is formed by several linked modules which provide a learning management system (ATutor), a Content Management System (Acontent), and more recently a networking platform (ATutor Social). These modules can work individually or connected to form a social learning and networking system.

ATutor is the first (and only, according to its developers) LCMS to comply completely with the accessibility specifications of W3C WCAG 1.0 at the AA+ level. This guarantees that special

browsers can read its content and the user can interact with its tools regardless of what devices / support hardware or software he/she needs to do so. On the other hand, and mostly because this compromise with accessibility, ATutor may lack of certain features and variety of options that other LMS offer.

.LRN v2.5 (http://www.dotlrn.org/): The DotLRN, e-learning platform, originally built at MIT, is built around the concept of digital communities. DotLRN provides a collaborative space where users can communicate and collaborate using built-in applications tailored to learning needs as well as learning resources. Communities can be created on different levels: schools, classes, courses or even (sub)groups of students.

These communities can have their own tailored start page, the community portal, where different kinds of content may be displayed based on the needs of that particular community.

DotLRN provides a wide range of built-in applications or functionalities such as calendar, grading, questions and tests, learning resource library, problem-based learning, a SCORM player etc.

3 From LMS to LCMS to Collaborative Learning Environments

CLMS stands for Content Learning Management System. The main difference from LMS to LCMS is that the second is not only meant to manage, deliver and track online training to students, but also focuses in learning content creation. A pure LCMS focuses on the development, management and publishing of the content that will be part of online courses, being the same (or connected) platform as an LMS. Usage and re-usage of contents from central repositories is also one of its main keys.

However, both terms are frequently used and confused, and many LMS claim to be LCMS as well, by using terms such as LMS or CMS (Course Management System).

In the early days (2000-2003) LMS didn't include specific tools for collaboration, rather than communication, but later, they all started to provide extra features to allow group work, file sharing, online editing, etc.

This addition of features responded to the rise of constructivism (a theory of learning where humans construct meaning from current knowledge structures) in the e-learning field[3]. This theory affects teaching and learning pedagogies, with a number of applications/ learning activities such as

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[3] Huang, H. (2002). Toward constructivism for adult learners in online learning environments. British Journal of Educational Technology. Vol 33. No 1. 27-37.

discovery, hands-on, experiential, collaborative, project-based, and task-based learning. LMS needed to support such possibilities.

Internet provides a powerful mean for adults to actively search and discover rich and meaningful resources to construct their own knowledge or to solve their doubts and lack of specific learning. This way, Internet can be a very effective tool to support constructivist learning, as it provides an endless list of possible resources and connections to build and construct knowledge from.

Informal learning – Social learning in the Web Age

Informal learning is today one of the most recognized methodologies when it comes to adult learning, quantitatively far more important than formal learning. It happens in any place, home, work, through daily interactions with our contacts...and of course, through our interactions in web environments, both for adults and young learners. Informal learning is completely independent from instructor-led programs, such as courses, or self-learning initiatives.

However, its importance is extremely high in terms of time to performance level, as a study done by Moore[4] in 1998 pointed out, well illustrated by this graph.

As professor Charles Handy -from MIT and London Business School- stated "The best learning happens in real life with real problems and real people and not in classrooms.".
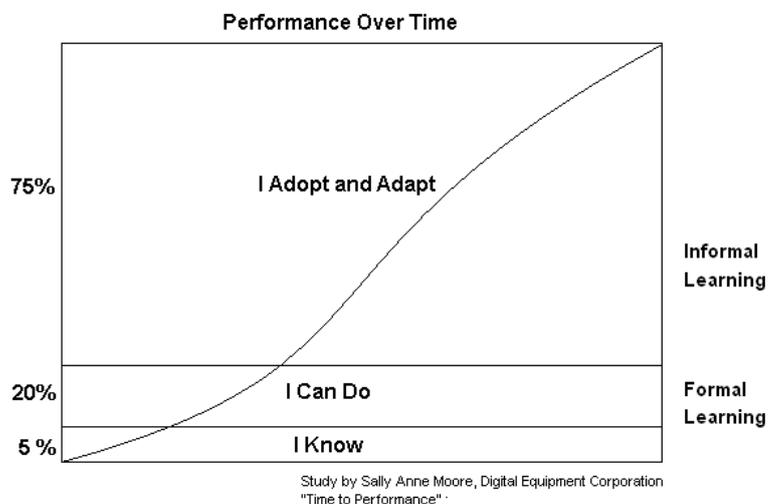
Figure 1: Performance Over Time

Some of the key issues of the success of informal learning are:

It's *social*. Most of what we learn, we learn it from people, family, co-workers, people who we have met through the Internet, (such as people who share some needs, as in online communities for dementia related issues).

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4   Moore, Sally-Ann, "Time-to-Learning", Digital Equipment Corporation, 1998

At work we learn more than in school or formal e-learning courses. We learn by observing others, asking precise questions to answer our needs, or simply by working hand by hand with people who know more of our issue of interest. The Web provides a huge range of information and learning resources, and more over, we can connect with the authors of this information and resources. Formal learning -courses, workshops, online or not- is the source of only 10% to 20% of what we learn overall.

It is *personal*. Informal learning is suited to our individual learning needs, not to a broad, average type of user. It is completely user-centered, as it is the learner who seeks the information s/he needs.

It is *self-directed*. This is closely related to the prior statement, but it is something where it differs from formal learning. No one is responsible for the progress or learning path taken by each learner. Learning is engaging, because it is looked after and measured by the learners themselves.

It *comes in small pieces*. Very often, what we need to learn is something very precise, very concrete, and for that we don't need a whole course on the issue and everything around it, just an answer to a specific need, an explanation of how to carry out something, etc. Informal learning suites this small dosage very well.

It's *time-independent*. Formal learning has time limitations, as courses normally are adjusted to a certain calendar. But informal learning in the Web era means that you can learn when you want, in the bus, in the middle of the night,... right when the learning need appears. What really matters is to learn when the need arises, and this is where it connects to the "Just-In-Time" learning concept. When we take this example to our UnderstAID project final users, it seems reasonable to think that this JIT learning applies to their needs. When a new dementia symptom happens to their relative, or a new situation is faced, is the right time to find answers, to learn what to do, to seek for advice.

4 Social learning & Personal Learning Networks (PLEs)

Thinking ahead to social learning:

- Tacit knowledge is best developed though conversations and social relationships
- Training courses are artifacts of a time when information was scarce and connections were few; that time has passed.
- Social learning networks enable better and faster knowledge feedback loops.
- Hierarchies constrain social interactions so traditional management models must change
- Learning amongst ourselves is the real work in social business and management's role is to support social learning.

A Social capable online learning platform should then favor easy and non-hierarchical interactions among its users, active communication and collaboration in the creation of shared learning contents, be open to other forms of contents and networking outside the platform (sites like Youtube or Flickr, social networks like Facebook, Twitter, etc), social bookmarking, .

Educational technology specialist Jane Hart[5], founder of the Centre for Learning & Performance Technologies, has pointed out 5 key principles for a successful formal online social learning experience. Quoting her words[6]:

- **scaffolding the learning experience** – enabling a framework for learning to take place – both in terms of the infrastructure (technology) but also in terms of providing the right conditions for learning to take place. The framework should give just enough structure, without constraining personal and social learning
- **offering as much autonomy as possible** – it should allow people to participate in the ways that they feel most comfortable and best suits them, and it doing so take responsibility for their own learning
- **focusing on enabling the social interaction** – whether it be discussion between the group, knowledge sharing, or collaboration in some other way, e.g. co-creation of content or co-solving a business problem
- **Supporting the experience with content as appropriate** – it shouldn't be driven by the content – but rather supported by essential resources on the topic to get people thinking or conversing or doing, and it should also encourage participants to provide content (links or their own resources) in whatever format they prefer. The workshop leader/organizer's role is

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5   http://c4lpt.co.uk/jane-hart/
6   From her article published at: http://www.c4lpt.co.uk/blog/2013/05/11/5-principles/ [visited 14/10/13]

much more about guiding the learning experience, than dominating it.

- **and of course driving it with a performance outcome in mind**– it needs to be focused around what participants will be able to do as a result, and, ideally, at the end there should be some form of peer-assessment, so that it is their colleagues who rate their performance.

These principles refer mostly to *formal training* in the workplace, but are also very relevant for informal learning as well.

Most LMS have made an effort to accommodate this "social trend" in its features, some more effectively than others. Let's see some of the most outstanding examples (in the Open Source world):

Moodle counts on the following "social tools", all except My Moodle, within each course

- Blog
- Youtube block
- Flickr block
- RSS block
- Tags page
- My Moodle: Offers a unified and personalized access to information and communication from each course we're enrolled in.
- Wiki activity
- Chat activity
- Messaging

Chamilo:

- Social learning network. This feature is built outside the course system, so it is a true networking feature, with the possibility of:
    - o Marking friends
    - o Forming or joining interest groups
    - o Publishing your portfolio
    - o Linking to your blog's last post (or any RSS feed)
    - o Publishing links to your other social networks profiles
- Social learning network platform
    - o Create interest groups
    - o Link to other social network platforms

  o Register links to "friends"

  o Send messages, images, videos to other platform users

Sakai:

- Announcements module
- Chat room
- Mail tool
- Meetings through BigBlueButton
- People (aka Roster)
- Profile tool

- Wiki
- Dropbox
- Blogs
- Forums
- Profile 2

ATutor was extended with the google OpenSocial specifications, some of that are the following:

- Opensocial tool bar. (that is available throught ATutor both within courses, and outside courses, accessed through a standard ATutor module sidemenu block. This bar provides. Initial tools linked from the toolbar will include: Groups, Profile, Contacts. Messaging, and Add Connections tool.)
- My network´s activity
- Profile
- Groups
- Contacts

Figure 2: OpenSocial Tool bar

There are other online platforms that were born not from the educative perspective, but from the social networking side of the Web, and incorporated features to support learning. We'll review some of them:

Edmodo. (http://www.edmodo.com) is the most popular social learning platform, with more than 18 million users[7] in 2013. It is a free social learning platform, which provides teachers and students an online private place to communicate and share resources in a social networking site. Its main features come from microblogging sites, where short messages introduce learning resources, tasks, dates, etc. Edmodo does not try to cover all features and tools that are typical in a traditional LMS, but focuses in interaction between users, facilitating the creation of open or closed groups, online communities of practice where to collaborate with peers or look for support in their learning. This platform also features social tools to engage users and provide live feedback, such as the possibility of adding "reactions" to resources or contributions posted in Edmodo (similar to Likes in Facebook).

Another key element in Edmodo is the possibility of adding more features, external tools and resources.

SocialElearning http://www.e-intelligent.es/en/Products/Socialelearning/tabid/786/Default.aspx , it is a solution designed by E-intelligent company, where a number of Open Source solutions have been grouped and adapted to form a suite for social learning: Moodle, Drupal, Elgg, etc.

ELMS (Drupal based) https://drupal.org/project/elms

ELMS stands for e-Learning Management System. ELMS has been created by Penn State University to meet needs in the development of content for online courses. These courses can be both closed enrolement and linked to internal systems, or completely open as Open Education Resources (http://www.oercommons.org/). The result is an incredibly powerful learning environment that can be used to create engaging materials and experiences for students.

Some ELMS features are:

- Create a unique site per course
- Design engaging experiences with highly flexible theming layer
- Create and distribute course outlines & materials
- Integrate rich media courseware
- Meets necessary accesibility requiriments
- Point-and-click site course outline creation
- Add rich media assets to courseware easily
- Create engaging experiences to foster student engagement

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[7]   From http://techcrunch.com/2013/03/06/now-18m-users-strong-edmodo-makes-its-first-acquisition-in-root-1-to-become-the-app-market-for-education/ (visited 20-10-2013)

SocialWire (Elgg based) http://www.socialwirelabs.com/ is essentially a software platform to support teaching, social network technology-based and informal learning and collaborative work orientation. Taking the basis of a social network built on the Elgg open source project core that includes the basic elements of social networking, SocialWire provides a number of modules developed specifically for education and learning. Unlike other SLE (Social Learning Environments), an essential objective in SocialWire is to adapt the structure of the informal exchange of knowledge of social networking to a formal system of education. For this reason, an important design decision was to incorporate relevant functionality of traditional LMS (Moodle, for example) as assignments, quizzes, grades, etc.. that also allows support to formal learning.

Some SocialWire modules, which expand the original Elgg modules, are:

- Questions and answers
- Contests
- Test and Quizzes
- Question Bank
- Tasks
- E-portfolios

- Headings
- Gradebook
- Ranking Points
- Forms
- Surveys and decision trees.

Finally, in general, Social Learning Systems have the following pros and cons

SLE pros	SLE cons
Personalisation	Can be confusing
Social interaction, PLE	Worse for structured learning
Oriented, self-driven	Adjustment individual-group needs
Informal learning, open to	Less stable (open source written are less tested than proprietary sw)
External resources - networks	

Table 1: SLE pros and cons table

5 Social Networking Sites useful for social learning

Edmodo, microblogging for the classroom. Edmodo is a free cost and safe social learning platform for teachers and students. It's a microblogging tool that is used in education for organizing content, assignments and interaction between teachers and students. Edmodo allow to creates a virtual space for communication between students, their tutors and other teachers and communities in which they can share messages, files, links, calendars of different activities, as well as propose different types of tasks, surveys, assessments and permitting professor manage differently.

Facebook is the fastest growing social network that helps people communicate efficiently with friends, families, coworkers, etc. 50% of facebook users log on day by day. Average user is connected to 80 community pages, group or events. Although facebook was not created to be used as a learning platform, many of their users know how to works effectively. We can use facebook as a PLE platform by configuring and using a lot of facebook applications such as slideshare, udutulearn, uduteach, studygroups.

Twitter is the most important microblogging social network that enables users to send as well as read short messages called "tweets". As the same as facebook, twitter was not created for elearning but we can use it for this purpose by reading historical tweets, monitoring tweets related with a determinate term, gathering opinions on a topic, debating and more

Pininterest is one of the fastest growing social networking sites (the third after Facebook and Twitter). It is a sort of digital bulletin board or scrapbook for collecting the things you find online. In a way, it is a visual and *nicer* evolution of social bookmarking sites such as Delicious or Diigo. Pinterest makes it easy to save and organize whatever you discover online. For example, whenever you find an article or a blog post you like, you could save that article as a pin. The pin is then displayed as a picture on a pinboard, creating a collection of different images as you add more pins. Clicking a pin will link you back to the picture's original website, turning your pinboard into a series of visual bookmarks. But it also allows you to follow the pins saved by your friends and other users, show your approval (by liking them) and post them (repin) on your board.

6 Augmented Reality

Augmented Reality is a technology that combines the real world with virtual elements. It works basically superimposing layers of virtual information upon existing physical information. To do that, it is necessary to have some basic elements such as a screen, camera, augmented reality software and a series of AR triggers. Due to the type of devices needed the mostly used are tablets and smartphone mobile devices.

Augmented reality can be interesting to provide relevant, geolocated information to caregivers, live communication with users, specialists, etc.

Figure 3: Augmented Reality example

The main objective of this technology is to give a hybrid environment where the user can interact in real time and the possibilities are:

- Information layers: Many Apps that give information about objects and places.
- Discovery based learning. Photographing places and objects we can retrieve information about them.

Some of the most outstanding app for mobile devices in terms of number of users and community around them are the following:

- Google googles: (Available in Google Play)
- Layar: (https://www.layar.com/)
- Wikitude: (http://www.wikitude.com/)
- Aurasma: (http://www.aurasma.com/)

In our case we can consider to implement an AR tool for mobile devices, who get our GPS location to specify the description of the nearest points of interest (pharmacies, health centers, care professionals, associations, etc..) and also locate users who are using the same platform to get in

touch with them (for this last feature, this app should ask to final users if they want to be located by other users due to privacy issues).

7 Immersive 3D environments

A virtual world is a graphical environment materialized on the computer screen and although there are viewers for mobile devices. Once the user accesses the world he can cross it, interact with other users, building elements ... all of that using a graphical representation of the user, called avatar whose appearance is configurable at will[8]

As principal characteristics we have:

- Fun, creation of avatars, exploring…
- Real time, flexible.
- Posibility of embedding learning contents.
- Usability is not good.
- Confusing for learners (Especially if the user have never used a sandbox/3D game)
- Learning by discovery.
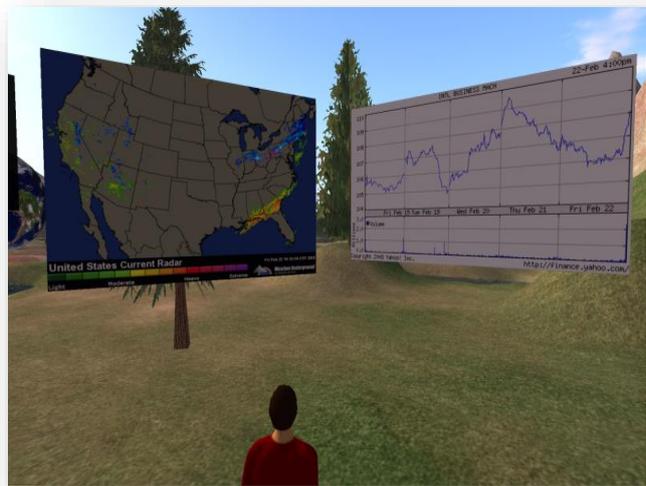
Figure 4: Immersive 3D environment. (Opensim)

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[8] Rodríguez García, Teresa C. (2011): E-learning en mundos virtuales 3D. Una experiencia educativa en second life. Revista Icono 14. Madrid.

Open simulator: is an open-source server platform for hosting virtual worlds. It is compatible with the client for Second Life and can host alternative worlds with differing feature sets with multiple protocols. Characteristics:

- Affordability: Free

- Flexibility for creating, archiving and sharing virtual content.

- Complete control of every user´s experience

- A growing user community.

Some Virtual Worlds…

- Open Simulator (http://www.opensimulator.org) is an open source multi-platform, multi-user 3D application server. It can be used to create a virtual environment or world which can be accessed through a variety of clients, on multiple protocols. The major benefit of Opensim is that the virtual world can be easily customized by the instructor or the students.

- Open Wonderland: (http://openwonderland.org/) 100% Java open source toolkit for creating collaborative 3D virtual worlds.

- Croquet (out of date).

- Open Cobalt Metaverse Project: (http://www.opencobalt.org/) is a free and open source software platform for constructing, accessing, and sharing virtual worlds both on local area networks and across the Internet, without any requirement for centralized servers.

- Second life: (http://wiki.secondlife.com/wiki/Second_Life_Education/Resources) Is a free Online virtual world developed by Linden Lab with more tan 20 million users around the world where users can interact with each other through avatars called residents. Residents can explore the world, meet other residents, socialize, participate in group activities, create and trade virtual property and services with one another.

- Minecraft: (https://minecraft.net/) is not videogame designed for educate but serves to education purposes with two potential objectives as a learning and teaching tool. The first is as an 'affinity space' who serves to encourage participation and deeper engagement in learning content. The second potential objective is as a simulation

environment, for example to represent objects[9]. Minecraft has also a custom educative mod called MinecraftEDU (http://minecraftedu.com/page/).

8 MOOCS

Massive **O**nline **O**pen **C**ourses: They are massive, open online courses that are based on the pedagogical principles of connectivism. They postulate that learning and knowledge are found in the diversity of opinions and in the process different nodes or information sources are connected. Registration is free but, they normally require payment for other features such as obtaining a certificate, personalized tutoring, etc.

Some of the most popular moocs are the following:

- Udacity: https://www.udacity.com/
- EDx: https://www.edx.org/
- Udemy: https://www.udemy.com/
- Coursera: https://www.coursera.org/

Regarding to UnderstAID platform, it seems that in spite of the MOOCs being a good resource for adult informal learning, it would be unsafe to implement due to if since this kind of courses are open to everyone, we can´t to foresee the number of persons who will join the platform and we would need to have into account a much larger potential audience, that could affect the platform performance. Furthermore since the platform will use two different interfaces, for the premium version the "open" concept of MOOC definition would be rejected. Although this kind of learning is focused in a peer to peer learning style, this type of education has its useful points for our case (p2p collaboration is always positive), but caregivers need also professional, validated support. Regarding to the contents, MOOC uses the same contents for everyone and we need to introduce multiples points of view in order to customize all the materials according to the caregiver´s characteristics as said in wp3 theoretical learning framework

UnderstAID must give users the possibility to specify preferences about media types and learning methods and also must contain learning materials and methods that reflect the user perceived preferences."

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[9] **Jeffrey Brand and Shelley Kinash** (2013): *Crafting minds in minecraft.*Bond University.
http://epublications.bond.edu.au/cgi/viewcontent.cgi?article=1052&context=tls

9 Tools

In order to design UnderstAID platform we believe we need to focus in just a few number of tools, with very simple design and friendly interface, due to in the most of cases end users will be people without much experience using mobile devices or computers, and/or senior citizens. Thus, the platform as well as the contents that will be designed will be focused in maximum accessibility and usability for the target end users.

Implement a whole LMS / LCMS platform, although it would be possible, is not advisable as these systems are raised primarily *for heavily guided group learning* and would be difficult to adapt them to our needs.

In addition we would have the problem of such devices to be used, many LMS are not yet fully adapted to mobile devices and this adaptation would be required to work both as a mobile desktop Access.

A reasonable idea would be to choose a set of tools and an LMS system to suit them to our needs but adapt them to an external platform might not be feasible. Ideally, since the tools we will use are few in number and concise, we can make a selection of them and create / adapt open source code to our needs, always using a compatibility standard for interactivity & info. It would be recommended to use TIN CAN (a extended SCORM standard).

Communication Tools

Asynchronous *e-learning*, commonly facilitated by media such as e-mail and discussion boards, supports work relations among learners and with teachers, even when participants cannot be online at the same time. It is thus a key component of flexible e-learning. In fact, many people take online courses *because* of their asynchronous nature, combining education with work, family, and other commitments. Asynchronous e-learning makes it possible for learners to log on to an e-learning environment at any time and download documents or send messages to teachers or peers. Students may spend more time refining their contributions, which are generally considered more thoughtful compared to synchronous communication. [10]

Synchronous *e-learning*, commonly supported by media such as videoconferencing and chat, has the potential to support e-learners in the development of learning communities. Learners and teachers experience synchronous e-learning as more social and avoid frustration by asking and

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[10] Stefan Hrastinski, "The Potential of Synchronous Communication to Enhance Participation in Online Discussions," paper presented at the 28th International Conference on Information Systems, Montreal, Canada, December 9–12, 2007.

answering questions in real time. Synchronous sessions help e-learners feel like participants rather than isolates

In our case we can use both types of communication tools. In asynchronous mode there should be a tool to exchange simple and non-urgent private messages quickly and easily among caregivers and professionals. More than a mailing system, it could use a system similar to send posts on a forum. In addition of the communication among caregiver and professional, communications with other caregivers are very useful to exchange opinions, points of view, tricks to do the job, as well as support. As was mentioned in augmented reality tools, not all caregivers will want to communicate each other, so a privacy control must be enable.

In addition of the private messages system, it would be a very rich situation to have a discussion board among all the caregivers, but this tool require a moderator if the published comments are not desired.

Other possibility to the UnderstAID platform are the news ¿groups/board/widget?. With this tool, all the caregivers' community will be up to date with the updates in the platform, when a new learning content are available to consult.

Asynchronous communication tools are a good option if the caregiver wants to check messages after they receive them.

A synchronous tool would also be desirable to avoid "confusion" that may occur in the asynchronous system. To this end videoconferencing tool[11] with a user friendly interface (a video window and the basic call settings moreover should be appeared a online people list to contact with) would be desirable.

Videoconferencing tool don't be useful in the case of use a mobile device without camera (although is a unusual situation), for this reason we can thinking in two different options: Best would be implementing a chat window onto the videoconferencing tool, the other option is to provide a chat access using our own platform or other chat platforms like IRC allowing foreign people to get connected to the caregivers network.

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[11] In the case of use a web based application, will it work through html5? Maybe not all browsers can use this feature

10 Authoring

Contents development

Since we have different types of caregivers, contents should be presented in line with their cognitive, social, emotional, and motor characteristics. To do that, firstly the platform should show a survey to adjust the user experience to the caregiver situation.

Regarding contents, they will be written always in *positive, direct and simple language* to respond to possible users' low level educational background, and since their main function is to support the caregiver job.

In our platform, at the time of designing its contents, we have to consider what kind of materials we want to create (audio, video, photographs) and the existent possibilities to adapt these materials to the different languages.

Designing full-text content, although some of the recipients likes to read, not all recipients will feel comfortable with this type of contents, because of be heavy and complicated documents.

Although in our case texts will be written in very simple language and these must be supported with different artwork and practical examples to aid understanding of the caregiver.

It would also be interesting that these contents have some kind of assessment, both in score (maybe by star´s system at the top of the content) and in the form of reviews (writing simple posts above the content) where users can indicate if the different materials are useful or not and the reason.

At last, one important thing is that contents, in addition to displaying information about themselves, they have to foresee the progress of the patient disease and must be updated to their needs. To do that, the application should give to the caregiver the option to access again to the initial survey in order to update the fields and adapt the contents to the new situation.

Organization and production of content

Regarding these different contents, they should have a simple structure preventing long blocks of deep content areas.

The platform design shall be instructive, that means, contents may keep didactic and organizational coherence. This is to pass from a simple text block to a well-organized hyper textual source. Thus, we shall create "learning units", minimal units where we can organize the learning materials to facilitate knowledge management: creation, indexing, storage, distribution, use, reuse, evaluation,

etc. The principal aim is to produce documents whose structure is associative (hyperlinks), hierarchical and mostly nonlinear.[12]

One idea to organize these learning units could be to present a picture of a divided house and his environment in its different parts, thus, by accessing and pointing the different elements of each room the caregiver will see a graphical index of contents related to that area.
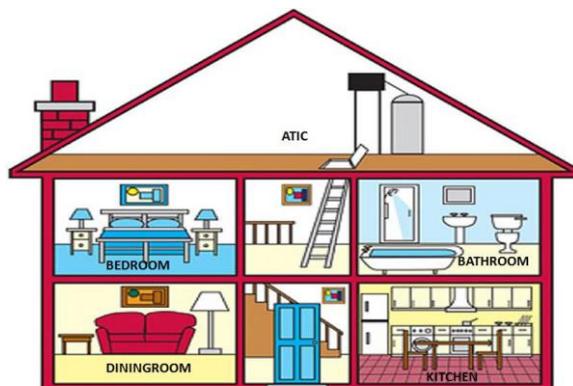
Figure 5: Example of contents organization.

Contents designed must also have a tagging system for easy and quick search.

Related to the contents and since we have two versions of the platform, the lite version should detect the type of the device being used by the caregiver to fit the content to the screen size and avoid making zoom in and zoom out constantly (just in case of using the web navigator to access to the contents and not the app).

In addition to the purely textual content, it is useful to add media content, but it must be defined how this should be done, in case of videos, we have to address the complexity of the 4 languages of the project, which will require to record different videos with voice actors for each country, or otherwise to record a unique video and then add subtitles to each language.

One option to solve this situation may be to create cartoon videos that would later be subtitled[13] in different languages, starred by a character guide. Although this guide character could be present during the entire application, (maybe the same character as the chatbot?) and will have three main functions:

- Giving life to the images.

- To guide the user through the different parts of the platform.

- Generate an identification of the person with the experience that has

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[12] **Centro de Enseñanzas Virtuales de la Universidad de Granada** (2005): *Guía para la generación de contenidos educativos en entornos virtuales.* Universidad de Granada.

[13] Or even the platform can use the voice of some reading tool, such as google text to speech. This tool is also desirable for improve the platform accessibility.
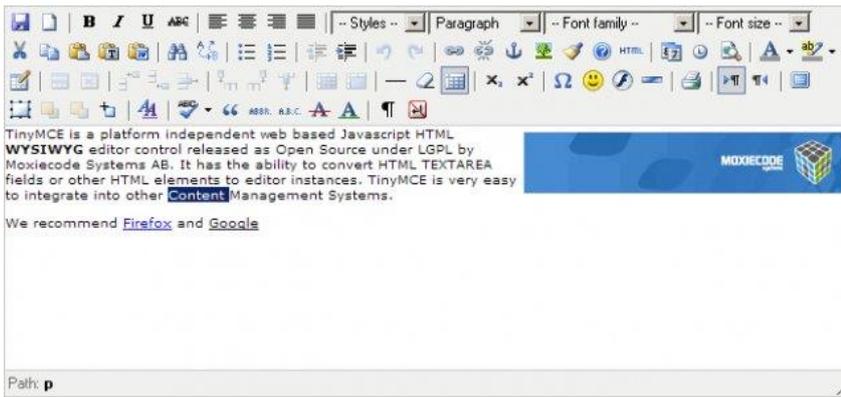
Figure 6: TinyMCE interface.

As in the textual content, video content should also have a rating system by users.

To facilitate to the maximum the text content creation and edition from desktop, the platform maybe could implement a WYSIWYG (What You See Is What You Get) document editor similar to TinyMCE (http://www.tinymce.com/) or CKEditor (http://ckeditor.com/). This feature is interested due to dementia professionals don't have to know the platform internal running, so this is a simple way to create and update the contents quickly. According to the contents update, platform should implement a concurrent versions system, to rollback if needed. Also the new contents must be approved by dementia experts to be appropriate to the caregivers.

Unofficial contents development

We believe that it is essential that caregivers can contribute to understAID by providing their own content, based on the daily experience and interaction with their relatives. Caregiver contributions will improve her/his self-esteem because they will see that their work not only serves to care for her relative, it also be useful for many other caregivers in the same situation.

 These contributions can be made from different areas: First area by making simple comments to the official understAID contents. Second area, by creating new contents which can support official contents. Thus, as the creating content system for professionals previously proposed, we should create in the platform a system which allows that caregivers can share their appreciated contributions with other caregivers.

We propose the same content system as before but differencing two profile access types to the tool: Professional access and caregiver access. The basically difference between both types are that the caregiver, after writing and sending the contents, these will be approved by an administrator in order to publish and make it visible to the understAID platform.

About the organization of these comments, we believe as important that they will be a separation between official and unofficial contents. Since the unofficial contents complements official ones,

we have to add in the official contents a series of links with the new "related contents" and vice versa.

Although it would be also interesting that, since the nonlinear type of the contents it's a basic requirement, understAID may have two different principal access to the contents, one will redirect the user to the official part and the other to the unofficial, having both the same operating, only differenced by background colors or images to know what type of contents we are consulting.