



Virtual Portal for Interaction and ICT Training for People with Disabilities

Research of blended learning approaches & Web 2.0/Web3.0

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| Outcome No. | | 17 | |
| Workpackage No. | 5 | Workpackage Title | Educational and pedagogical framework |
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| Status (F: final; D: draft; RD: revised draft): | | F | |
| File Name: | | D17 Research of blended learning approaches and Web 2.0.docx | |



Version History table

| Version no. | Date | Dates and comments |
|-------------|------------|---|
| 0.1 | 25-06-2012 | Draft created by EuroCy |
| 0.2 | 26-06-2012 | Contributions provided by Hiteco |
| 0.9 | 28-06-2012 | Complete draft created by EuroCy, incorporating all contributions |
| 1.0 | 28-06-2012 | Proofreading and production of final version by EuroCy |

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1 Introduction

The present document aims at discussing the pedagogical and educational benefits and impact of applying blended learning approaches for people with disabilities, using the full advantages of Web 2.0 and Web 3.0. The specific use of ViPi interactive tools and services is also discussed. The final objective of the work is to provide to trainers a blue print on how to optimally use the ViPi platform and its tools and services and training material, as well as, the provided serious (mobile) games and have it integrated in current training practices and customised e-portfolios.

The document is organized as follows:

- Section 2 presents a general discussion of the learning and pedagogical approaches for the training of persons with disabilities. Introducing also the concept of “difabilities”, the section provides a source of experience and good practices which trainers are encouraged to adopt in their practice.
- Section 3, then, discusses the use of Web 2.0 concepts and technologies in teaching, focusing on the advantages but also on the challenges introduced by these technologies.
- The same approach is adopted in Section 4, where the concepts and technologies of Web3.0 are introduced and exploited in the blended educational framework.
- The document continues and concludes with Section 5 which comprises an effort to summarize how the discussed approaches and blending of technological domains are taken into consideration in the ViPi project outcomes, including the platform, the curriculum, the mobile applications, mobile games, etc.

2 Learning and pedagogical approaches for the training of persons with disabilities

Sometimes in order to minimize marginalization one should rethink practices so that a more socially just way of viewing things, is ensured. To this end, the term “difability” may be introduced and be recommended in the training practices instead of the commonly used term “disability”. What is the difference between the two terms, disability and ‘difability,’ and why people should rethink the original term if the new term means that people are still being labelled? The answer might be the belief that if all people have a label, then discrimination may lose its power and more opportunities may be created for all.

On one hand, disability is a term that emphasizes people’s weaknesses, a person who is ‘dis – abled’ means ‘disadvantaged according to their abilities’, in other words, not ‘able’ to do certain things. On the other hand, one should not forget that people have strengths that perhaps are not so obvious and need to make the effort to find these and build on them. The trend has been to over-emphasize what people cannot do (based on the medical definition model). But this can affect people’s self-esteem in many aspects of their lives. What is ‘normal’ has been a subject of much debate; people are categorized according to the accepted ‘norms’ and those outside these norms, are called disabled.

Taking an alternative view, one could suggest using the term ‘difability. This is a new term that was introduced during the Youth in Action Programme – Action 4.6 by a youth club that refers to people having ‘different abilities’ rather than disabilities. So here the emphasis is on people’s abilities rather than disabilities. By using this term the objective is not to ignore people’s diversity - in this case in terms of abilities - but to make an effort to respect people’s diversity of their needs and talent(s).

Under the umbrella of ‘difability’ one could include persons that have not only physical but also cognitive, emotional, developmental or a combination of the above impairments. So the conclusion is easily drawn, that disability is not only what is visible. It includes many things that people cannot see, i.e. learning difficulties, etc. Especially in education, if disability is thought of as a value judgment statement, it means that educators should concentrate on how to remove this term from their thinking, as it is something that all people face in certain situations. The efforts must be focused on removing barriers and promoting a good quality of life where diversity is respected and inclusion is promoted.

A key factor in learning is to emphasize on believing in people's abilities and promote efforts towards removing potential barriers and include people in an enjoyable learning experience environment so they can build upon their abilities. The scope of a blending environment of learning approaches, is to investigate best practices and different approaches that may help individuals to access meaningful learning. As a next step, to guideline those and put them in practice. Every person has the right to education but as far as persons with 'difabilities' are concerned, an extra effort is required such as to minimize the barriers as efficiently as possible. In order to achieve this, there is a necessity to explore all available tools and provide a *flexible, accessible* and *adaptable* learning environment. Blending approaches increase considerably the possibility of not only building upon peoples' abilities but also enhancing their self-esteem and finally encouraging social interaction.

The following paragraphs discuss some best practices and guidelines to educators and teachers to use in educating persons with *difabilities*.

2.1 Guidelines in pedagogical approaches

First of all, the term **Pedagogic** is introduced, that implies teaching and learning issues. The question that should be asked to an educator is: What is your philosophy of the way of teaching; This would have an effect on the structure design, content design. So the pedagogical approach that the educator is using is very important. When one needs to teach a diversity of individuals with certain abilities, this is not an easy task because it implies a more **customized** teaching approach according to the individual profile of abilities and needs. Some of the important keywords to consider when designing a learning environment that implies people with different abilities are:

Flexibility, customization, adaptability, accessibility, assessment, reassessment, assistive technologies, simplicity of the content materials, rewarding system, etc..

The above keywords find their application also when e-learning training environments are designed. The creators of such environments have to also have in mind the pedagogy they are going to use and build it in a way that will be deductive or facilitate learning. An additional aspect is that the technology to be used needs to be easily accessible, offer availability of resources, be adequate to the individual skills, provides ways of support in order to use the resources effectively, provide simplified and different levels of material, offer priorities of needs and ways of evaluation of the improvement of the person, and also a rewarding system that will encourage the individual.

No matter what tool the education environment will be built upon, the first step is to start **analyzing student's capabilities** in order to design an effective educational environment based on their

abilities. This is very important stage because if the teacher wants her students to have an enjoyable and effective learning experience she should well know the characteristic of this population so to give them an environment that they can work according to their abilities. This will lessen their barriers and make them feel less stressed.

A second step should be to **set our training goals**. It is very important for the teacher to have a clear picture of what is/are the things she wants to achieve after each training session. Not having a clear picture of the expectations, means simply wasting time.

The next step should be to provide **guidelines and prioritize** those training goals. It is very important to explore if the set goals are realistic, achievable and according to the available time limits, resources and budget. Also important is to keep in mind when setting goals, that the diversity of people implies that some of those people would need more time to achieve the setting goal.

Moving on to the next step, the teacher needs to **analyze the content of the materials** s/he wants to teach. The materials should be given in different forms like wav file, text file etc., in order to satisfy the diversity of individuals' needs. For instance, for a blind person the materials should be given in a sound file or with Braille system or both, and the delivery of the materials should be in a small chugs.

What is next is to choose the **type of training** the teacher will run and what **teaching approach** she is going to follow, exploring what the more suitable at each case is!

Providing some examples: Starting with **one to one tutoring**, in most cases this approach could benefit the individual because it has the tutor to support, also observe and schedule a more appropriate program based on his/her needs so usually the individual improves his/her knowledge quicker because he/she is more focused on his/her learning material. This is more costly and the expectations are usually higher, however it could also create unnecessary pressure. Also the relationship emerging between the tutor and the individual is crucial. If the individual does not understand the way this tutor is tutoring then he/she would feel discouraged and would not follow or see any improvement.

A different choice would be **the group teaching** that characterizes the traditional way of teaching (in the classroom). The benefits of this way are many, of which some of the most important are the acquisition of new skills, like collaboration with peers, the contribution in the class, the problem solving and adding on the individual's communication skills, also the fact that the individual has the chance to make friendships and have the feeling of belonging in a group, the fact that he/she adds on

his/her knowledge not only by what the teacher delivers but also from different viewpoints. Therefore, in this approach it becomes obvious that the relationship of the tutor to the individual student is not so crucial as it is in the **one to one tutoring** model. The drawback, however, is that individuals are not so concentrated and the tutor cannot always follow their evaluation/improvement. In addition, for some individuals this way of teaching might discourage them if they enter into comparing their improvement with their peers.

A third choice could also be the **e-learning** that can be actually a combination of previously presented approaches. The introduction of the web provides tutors with the opportunity to training people all over the world, using online environments and avoiding travels, thus saving money and time. Internet e-Learning environments, offer the flexibility of learning at own place and time using different media, thus leveraging the opportunity to potentially acquire more knowledge and skills. A drawback (and at the same time an enabling challenge) of this approach is that it has the acquisition of certain ICT skills (Information Communication Technology) as a prerequisite. It also requires the availability of the appropriate technology, in order for the training to be efficient. The e-learning environment should provide the necessary flexibility for customization, such as to design the courses after analyzing the characteristics of the audience (abilities, cultural difference, ethics, etc.) and making it as more accessible as possible. How the Web is embedded in education is further discussed in the following chapters.

All above presented approaches belong to the **formal learning** category, however, one could also discuss the **non formal learning** or, as known in some countries, the **social pedagogy**. According to Fordham (1993) [1] non-formal education is about 'acknowledging the importance of education, learning and training which takes place outside recognized educational institutions'. Then one can discuss about acquiring knowledge through role playing, simulation game, etc. Mostly, through interaction!

Non formal education creates opportunities for an enjoyable way of learning because the individuals learn through interaction with peers, so team working collaboration and communication skills are being built through this process. This is usually a more costly approach because it is not class based, therefore in some cases people need to travel and assume other expenses. This sometimes can also create tension among the individuals because some of them feel more pressure going to a new environment. Things become harder when considering the case of individuals who have mobility or medical problems, but of course every obstacle could be removed if enough time is dedicated for planning and good communication between the trainers is established.

So far, various approaches have been discussed, from which the trainers may choose depending on the goal of their training and on the complexity of the materials that they have to deliver to the trainee. In some cases two or even more approaches are necessary to be blended, thus leading to focusing on “blending learning”.

According to Shepherd C, “If you are doing two things you are mixing the context which people learn, this is primarily for making the learning effective and in some cases you are mixing the media that people learn in order to make learning as efficient as possible.”

So the key here is mobilizing different learning approaches to transfer new skills. One key reason that blending learning is appropriate is when the teachers have to deal with more complex material and they need to give to their trainees the opportunity to practice on new skills or learn new skills but in a more safe environment so they can get same feedback on a media basis but also when they want to support the trainees to eliminate distance or other constraints. This approach could save time and money, and is also beneficial for the trainee because he/she would have different ways to absorb the material, flexibility of time, customized program based on his needs, and so on.

What follows the decision on the pedagogic approach that the trainer is to follow, is the need to analyze in more details **the strategies** that he/she is going to use to deliver the material. For example, the delivery of the material could be through group discussion, self-observation, doing an assignment, even could be a combination.

Last but not least important is the ***evaluation of the work done***. Strategies are needed to evaluate the learner’s knowledge and experience, also the content delivered, the learning environment and in general the whole training session. This should be done during and at the end of the course. During the course it would help to make modifications where it is appropriate so the learning experience would be more effective. This feedback is valuable because it would provide the trainer with the guidelines for the next training.

2.2 Challenges for the trainers

“Before you tour well, it is better to be informed where you want to go, well prepared by having all the tools you may need along the way, including your maps in order not to get lost”. Training a person with special needs does not differ a lot.

As a trainer the first thing to do is to **explore a person’s** abilities and difficulties (assessment), by exploring their history (reading previous assessments) and by self-observing the overall picture of the

subject student. This approach facilitates the trainer in acquiring a broader picture of a person and their situation. One of the challenges that trainers face, when applying their pedagogical knowledge & empirical learning in teaching, is that they cannot acquire a full clear picture of a person's physical and emotional situation from the first meeting, as things usually change under pressure situations. Usually more time is needed from trainees' point of view to explore the new environment, in order to show strengths or weaknesses and express their needs. Until then, the trainer will have an initial view of the possible scenarios that they may come across, by exploring what other professionals have already underlined and the strategies they suggest. ***"What works best, cannot be left ignored"***. Trainers need to explore what others suggest and understand that those practices which have worked cannot be left ignored as these may already suggest something that a person may feel more comfortable with and may be something that they can build upon.

The framework of Van Deursen and Van Dijk¹ might be helpful here, since they distinguish four types of digital skills:

- Operational skills
 - Operate an Internet browser
 - Operate an online search engines
 - Complete an online form
- Formal skills
 - Navigate on the Internet by recognising and using hyperlinks
 - Maintaining a sense of location while navigating
- Information skills
 - Locate, select and process information
 - Evaluate the information source
- Strategic skills
 - Taking advantage of the Internet by goal oriented action and making decisions to gain personal benefits

Equally, the Easy ICT initiative (<http://www.easyict.eu/>) that prepared a diagnostic tool to assess ICT skills of the young people with intellectual disability could be helpful.

¹ A.J.A.M. van Deursen, J.A.G.M. van Dijk. Digitale vaardigheden van Nederlandse Burgers. Een prestatiemeting van operationele, formele, informatie en strategische vaardigheden bij het gebruik van overheidwebsites. University Twente, Enschede, 2008.

Another challenge for the trainer is to find the best tools in order to start exploring a person's abilities, without really underestimating them, and to build upon them. In order to achieve this, the trainer must have at his/her disposal and be able to effectively use **accessibility**. When discussing accessibility of a person with different abilities, it is essential to emphasize the need to be able to assess each person and their needs, to facilitate provision of a bespoke accessible environment designed to their individual needs. The trainer's challenge in this case is to choose the correct tools that best fit an individual's needs, by initially ascertaining empirical knowledge in understanding what needs an individual may have and secondly have accumulated pedagogical knowledge to know how to satisfy those needs. A person's needs may incorporate a psychological support element, as well as, initiatives to support the fundamental belief to enhance their abilities and quality of life. This may be achieved by supporting people via available opportunities, promoting belief in their abilities and stretching their skill-set, reaching the goal of maximizing their independence.

One of the objectives of education is to facilitate learning to ensure support for the developing independence of an individual. Continuing, the challenge for a trainer is to find the best way to implement the personal plan of an individual.

Providing accessibility is very important. "Accessibility is a broad topic with two main parts; providing access regardless of a person's physical or mental ability and providing access regardless of social and economic factors."

The availability of technology, nowadays, makes the trainers' community feel optimistic, as no one can be left behind from education whatever ability a person may have (even if a person can only move his/her eyes), because there are plenty of assistive tools that can support an individual to access education, work or socialize, and to participate inclusively and not feel marginalised.

In viewing accessibility and technologies, the various available methodologies are assessed in suitability to facilitate a person with different needs access to knowledge and their environment. Some of these methodologies are: Access methods, Magnification, Scanning, Predictions, On-screen keyboards, Speech Synthesis, Speech Recognition, Colour Coding, Writing with Symbols, etc. Basically, hardware and/or software that may be used by "normal" people but now being used with a **different methodology** (i.e. Word processing with bigger letters, less toolbars, full screen options, different colours of fonts, etc). In other words, all hardware and software used by "normal" people may be also used via a different methodology and **adapted to meet** the differentiated needs (i.e. a normal keyboard with clear stickers on it to facilitate ease of access and understanding, or the

positioning of a screen vertically to serve a person in bed). There is plenty of **specially designed** hardware and/or software, which are dedicated hardware and/or software developed to meet specific needs of people with physical limitations, i.e. personal communication devices for someone autistic or for someone with communication problem(s).

The challenge for the trainers is to identify which methodologies and tools to use, as it may consist of a combination of methodologies and tools that best fit an individual's needs. The selection should always be made bearing in mind the requirement of simplification and prioritization throughout the implementation processes with regards to the material contents, which ought to be adjusted to the capabilities of an individual, giving an individual adequate time to absorb such material.

Once implementation of an individual plan is on-going, a trainer reaches the evaluation stage. During this stage a trainer looks at the predetermined staged goals set, against those that were achieved, possible reasons for difference, whilst embracing a person's emotional situation. At this stage a trainer is looking for areas of improvement, making any necessary adjustments to an individual plan accordingly to facilitate the further development of desired results whilst remaining open minded about other available options of methodologies and tools. This is an on-going process, as the empirical knowledge of a trainer and his/her experience with an individual builds over time, developing their understanding of the person's needs and abilities. A trainer will evaluate those needs against existing options of methodologies and tools as potential solutions **to existing or evolving needs**, while reviewing those areas that may not have achieved fully or partially their desired results. The process aims at resetting staged goals, implementing and evaluating potential outcomes, always with regards to an individual's personal plan.

In some cases people have been left behind, because of a limitation of resources or limited knowledge of carers and/or professionals. With a lack of knowledge in choosing the appropriate tools and/or best methodology to use, those tools can become quite dangerous as a person can become discouraged and de-motivated. So trainers and/or educators ought to know their tools very well as the limitation of their own knowledge can harm an individual more contra to the carer and/or professional wanting to help them.

2.3 Challenges for the trainees

Every training experience, except of the sense of enthusiasm and curiosity creates a sense of confusion and anxiety. For some people the feeling of anxiety overcomes all the others and makes the individual acting nervously.

One can say that the individuals can be distinguished into two categories; i) those who are willing to put their self into new situation in order to prove to everybody or just their self that are capable and even if they have the above feelings they would try on new things, and ii) those who prefer more individualistic way of leaving who do not like the changes because this would put them in a very stressful situation. Usually the persons in this second category do not believe a lot on their abilities. Both groups of people are encouraged to be educated in order to gain social and educational skills, feel more inclusive, also build upon their self-esteem and feel independent.

Every citizen should be active in order to be proactive. Lots of those people who felt marginalized and wanted to have a chance to show that they can be active citizens, they have the opportunity to feel more capable through training. During a training session the trainee may phase lots of challenges like the above underlined: At the first meeting, the anxiety is in high level and queries arise like “am I able to do this” or “would it be too difficult for me”? They have thoughts regarding the level of the materials, the way the material would be delivered, who the trainer is going to be and worry of being over criticized.

It is very important to feel comfortable with the trainer, to feel that their trainer understands their possible difficulties and that he/she do not emphasize on those differences. In order to achieve quicker results this approach is important because the trainees would know that they can address their questions to their trainer, resulting to the training running smoother.

Another challenge for the trainee concerns the expectation of skills needed in order to take a suitable training. Training that requires techno skills usually makes the person feel enthusiasm but also worried if he/she could be good enough. However, usually after few sessions the person feels more self-esteem because something that all “normal people can use” if he/she can use it also means he/she had proved that he/she is the same capable and he/she feels more inclusive. The keyword there is the correct training, with a good trainer who is willing to understand the situation of the person and also the provision of an accessible environment and materials.

3 Using Web 2.0 technologies and social media in teaching and learning

The introduction and evolution of the Web has made lots of changes in the way we perceive education. One can say that the Web and the social media which include Web-based and mobile based technologies are used to turn communication into interactive dialogue among organizations, communities, and individuals transforming the traditional way of teaching towards an e-learning space. This may have created lots of opportunities for accessing education for different groups of people with different abilities across the world. This transformation has also created challenges for both trainers and trainees. Moving towards a more engrossing digital way of living and discussing digital identities, people are going to feel even more marginalized if they would not have those skills that the new century needs. Therefore, having techno Web skills is even more essential for moving forward, especially in areas of education, workplace and in general - life styles.

The fact that peoples' needs for transferring, retrieving, manipulating data/information/knowledge increase, has provoked professionals into discussing how to increase the capabilities of the Web and make it more of a productive tool than just a huge library of information. At the initial stage, as it is simplest, the first version of the Web (can be labelled Web 1.0) was storing a huge amount of information in an electronic way, with users being able to retrieve information which contributed towards building knowledge and/or promoting peoples' personal interest(s). Examples can be the Britannica Encyclopaedia online and the many personal websites.

In order to increase its potentials, Web 2.0 was created as an evolution of Web 1.0. The idea was to "build applications that harness network effect and get better as more people use them" (Musser & O' Reilly: 2006). In few words, a user's role has also evolved into being also a contributor of the web content, as users could then not only read only content but also contribute by adding to the written content on the Web, upload a video, have a digital identity, and communicate via social media, etc.

The evolution of Web 1.0 to Web 2.0 has created lots of benefits with regards to education; it has changed the fundamental way people perceive an educational environment. Now the education community is in discussion about e-learning and the opportunities that may be offered to different groups of people. People who may not have been easily educated elsewhere, either because of mobility or other problems, they may now have accessibility to education from their own living place.

How to embed and benefit from Web 2.0 technology in education and learning, is discussed in more detail in the following sub-section.

3.1 Embedding and benefiting from Web2.0 in teaching

The transformation of Web 2.0 has introduced new ways of teaching which has increased the learning potential of students. In the following paragraphs a discussion is provided on how the introduction of the Web 2.0 has transformed teaching. First of all, the potential that may be created to trainees and second of all, the possible challenges that both trainers and trainees might face.

Moving from a class room environment to an e-learning one can initially create to varying depths and times an anxiety for trainees who are used to being educated in a traditional teaching environment, interacting collaboratively and in face-to-face with teachers and peers. Web 2.0 can supplement these traditional methods of teaching. For instance, a trainer can give a simple project to their students that will allow them to use a social space to exchange ideas. Also, the trainer may observe and have control over their discussion and their questions which will arise. The trainers could introduce to their trainees new materials which are downloadable and/or the trainees can enrol in an online discussion, etc., which may be integrated into a class or become an additional component to learning.

Another possibility is to move the whole class into an online environment where the tutoring would be performed 100% online. The role of the trainer/tutor would be to transfer the educational material, providing activities, while controlling discussions and contributing to them and by responding/answering questions. Students could then contribute in discussions, discuss the details of their subject materials, submit individual work, or work collaboratively on an online project, possibly even critiquing each other.

To have an accessible and effective learning environment, presupposes that trainees and their trainers/instructors have the necessary techno and Web surfing skills. The next paragraphs provide an overview of the benefits from this way of teaching, first for the trainees and second for the trainers/educators:

Trainees may benefit by building upon their technology and Web skills, through their experience of using lots of important facilities that Web 2.0 offers, i.e. browsing, select, retrieve and manipulate information, chatting, commenting, using wiki (a website which allows its users to add, modify, or delete its content via a Web browser), upload materials, upload videos and pictures, etc.. Those skills plus the opportunities for collaboration to work with others in part or fully on given assignment(s), to

critique other colleagues work while having their work also critiqued by peers, the exchange of ideas between them may expand and add towards their knowledge from each other rather than only from their trainers. Learning may be more self-directed and enjoyed more so as a student may benefit from a multimedia teaching environment, for example: they may search for more information about the material they are being taught, can view pictures, search for specific videos all of which may make the materials more understandable and interesting. The use of Web 2.0 may provide a more accessible environment by using different assistive technologies with certain modifications creating more opportunities for trainees with different abilities to be educated, as trainees may have the opportunity to be educated from home, at their own time and pace, minimizing elements of marginalisation.

On the other hand, the benefits for the trainers are also manifold. Using the Web 2.0 facilities trainers can easily value the contribution of their trainees in a discussion stage and throughout the process by keeping a track of their individual participation and give valuable feedback to the groups and individual trainees. Tools like wiki can help the trainer to keep a track of possible queries from the students and organize their work, creating resources for his/her trainees to promote more meaningful learning.

3.2 Use of mobile technology in teaching

The evolution of the Web has also brought the mobile devices more into the game. The learning domain could not be left aside, as the vast amount of opportunities created for real-time and ubiquitous communication and collaboration offer challenges for the education community. The following paragraphs discuss the integration of the mobile technology in learning and the associated impact.

3.2.1 Impact of use of Constructivist Learning Theory and Mobile Technology Integration²

The Universities and high schools across the world are looking at mobile devices such as iPods, cell phones, and Netbooks (Alexander, 2004). The goal of these institutions is to integrate these mobile technologies to enhance the education of students in new and innovative ways. The research and current practices are applying traditional and new hybrid learning theories in the integration and

² Impact Constructivist Learning Theory and Mobile Technology Integration by Thomas Craig and Michelle Van Lom https://sites.google.com/a/boisestate.edu/edtechtheories/craig_and_vanlom

support of mobile technologies. Constructivist learning theory is leading the charge by demonstrating how a traditional learning theory can impact a new innovative technology.

The integration of mobile technology should be a revival of constructivist learning theory as a basis for the new dawning age of mobile technology integration. Constructivist theories propose that “knowledge is being actively constructed by the individual and knowing is an adaptive process, which organizes the individual’s experiential world” (Mayer, 1992; Hendry, 1996). One of the main beliefs of the constructivist is that people develop and build understanding from their own personal and subjective experiences. Trainees bring their own schema (past experiences) into their academics and use it to enhance their learning by gaining more knowledge and build upon their old. Even though a trainer can be excellent and excel at implementing constructivist learning theory in conjunction with mobile technologies, trainees will not necessarily learn. As already explained in section 1, the trainees need to have the opportunity to experiment and utilize previous experiences to build new understandings of the educational material. Constructivist learning theory enables the mobile technology to focus on the trainee’s ability to be self directed and draw conclusions (Karagiorgi & Symeou 2005). Constructivist learning theory differs from other traditional educational theories in the implementation of mobile technologies. This theory allows trainees to work independently and have a trainer as a facilitator. Trainees eventually learn more when they have to explore and experiment rather than being told why something works. When trainees can use what they are learning in real world situations, it sinks in and stays with them for a longer period of time. Constructivist learning theory allows the individual to place worth on mobile technology, rather than mobile technology imposing value on the individual. When we realize and utilize this principle to impact mobile technology in the educational setting, the two principles develop into a hybrid model for integration.

Many have used models of instruction informed by constructivist theories to implement mobile technology into teaching. A research example of constructivist learning theory being applied in the real world with real results, in conjunction with mobile technology was conducted utilizing “The Virus Game” (Collella, 2000). Learners took part in a simulation game that demonstrated the spread of a virus. The simulation was created for use with mobile technologies and when integrated into the classroom demonstrated that the combination of constructivist learning theory and the integration of mobile technologies resulted in:

- Trainees readily engaged with the simulation, and found it to be a rewarding and stimulating experience.

- Trainees successfully collaborated to answer the relevant questions about the simulation.
- The technology facilitated, rather than hindered, normal interactions between the trainees – the devices augmented rather than replaced normal channels of communication, and hence provided unobtrusive technology support.
- Trainees were able to test out experimental hypotheses within the simulation after observing specific behaviours.

This simulation has been re-created for the PalmOS PDA, and is freely available from <http://education.mit.edu/pda/games.htm> (Lonsdale, Naismith, Sharples, Vavoula, 2004). The use of mobile technologies is having a direct impact on integration, pedagogy, and learning theories, and are being utilized in new and innovative ways. Mobile devices like the iPod touch mobile phones and many others are being looked at in a whole new method. These tools combined with wireless technologies are leading new approaches in education and have generated a great deal of excitement. Everywhere in education, from the small rural school district to the large metropolitan college of higher education, mobile technology is being considered, implemented and then looked at again for further implementation. The numbers of new and current mobile wireless technologies implemented for the direct impact of trainees learning is staggering.

These mobile technologies are more efficient when utilizing constructivist learning theory to impact future development of learning. It is expected that in the near future trainers, trainees and the entire community will have the ability to utilize mobile technology in most major areas. This allows them to experiment and utilize a major principle of constructivist theory, the ability to experiment and learn.

Interest in mobile technology integration continues to be fueled by the notion that these mobile devices have the ability to have the greatest amount of impact on trainees' achievement at the lowest cost while still keeping the stringent focus on the tried and true educational learning theories and pedagogies. Mobile technology integration has become a focus area of technology for education because they enable a transition from the traditional theory of occasional, move the trainees to the computer lab scenario, which is often associated with computer use. Early evaluations suggest trainers and trainees respond to mobile technologies favourably. For example, 90% of trainers in a study of 100 Palm-equipped classrooms reported that handhelds were effective instructional tools with the potential to impact trainees' learning positively across curricular topics and instructional activities (Crawford & Vahey, 2002; Vahey & Crawford, 2002). As these results are applied, it is found that the principles of constructivist learning theory are being applied, perhaps by accident. That road

leads to application of constructivist principles through distance education utilizing mobile technology integration. Distance education and the “learn anywhere any time” learning appeal that is taught everywhere utilizes constructivist learning theory to provide educational value. A key aspect of effective distance education is focusing on the needs of the trainees, the requirements of the content, and the constraints faced by the trainer. One way that this focus has been addressed is through the integration of mobile technology and constructivist learning theory foundation. Distance education is applying the constructivist theory to build flexibility that allows for a major pedagogical change and benefits that allow trainees to progress at their own pace allowing trainees to actively construct their learning in an adaptive process. Construction of learning thus continues and grows at varying rates of individual progression towards a goal which is a typical of educational practices. In traditional classes, progress at the same pace is achieved in synchronization with the delivery of information through mass lectures and tutorials in a traditional format (Yousuf, 2007). How does mobile technology integration fit within distance learning environments?

The advantages of mobile technology integration, distance education and constructivist learning theory demonstrate some definite impacts on the educational process. The rubber meets the road in a study contained within the article revealed that a significant majority (90%) of the respondents of a survey agreed that mobile learning provided new opportunities within distance learning. It also reveals that a sufficient majority of respondents (87%) agreed that mobile learning being flexible is available anytime and anywhere and that (78%), of respondents supported the statement that quicker feedback in distance learning is possible through mobile learning (Yousuf, 2007).

Some researchers³ recognize activity theory as a powerful framework for designing constructivist learning environments and trainee-centered learning environments (Jonassen, 2000; Jonassen & Rohrer-Murphy, 1999). However, certain limitations and unsolved problems in activity theory have been raised. Barab, Evans, and Baek (1996) pointed out that “life tends not to compartmentalize itself or act in ways that are always wholly consistent with our theoretical assumptions” (p. 209). They suggested researchers move from isolated to complementary theoretical perspectives. Although the details of activity theory are not described in this paper (Engeström, 1987; Leont'ev, 1978; Vygotsky, 1978), several elements of it are indeed used to modify transactional distance

1 ³ A Pedagogical Framework for Mobile Learning: Categorizing Educational Applications of Mobile Technologies into Four Types. **Yeonjeong Park**. Virginia Tech, USA
<http://www.irrodl.org/index.php/irrodl/article/view/791/1699>

theory, adding a dimension and creating a pedagogical framework for mobile learning that is illustrated in Figure 1.

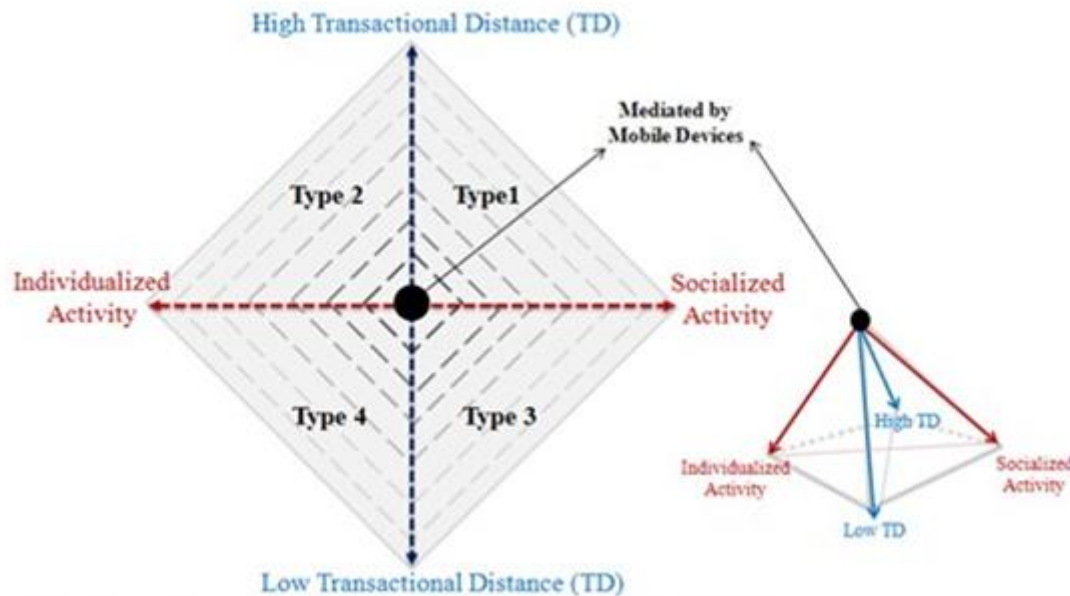


Figure 1. Four types of mobile learning: A pedagogical framework

First, *activity* is conceived as a unit of analysis. Since transactional distance theory considers a course or program to include several lessons (Moore, 2007), this made it difficult to decide the transactional distance for the course as a whole. For example, the presentation of information is likely highly structured, while questions for discussion require high dialogue process, but both of these activities are typically course components. As a result, a course including several activities with different degrees of transactional distance cannot simply be categorized as either high or low transactional distance. Thus, by confining the unit of analysis to “activity,” it is easier to determine to what extent transactional distance can exist because the activity is a “minimal meaningful context for individual actions” (Kuutti, 1996, p. 26).

Second, individualized and socialized activities are *mediated* by communication technology which is one kind of cultural-historical artefact in activity theory. As Kang and Gyorke (2008) point out, both transactional distance theory and activity theory consider mediation to be important. Thus, with “mediation” at the centre of the framework, individualized activity at one extreme indicates a form where a trainee is isolated from communicating with other trainees, and socialized activity at the other extreme indicates a form where trainees work together, share their ideas, and construct knowledge. At the same time, activities are mediated by the rule which can be either highly structured with fewer dialogic negotiations (high transactional distance) or loosely structured with

more free dialogic negotiations (low transactional distance). As mentioned above, mobile learning is “mediated learning by mobile technologies” (Winters, 2006) and the mobile technologies uniquely support trainees’ learning both collectively and individually (Koole, 2009). In placing high or low transactional distance on the y axis and individualized or socialized activity on the x axis, the framework generates four types of mobile learning activities.

Third, the dualism of *individual* versus *collective* (or social) is a dichotomy, but it is also something to be connected and balanced. Activity theory has attempted to transcend the issue of dualism in such pairs as individual-society, subjectivity-objectivity, agency-structure, psychological-social (Roth & Lee, 2007; Watson & Coulter, 2008). However, according to Garrison (2001), Leont’ev’s activity theory (1978) drew close to Dewey’s theory of transactional coordination, but Dewey pushed his functionalism beyond describing “inter-actions” to a theory of “trans-actions.” There are similarities and differences between the approach of activity theory and the approach of transactional distance theory derived from Dewey’s work. Activity theory is an analytic framework for understanding an individual’s (subject) actions on learning material (objects) mediated through artifacts, interacting with a community, moderated by a set of rules, and distributed by a division of labour (Engeström, 1991). It forms a part of the basis for transactional distance theory, which is a framework for understanding the relations of key variables (structure, dialogue, and autonomy) in the context of distance learning. Although a number of important concepts from activity theory are simplified in Figure 1, a dimension indicating the range of individualized to socialized activity can be a useful lens for reviewing diverse mobile learning activities. Above all, the distinction between individual and socialized activity is a generally understood and accepted categorization; for example, Keegan (2002) stated that distance learning has two forms, individual and group learning.

4 Using Web 3.0 and semantic Web technologies in teaching

4.1 Introduction to Web 3.0 and relevant technologies

Like in Web 2.0, many people wonder what Web 3.0 is all about and how much different it is from its precursor Web 2.0. Web 3.0 is a new concept which is found now in the evolution stage of Web 2.0. ([2]). As introduced in Section 2, one can see how the Web was firstly introduced as a simple tool storage of data/information/knowledge, because the user could only read the content that was stored in the Web. Nowadays, with the use of the Web 2.0 the user is in the production (read, write and contribution) stage of the Web content. Therefore, the development of the Web is not only driven by technology but also by users. More and more people are using Web sites like Facebook, YouTube, Wikipedia and those Web sites could not be vital without the contribution of the users who will upload video, photos, add comments, etc. Some of the well known facilities of the Web 2.0 are the tagging, blogging, and social networking.

Going one step further, one could imagine how the content will multiply, now that there exists a huge amount of information over the net and the content is growing second by second. The Web is also moving in other appliances also, like the mobile phones, whose utilisation in education has been introduced in Section 3. One can also imagine how difficult and confusing it would be for all people to make a selection from the vast amount of information by simply using the usual keyword-based search. Lots of times users receive huge amount of information around keyword but without really seeing meaningful information.

Having lots of information without any link between them is not useful. So there was a need to find another path, to make all this information be linked and take meaning so to take a more meaningful insight to information. This need led to the evolution of Web 3.0. With the introduction of Web 3.0 the goal is to help the user get meaningful information based on his needs. This evolution can be characterized as the “smart web” because the Web could now offer more intelligent services, not only read and write but also process the information. The Web becomes active and able to guessing what the person needs, not only by keywords but also by the meaning of what the person needs.

An example of such an evolution is the Amazon Web site, which offers to their clients products that other clients with the same interest bought beforehand. Therefore, Web sites like this are in the process of adding extra information about peoples’ interests.

The above described needs led to the introduction of Semantic Technologies over the Internet in order to writing programs which in human manner convert data into useful information. Before going further, it is important to understand what *semantic* means; it means to identify the meaning behind of what you say or write. So the new idea now is to teach computer to understand what you actually mean by something you wrote or tell. For example, if you write hart car you might mean I love my car. The future web is obtaining users' wishes from linking together different sources of information from different appliances or objects like car machines, factories, computers, mobile devices, even milk. The trial is to lessen the barriers phased with the existing Web and provide services that would make peoples' life easier. Semantic technologies provide reliable, secure and efficient services which are provided to anybody in anyplace without interruption.

An example of this technology is the online agenda, which would check among different personal Web sites that refer to different events like Linkedin, Facebook, etc. and would check the possibilities of an appointment. Another example is a service that provides the more suitable root in case a person is going to take a trip, by checking between a GPS service, local weather services, also availability of restaurants, etc.

Undoubtedly, the introduction of Web 3.0 creates even more benefits and challenges in the education community, as well. Those are discussed in the next sub-section.

4.2 Embedding and benefiting from Web 3.0 in teaching

This sub-section addresses the query of how the education community can embed and benefit from the Web 3.0 technologies in teaching, what opportunities are created for trainers, as well as, for educators.

The actual introduction of Web 3.0 technology in teaching is envisaged through the wide-spread of the concept of **cloud computing**, and particularly with the involvement of mobile environments. The word cloud is a metaphor for an Internet based service so is a point of access for certain computing needs and it might provide business applications like MS Word, MS Excel, also video applications and social networking services. Therefore, cloud computing provides lots of benefits for companies, institutions and users. Rather than storing a suite of applications on each computer and hardware device, one can consolidate all of them in one central location and provide access to multiple users through a Web interface. This kind of central services, would store all the programs that the user might need and they would allow the user to login into any specific Web service. The benefits of cloud computing are manifold, like cost saving and ease of access by many users from various

locations having access from various devices like cell phones, TV, computer, smart-phones, tablets, and more.

Adding ***e-teaching delivery platform in the cloud*** with intelligent tools, one can see the opportunities that are created in teaching, as it will assist interactive teaching, through collaboration between trainers and trainees. In addition, this type of cloud training services would further use intelligent customization and a mobile environment, to ***adopt courses to users' personal needs***. This is a great opportunity for trainers, since one of the main challenges that a trainer faces when training a person with different abilities is how to adopt the material according to student's needs.

The trainees themselves could also be benefitted directly from the offering of international education that combines different smart technologies that would help the user understand. For instance, an educational institution may offer the combination of video in e-teaching with semantic social network tools to increase the personalization of material and make the trainee feel well treated. Also the delivery of the content to trainees could be available from everywhere and anytime through different devices.

The combination of cloud computing and the intelligence that Web 3.0 transfers, provides accessibility of the learning environment through different places and devices so a person could choose the environment that is more suitable for him and by simply logging-in would have all the necessary resources he/she needs from the media that finds more appropriate according to his needs. All the information would be stored in the cloud so the user would not miss any work completed. Finally, embedding smartness in technologies would make the process of learning more efficient and more enjoyable.

5 A blended educational framework with Web 2.0 and Web 3.0

5.1 Combining Web 2.0 and Web 3.0 in teaching and learning

The previous sections introduced the concepts of Web 2.0 and Web 3.0 and their potential application in the education domain. Evidently, the use of each of the technologies is beneficial for both the trainer and the trainee, in that they address many of the guideline aspects discussed in Section 1. For instance, Web 2.0 leverages the immediate interaction of the trainer with the trainees, but also giving the option to customize the environment to each individual's needs. At the same time, a trainee would feel belonging in a group and also enjoy the safety of own environment.

Furthermore, the Web 3.0 technologies further empower the interaction by individualizing the content delivery experience. The interacting trainees are not just numbers from the point of view of the machines, but their needs, wills, weaknesses, strengths, etc, are modelled using semantic knowledge models (ontologies), turning them as semantically identifiable individuals also for the machines. For instance, a trainer uploads a video in an e-learning environment which is to be delivered to the trainees in the framework of a training session. The video may be tagged with information whether it is accessible by blind users, whether it talks about e.g. browsing the Internet, whether it is an assignment or simply a material to study, etc. The e-learning environment, would allow the trainees to access them, as in Web 2.0 era, but it will also provide further knowledge on whether a blind trainee will be able to access it (such information can be also stored using Web 3.0 knowledge models) and what the content is about.

One can argue that Web 2.0 and Web 3.0 technologies have only positive impact and can improve the learning experience, especially considering the option to combine traditional approaches with these new vehicles. Additional material can become available, from all over the world, additional means to deliver the material are also available, access to experienced trainers, more individualised courses, etc., are only few of the advancements introduced with technology.

There are many of scenarios which demonstrate the benefit of such blended approach for the teaching/learning of persons with disabilities.

For instance, the Nwabugor case study (case study of a friend's use of the internet to teach herself mathematics, Nwabugor G. KCL 2012) is only one example of how beneficial the technological learning tools can be. This woman taught herself mathematics by selecting materials from the Web that were more suited to her way of learning, achieving something that had seemed impossible during her school years. Another scenario is the one of Shueh L, (case study: My 12-year-old cousin - growing up in Silicon Valley, Shueh L, KCL 2012). Shueh story was about a 12-year-old boy who used the Internet not only for socializing and staying in touch with his family, but also in very creative ways. He has created his own YouTube video, and upon seeing his friend's feedback realized he needed to put more time and effort into his guitar playing; he used eBay to advertise his games; and he assisted in the school website. This can be a perfect example of how technology can enable a person to develop and represent his/her own identity. This second example shows that the boy used the technology very positively; it is also important to note that his parents imposed time restriction on his Internet use, which encouraged him to use the technology in a beneficial way.

The blended online learning, taking advantage of every Web aspect, gives the user a chance to see another side to literacy, a side that permits self-directed learning according to the user's own needs and interests.

5.2 The ViPi integrated platform paradigm

The ViPi project is already taking into account and leveraging these blending opportunities by combining the general learning approaches and guidelines, to the effective use of Web 2.0 and Web 3.0 technologies. More specifically, the project delivers a Web platform together with a curriculum and training document, as well as, a handbook to assist trainers in their work. The different pieces are:

- A Web portal providing information and also a repository of learning objects (text, games, media, Internet links, etc.) with Web 3.0 searching and discovery capabilities
- A social networking platform allowing trainers to communicate and interact with trainees in a way facilitated by a full Web 2.0 enabled environment
- A fully accessible (as are the other pieces) e-learning environment with increased customization ability, that will host a structured series of courses on basic ICT skills, facilitated by a well-formed curriculum and a proposed rich training content for each of the curriculum sections.
- A handbook to help trainers make real use of the ViPi outcomes, playing also the role of a manual for the users.
- A mobile application for Android-enabled devices that provides on-the-go access to both the ViPi portal with the learning objects and the social networking facilities.

- All outcomes are provided in accessible format, thus leveraging inclusion of all potential trainees.

The following paragraphs make particular reference to how the Web 2.0 and Web 3.0 aspects of ViPi, as well as, the mobile technologies can be utilised in the learning experience.

5.2.1 ViPi Web 2.0 and Web 3.0 aspects in learning

The Web2.0 & Web3.0 features of the ViPi platform are summarised in the following, also explaining their potential use in the learning process.

a) ViPi Learning Objects repository and semantic search engine

Among the listed outcomes of the ViPi project is a repository of learning objects with a search capability, provided through the ViPi portal. The repository is also accessible through ViPi's mobile application (Android based). This repository hosts learning content created by trainers and other content providers, for the training of persons with disabilities, and providing trainers and other stakeholders with learning content in a variety of formats (URLs, courses, serious games, mobile games, etc.). Leveraging the opportunities offered by semantic web, and by content provision through different means (desktops, portables, mobiles) and technologies (web and web-services), the project implements a semantically enhanced annotation and navigation infrastructure, facilitating the efficient discovery of accessible learning objects through its repository. To facilitate the discovery and meet the accessibility needs of PwD, learning objects are semantically tagged with a developed ontology, building triplets like the [LO – is of type - video] or [LO – is compatible with impairment - hearing], etc. On the other hand, all users' profiles are enriched with semantic tags like [User1 – has impairment - hearing], [User1 – prefers content of type – game] for the individualized provision of search results. With the use of semantic annotation, learning objects can be retrieved by their semantic concept and not only by arbitrary tags or their content. Therefore, searching through the repository and locating the proper content becomes much easier because of the structured meaning.

This Web 3.0 enabled repository of learning objects has an important two-fold impact to the learning process. On one hand, the trainees will have at their disposal a one-stop-shop of learning material from which to locate and use in their effort to acquire basic ICT skills. On the other hand, the trainers have a place to upload training material and also make use of material uploaded by others, thus removing any barriers to finding the proper material for different needs of trainees. More importantly, the material is ensured to be accessible and its discovery is facilitated by guided search, powered by Web 3.0 technologies.

b) Rating and commenting on learning objects

Leveraging the potentials of Web 2.0 technologies, the ViPi platform enables the interaction among the users and the provided content. That is, the trainers as well as the trainees are allowed to transfer their opinion about the quality and usability of each learning objects, by using the rating functionality and also further elaborate on their views using the commenting functionality. This way, the quality of the provided content is ensured in a collaborative way, implementing a mechanism by which low-quality material is directly excluded by the users themselves.

This offers a significant advantage to the education community. The trainers are able to find the material they are looking for and have an active participation in its improvement, and at the same time the trainees are given a word against what type of material is used for their training. The combination of the ease of discovery of content, with the ability to criticise it and improve it, definitely leads to maximum benefit for the trainers and trainees.

c) Social networking site

Further to the learning objects, the ViPi platform adopts the guidelines of experts and encourages the additional interaction among the trainers and the trainees. The benefits of this interaction have been analysed in the previous sections. In few words, the trainers can establish an either personalised or group-oriented communication channel with their trainees and answer to questions, discuss learning outcomes, assess learning capabilities, leverage social inclusion, and make the trainees feel that they belong to an active and live class without any physical barrier.

The social networking site is a key Web 2.0 technology that is made available to support the learning experience in ViPi platform.

d) An e-learning environment with pre-defined structured curriculum and courses' content

Another important interaction (thus Web 2.0) feature available through the ViPi platform is the dedicated e-learning environment. Through this environment, the trainees can take pre-defined courses on specific subjects and take also assessment sessions to self-evaluate their progress. Alternatively, the courses can be provided by a tutor, who will have the full control over the course running and a number of interaction features (email communication, chat, group assignments, etc.) to make the learning experience an enjoyable task for the trainees. Details about the features of the learning environment are provided in the Training Handbook available through the ViPi website at <http://vipi-project.eu> .

e) Mobile application and mobile games

As shown from the above features of ViPi, the Web 2.0 and Web 3.0 technologies are smoothly blended in one single environment with the single objective to make full use of the teaching guidelines and good practices and offer a state-of-art solution. This paragraph describes how the mobile application and the mobile games of ViPi are also blended in the same environment and for the improvement of the learning experience.

The mobile-enhanced learning can provide support that enhances training in a corporate business or other classroom environment. This offers the possibility not only to blending the technological features in the educational framework but also to blending the channels that one would have to access the education. For instance, the blended learning approaches become available in:

a) The classroom: Trainers are envisaged to be using mobile devices (such as a Pocket PC) in the classroom to enhance group collaboration among trainees and themselves.

b) Outdoor: Learning outdoors, for example on field trips, enabling continuous learning and portable tools for PwD.

c) At work: On the job training for someone who accesses training on a mobile device "just in time" to solve a problem or gain an update.

d) Lifelong learning and self-learning: The use of personal technology to support informal or lifelong learning, such as using handheld dictionaries and other devices for learning appropriate job related skills.

e) Other: Improving levels of literacy, numeracy and participation in education amongst young adults and also using the communication features of a mobile phone as part of a larger learning activity (e.g. sending media or texts into a central portfolio, or exporting audio files from a learning platform to your phone)

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