AN APPROACH TO THE TRAINING OF MEDICAL LAB TECHNICIANS FOR THE EFFICIENT USE OF DIVERSE IT SYSTEMS

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Abstract: This paper investigates the implementation of an on-line extendable content management platform for the training of medical personnel in the use of IT systems. The need for this tool arises from the current state of limited cooperation between medical labs, hospitals and their personnel. Moreover the slow adaptation of Computer Assisted Learning (CAL) in any industry contributes to the need for a central repository of knowledge. The paper then moves to the importance of human factors in these types of training. The proposal also builds on leading research in the psychology of learning especially for adult and experienced professionals. Finally the document suggests the use of a content management system (CMS) that can be extended to include e-learning attributes in order to support the technical side of this endeavour.
Key words: E-learning, critical systems, training, adult learning, professional training.

1. INTRODUCTION

Correctly it is rather difficult to share medical information between medical labs and even more to have that data available to doctors, hospitals and clinics. A plethora of systems has been developed and in use around the different countries. Even within the same country different labs use different IT systems. In Greece where the private medical sector holds strong there is no centralized guidance as to what systems to use, what measurements units to use or what interoperability features are needed. What is more, once someone becomes familiar with a system there are not keen to move to a new one even if it is better. Thus, we believe it is essential to have an on-line extendable content management platform for the training of medical personnel

on different systems. It would be more than a simple knowledge repository as it would allow users to add content as needed and would permit the identification of common parameters that would help in the future development of better software.

2. HUMAN FACTORS

The reason we are considering an extendable, user regulated systems is to identify common errors in the use of IT medical systems. When users start adding material around how to avoid errors we can model new version of the systems to make sure we account for them.

According to RSSB [1] there are 3 types of errors that humans make.

[1]. Skill-based performance: This type of performance usually applies to routine tasks that the operator has performed many times and they are regarded as slips or lapses.

Further classification of the Skill-based errors into four subcategories:

- Familiarity slips: Errors that occur during the performance of a familiar task on a similar but not identical task are called Familiarity slips.
- Similarity slips: When the correct task is performed on the improper object the person has conducted a similarity slip.
- Memory lapses: Omitting a step in the middle of a sequence, due to diverted attention or forgetfulness, falls under memory lapses.
- Association slip: Finally the association of two unrelated procedures or ideas from an external stimulus is an association slip.

[2]. Rule-based performance: In the case of rule-based performance one may apply a good rule but in the wrong condition or apply a bad rule to the correct condition. Similar to the omission slip one may fail to apply the rule at all.

[3]. Knowledge-based performance: This category contains more complex situations since tasks here need high levels of concentration and knowledge.

3. ADULT LEARNING PSYCHOLOGY

Since the online tool is going to be used by professionals in the field, it is reasonable to assume that the presentation of the content should enhance the outcome. The difficulty lies in distinguishing the levels of professional experience

that users have and present content that will satisfy both experts and a novice. Adult education practices must be studied and the relevant segments identified so that the content in the platform can be constructed. The importance of including this aspect in the research is also supported by Smith [2], identifying that it is time to recognise the interaction of the psychology of the individual and adult education.

According to Knowles [3], there are some basic principles that can be applied to adult learning.

- The target audience must be involved in such a way that the beneficial nature of the new knowledge becomes apparent.

- The outline of the content must be based on the goal of achieving pre-established objectives.

- Take advantage of teaching principles that are evidence-based to facilitate the learning.

A derivative of the Greek word "Andragogia", Andragogy is a focused theory that includes the general principles for adult learning. The term was first introduced by Kapp [4] but later on it was polished and given a more concrete structure by Knowles [3]. According to Knowles there are several key variances from tradition education models that need to be taken into consideration:

[1]. Adults have the physiological need to know why they are required to learn something. They need proof on how the newly acquired knowledge is going to benefit them.

[2]. School systems have created an instinctive reaction against driven or dependent learning procedures in adults. Instead of imposing the will of others, adults should be encouraged to make their own decisions within the training process.

[3]. The experience of the targeted audience must be taken into consideration, thus allowing them to draw upon their experience and build new knowledge.

[4]. Adults will consider learning new skills when this is dictated by problems occurring in their lives. In contrast to the traditional subject-oriented learning used in schools, that provides general knowledge to a wide range of learning subjects.

[5]. Clear motivations must be incorporated in the process with clear objectives that will be achieved as a result of the new knowledge.

It is important to know how these principals can support Computer Aided Learning over the internet. According to Knowles [3] Andragogical methods are most effective when applied to a community environment. In this case the community of medical lab personnel is a prime candidate for the application of the method. Based on the studies carried out by Brookfield and McEvoyit the application of adult learning methods has proven that the basic principal of Andragogy can be facilitated in IT courses [5]. However, individual courses and controlled environments are very different from the web environment. Online learning can meet the demand for efficient training, in a manner that meets the needs of any candidate regardless of location and time. In general we can summarize that the 3 main disadvantages of traditional teaching versus online learning are [6]:

- The teacher is available for limited time.
- The teacher is limited by location and proximity.
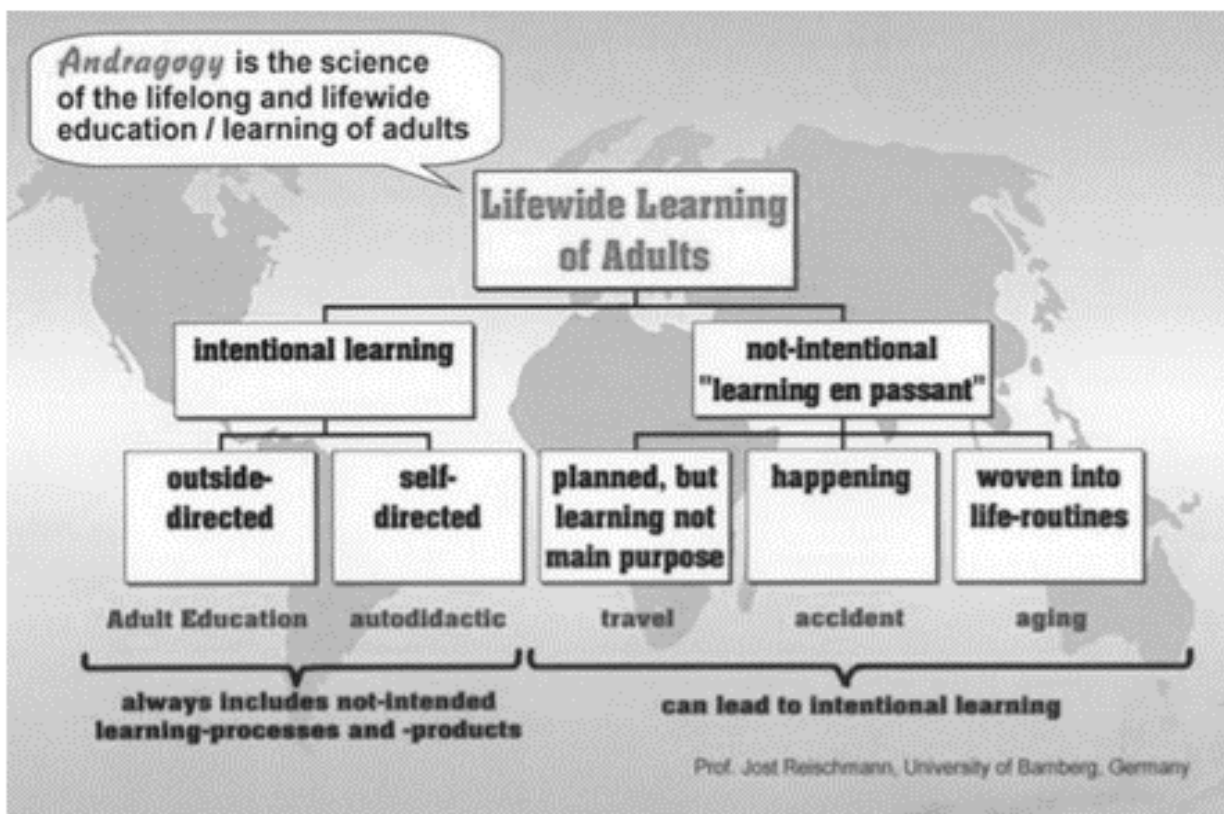- The teacher several times, is not using modern ideas and information.

Fig. 1. Structural scheme of adult education and adult learning [12]

Based on the successful delivery of an undergraduate web engineering course Ellis [7] describes the application of the Andragogy method to a class of 58 professionals over a 2 semester period. The course was conducted in a computer lab, once a week during evening hours. Our approach is different as it would rely on the

interaction between users and the material will be generated as result of the uses of other systems. Never the less we need to identify the useful elements that support each principle of Knowles theory [7]:

[1]. By being able to relate the learning material to real-life situations the students can understand the practical benefit of the course. As a result the first principal of Knowles Andragogy is met.

[2]. Self-directed learning is supported by the role of the educator within the class but mostly outside it. After the initial orientation students were place responsible for their own independent learning pattern.

[3]. The principal of experienced based learning is supported by using the experience that the students bring in the classroom as the foundation for generating new knowledge.

[4]. To support the fourth principle of Knowles Andragogy theory, the web can easily accommodate education oriented to the practical application of solutions to a problem. Students are eager to share problems that they encountered at work and try to apply solutions based on what they have learned about the problem in the classroom. This is essential for us as we rely in the interaction of the users within our system (virtual-classroom) to identify common problems, FAQs and other relevant conditions.

[5]. The final principal is met by presenting the student with clear goals for each part of the course.

It is evident from the list above that the principles of Andragogy can be successfully applied to modern training. The web can provide the necessary flexibility and a well-structured content can meet the principles that are set originally by Knowles and further expanded during the years.

4. CONTENT MANAGEMENT SYSTEM (CMS)

The current trend in web site management is to allow the client or customer to manage the content of the delivered web site. Since it cannot be assumed that the users have technical expertise a system must be created that is used the same way that the page itself is used. As a result the CMS itself is a web application that contains all the management functionality needed to modify the contents of a web page [8, 9].

CMSs are based on layer architecture. Users are presented with an interface and a set of options limited to what they need to manage the existing content and expand the structure of the site. The styling logic for example is obscured and can be found in

a different deeper layer [8, 9]. The browser layer contains all accessible functionalities.

The most important aspect of a CMS is its usability. This refers not only to the usability of the CMS interface but also the usability of the content that is supported by the CMS. The content that is managed can be identified depending on the way it is setup. For example it can be delivered dynamically, customized per user, centrally stored media and accessed or read/write available.

The goal is to present the user with a level of consistency across the different levels of detail. In order to plan correctly the structure it is important to know what the system and the content is going to be used for. In this case the plan is to create a web-site that will manage training content and allow the expansion of the site, through the CMS, to include new content and sections according to user needs [9].

At this point we must talk about the use of a CMS over an established E-Learning system. E-Learning systems are more constrained and thus lack much functionality that is offered by a CMS. As a result it is much easier to customize a CMS and include learning material instead of extending an e-Learning system. In Franziska [10] we see the application of such tools in training programs of airport security courses. The research and case studies showed that the great differences on computer literacy amongst the security officers were overcome by the CMS and the way it separated the display from the data. Based on that study and the pilot cases it is reasonable to assume that CMSs are appropriate for use in the development of learning systems.

Now we need to identify the essential features of a CMS framework for the development of the online training platform. According to Bergstedt [11] a perfect CMS could have the following features:
- Division of Content, Structure and Presentation (Single Source –Multiple Media)
- Management of assets
- Management of workflow
- Managing users and their roles
- Ability to import and export content
- Content Syndication
- Individualize the presented content
- Being extensible by scripts or modules
- Version-Management regarding content and assets
- Archiving content
- Publication
- Supporting the editorial process

Moreover as stated by Bergstedt [11] the future e-learning systems that are supported by CMS applications should include four main attributes.

[1]. High degree of individualization.

[2]. High reusability of content.

[3]. Optimized editorial and publishing process.

[4]. Meta data incorporation.

The expandable nature of the CMS can be used to extend the platform in order to cover the e-Learning functionality. Moreover its adaptive nature is what makes the CMS a suitable tool for using in the development of the on-line training platform

5. CONCLUSIONS / FUTURE WORK

From the information above it is evident that an extendable dynamic tool like that would be of great benefit. Any new IT system could be added into the training tool and be accessible to any and all personnel that would require training, thus eliminating the opposition of change and limiting the learning curve. The next step would be to create the content for the system, at least in a rudimentary format. Based on that the actual training system will be developed to incorporate the material. Afterwards, it would be beneficial to monitor the performance of the medical lab personnel and then add a new system into the training tool and monitor the adaptation rate.

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