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# DOES IT DEVELOPMENT FACILITATE DE-LINEARIZED LEARNING?

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**Abstract:**

With the necessity for lifelong learning, more effective methods need to be introduced within education. The traditional ways of matching the learning process to learning don't match these new requirements. New measures have to be introduced to be able to operationalize this matching process. This article introduces a set of measures that can be used in this respect. They are based on learning theory, a roles approach to learning, and we align with the de-linearized learning approach to learning and as to how this approach has an impact on the development of new technologies. By applying these measures to three examples of modern IT developments in education we shall illustrate this difference in the approach. The three examples of IT development are widely used in Hungary, how they cover the four learning theories and how they deal with changing roles in today's educational environment. As an illustration of how this approach of matching influences modern learning, we show how applying it within special needs education works out, and as a second example the solution Italy found for the language problems caused by the growing number of migrants. We believe that all this would work and can also be applied as good practice in other educational fields.

**Keywords**: Lifelong learning, roles approach to learning, mixed reality learning environment, learning technology, non-linear learning

## I.      INTRODUCTION

The fact that the current world is changing fast is not disputed these days. The fact that dynamic developments within, and in the vicinity of, modern society demand increasingly more attention has been known for some time and it becomes clear that organizations can no longer assume that current successes will be sustainable in the future (Fukuyama, 2011). It is quite clear, that this problem is certainly not limited to the organization theory alone. On a societal level people realise the importance of lifelong learning taking place throughout society, and that the traditional educational institutions no longer fulfil the new educational requirements. Besides societal level solutions, organizations have the responsibiliy to provide lifelong learning for the individuals.

On these three levels, society, organization and individual, obtaining access to the required knowledge is a complex task. Many sources are available and modern technology offers access to information and knowledge. Directly related to this is the quality issue of the accessable information and knowledge. Getting access, unlocking, combining, and using the right kind of knowledge in the right place and at the time is a challenge for future education. This forms the basis for our research. We strive to develop new approaches to learning and design new facilitating e-Learning environments.

Traditional education, from primary schools to university level, is organized as a factory where groups of children of similar age are processed, the linear approach being common practice. In the learning process the teacher knows everything, and the student learns from that knowledge. In current times this simple approach to learning no longer facilitates the growing need for education: And access to traditional educational institutions is often limited to specific age-groups; facilitating Lifelong Learning is not the main objective of these traditional educational institutions. They lack flexibility in facilitating students who have a constant need for the gain of knowledge and experience.

In this paper we look for ways, both for increasing the flexibility and efficiency of the traditional learning and for building the ability to make education available for those searching to fulfil their educational needs. The main focus is on the question as to whether the current ICT based developments in learning are able to fulfil these new requirements. This means that the main research question is:

**How do we measure the ability of modern ICT application to the learning requirements in current, highly dynamic, times?**

In the analysis we use three different measures to arrive at a judgement on that field. As measures we link to different learning styles/theories, in line with the theory of learning by sharing we study the ability to facilitate a roles approach to learning and finally we link to our theoretical insights regarding de-linearized learning.

## II.      DETERMINING THE SUITABILITY OF IT IN LEARNING

As laid out in the introduction, our research is aimed at selecting measures that may be used to determine the role IT can play within learning. The following sub-paragraphs will describe the measures we propose to use.

### LEARNING THEORIES

Learning theories are used in science: research is carried out on different learning approaches. Referring to earlier research (A. W. Abcouwer & Smit, 2007) the following learning approaches are recognized.

- In **behaviourism**, learning takes place in a repeated process of action and feedback. The best results are achieved by positive affirmation of behaviour. In Skinner's (1958, 1972) view, learning is the observable change in behaviour. In education the main characteristics of behaviourism are the focus on positive and negative affirmation of behaviour.
- In **cognitivism** learning is established as a response to behaviourism. Apart from the observable behaviour, internal processes are also important (Valcke, 2000). The focus is on knowing and obtaining knowledge, internal mental structures, and guiding the student in using the right learning strategy while at the same time relating new knowledge to existing knowledge.
- In **constructivism** people attach a meaning to their experiences (Bartlett, Burton, & Peim, 2001; Cole & Cole, 2001). The approach starts with a person absorbing experiences into his already existing knowledge (assimilation). A person can rearrange his own concepts in such a manner that the new concept can be included (accommodation). Lev Vygotski and Jerome Bruner added social component to constructivism (Bartlett et al., 2001), making learning a process for developing meaningful concepts on the exchanging of experiences in a realistic context (Cox, 2005; Kolb, 1984; Kral, 2005).
- **Connectivism,** a new learning approach, explains the impact of new technology on learning. Learning was considered an internal process of individuals, but according to connectivism, it may occur outside the individual, within organizations or databases. This theory is based on chaos, network, complexity and self-organization. The connections in learning are more important than we suppose, as "the pipe is more important than the content of it" (Siemens, 2004).

Traditional learning is usually based on the first two learning theories. As shown by Abcouwer and Smit (2010) the use of traditional e-Learning environments like Blackboard or Moodle also points in that direction. In their need for better communication, students use social media: Google Drive, Dropbox, Facebook or WhatsApp as learning facilities, proving that the utilized e-Learning environments mismatch the needs of students and teachers in current times.

Modern e-Learning environments have to facilitate learning along the lines of all four of the learning theories.

**FOCUS ON ROLES: LEARNING BY SHARING**

The modern society learning process is not only the period when children attend school, but a continuous process in someone's life having different phases in different roles. We can identify different stakeholders involved in learning processes. The most relevant stakeholders of the research of Thijssen, Maes, and Vernooij (2002)):

1. **Student** - permanently seeking knowledge and skills for self-development
2. **Teacher** - educates students by way of his studied knowledge that is relevant to the discipline of students' appreciation
3. **Researcher** increases the relevant knowledge to the discipline, sufficiently important and non-trivial
4. **Practitioner** uses (new) knowledge which should be relevant

The link between *practitioner, researcher* and *student* is crucial where an optimization of the learning process is at stake. The practitioner knows from personal experience the relevant knowledge in a practical context. He/she is able to translate this into an actual educational program, relevant to the students. The contact with the student is crucial to understand their

requirements. Based on their experience, the practitioner is able to translate their requirements into learning programs, and then *teacher* role takes over again.
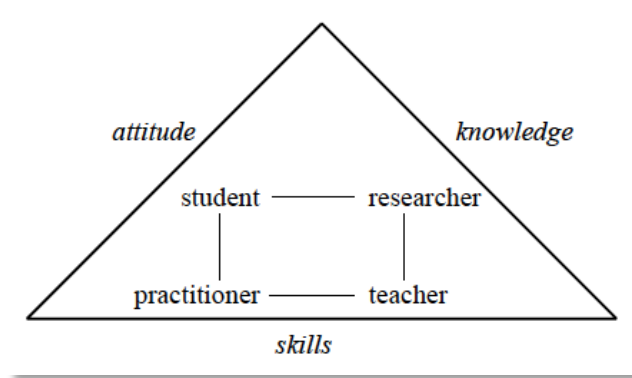


Figure 1 The original Learning by Sharing model

Thijssen and Gijselaers (2006)) publication introduces three types of learning wherein different approaches to roles are followed:

- *Learning by investigating*
  As far as research (learning by investigating) is concerned, the direct link between the scientific world and the business community enables researchers to identify areas in which to conduct truly relevant and innovative research. This ensures the production of useful knowledge, that is, knowledge useful for practitioners (Argyris & Schön, 1996) The notion of researchers as practitioners refers to the empirical testing of a theory, after which it can be adjusted according to (business) practice. In this way, applied research becomes research that is meaningful for business practice.
- *Learning by experimenting*
  The basis for deciding whether or not the accumulated knowledge is valuable can only be found by experimentation. Learning by experimenting is thus an important aspect for the intellectual development of the individual involved in the learning process.
- *Learning through practice*
  At the moment that the relevance of the accumulated knowledge is proven to be valid, the operationalization in actual behaviour has to be practiced. This is the final phase in the learning process, where the knowledge is internalized in actual behaviour and, in extension to the action repertoire, the individual can use it in common practice.

Thijssen et al. (2002) states that one of the challenges of education is the shift from classical sequential education (between ages 4-23), to the lifelong education of today. With this shift, the different roles an individual learner applies will change over time.

Modern e-Learning environments have to facilitate the roles approach and the three distinguishable types of learning.

**MODERN APPROACH TO LEARNING**

In line with the insights as introduced above, we link to the concept of de-linearizing learning as described by Abcouwer et.al (2016) .
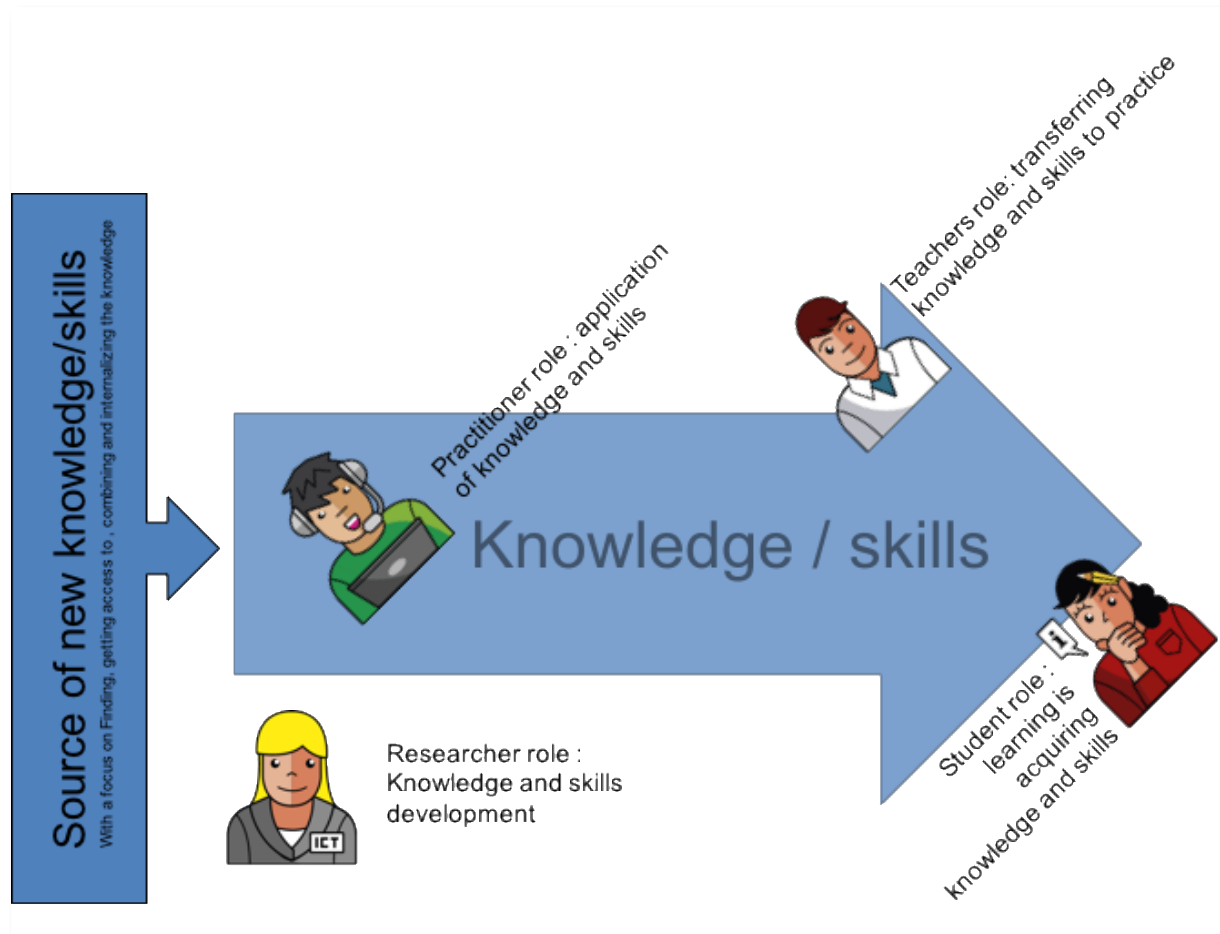
Figure 2 Roles and learning

In figure 2 we visualize the important aspects that form the basis of our approach to learning. Three aspects are relevant. Referring to Abcouwer et.al (2016) we can summarize the requirements for a modern eLearning environment along the following three lines.

1. **The process of acquiring, making accessible, and where necessary, developing new knowledge and skills**.
   The traditional assumption that all knowledge has to be available in a setting where learning takes place is no longer relevant in our rapidly changing world. The process of finding the appropriate knowledge is essential, and has to be studied in full detail, to be able to define the requirements for a collaboration system that facilitates this process;
2. **The actual teaching process**.
   As a consequence, a growing number of specialists will be involved in the teaching process. Thinking in terms of roles individuals play makes it possible to introduce different levels of involvement at an individual, organizational or societal level;
3. **Assessment and quality assurance**.
   The approach taken in our research leads to an extra aspect we should take into account. Given the fact that every person involved in the learning process can play the role of supplier of knowledge (teacher- or researcher-role), the quality of the knowledge itself should be assessed. Where a broader range of stakeholders will be able to add knowledge to the used knowledge base we will also develop mechanisms to remove knowledge that appears to be irrelevant in the context we are working within. In traditional

approaches, the process of choosing which knowledge is relevant is solely assigned to the teacher in cooperation with the researcher/specialist (both being people).

These three requirements of modern learning have to be supported by modern learning methods and e-Learning environments. It is important to refer to the basic switch in concepts that forms the basis for this new approach to learning: the switch from a focus on individuals involved in the learning process to the roles individuals are playing in the learning process itself. When looking at new developments in the e-Learning field, these three aspects of learning should be facilitated by the new learning environment.

### THE IMPACT OF DE-LINEARIZED LEARNING APPROACH TO E-LEARNING

The development of new e-Learning environments has been receiving great attention lately. Within the Horizon2020 program of the EU a special track was initiated called ***Technology for Learning and Skills***. It is based on the assumption that modern technology development has a guiding impact on the developments that take place in learning. The H2020 call describes the e-Learning developments from a technological deterministic perspective. It is our firm belief that this approach only covers part of the main interaction between technology and learning. When choosing a more social constructivist approach to the interaction between technology and society/organization/individual in line with this we may conclude that the domains are intertwined in such a way that the core of the problem of choosing an appropriate technology to facilitate learning has to be studied in the context in which it will take place (Howcroft, Mitev, & Wilson, 2004). Terms such as the 'social shaping of technology' require that a thorough analysis has to be carried out on learning itself. That is the reason that our research started from the perspective of a new approach to learning. Starting from this insight it is possible to come up with an opinion founded upon the value of those new technologies. In the next paragraph we shall apply this approach to a number of technological developments.

## III.    EXAMPLES FOR APPLYING DIGITAL TOOLS IN TEACHING

The suppliers of the traditional e-Learning environments, such as Blackboard, Moodle, Dokeos, Atutor etc., were constantly working on improving their environments in the last decennia. On the other hand, many educational institutions are studying the question whether or not they should stick to the e-Learning environment they are using. Several attempts were undertaken to try to formalize the process of choosing a new e-Learning environment. In a previous research (A. W. Abcouwer & Smit, 2008; A. W. Abcouwer & Smit, 2010) a method of choosing was developed that was mainly built on the assumption that an e-Learning environment should be able to deal with learning within the four learning theories. In this article we sketch a broader approach to deal with the judgement about the appropriateness of e-Learning development. It might be clear that we are unable to cover all the relevant IT developments so we will only look at three examples of developments that we see as important in the current field of education. We will study the following developments:

- Technology to support the flipped classroom
- The introduction of ICT support in commercialized teaching methods
- Focus on web based learning.

These examples are chosen because they are relevant to the Hungarian context where this research was initiated.

### THREE EXAMPLES – A DESCRIPTION

#### Flipped classroom
The flipped classroom concept is a special classroom management method, where the roles known from traditional ways of education swap places: knowledge transfer can take place at home, and deepening of this knowledge at school. Short video lectures are viewed by students at

home or at the beginning of the class session, while in-class time is devoted to exercises, projects, or discussions and more complex questions. The teacher can spend more time on discussions, group exercises and apply diversified activities to deepen the students' knowledge. There is no single model for the flipped classroom—the term is widely used to describe almost any class structure that provides pre-recorded lectures followed by in-class exercises. The benefit of a flipped class lays in the repurposing of class time into a workshop where students can inquire about lecture content, test their skills in applying knowledge, and interact with one another in hands-on activities. In the class, teachers function as coaches or advisors, encouraging students in individual inquiry and collaborative effort.

This development can only take place based on the supportive character of ICT. When a student is unable to take note of the theories, in any IT supported way, the flipped classroom concept will not work.

According to teachers, using the flipped classroom methodology, this method supports active cooperation between students and teachers, and unlike traditional teacher centred education, it gives a helping hand to students. This usually improves their efficiency in learning.

Applying the flipped classroom concept in actual education also offers the opportunity to take advantage of the specific knowledge a student brings in. As a Hungarian teacher stated:

'The most important thing is that valuable time at school is devoted to practicing and understanding instead of plain explanation! In that sense, the input knowledge of the students can be of great help in facilitating other students. This can also take place on the level of primary or secondary education'
Examples he was facing in practice:

- One of his third graders in primary education had valuable input because he knew everything about android watches like the back of his hand!
- To facilitate the sharing of knowledge a seventh grader in primary education, was lecturing the other pupils on the use of YouTube for the class!

**Commercialised learning methods**
At primary and secondary school level, but also at many universities of applied science, teachers (and sometimes school management) decide on the publisher from whom books will be ordered for students. A current development on this field is that publishers develop rich web-environments to support the teachers in using their education methods / books. As an example there is a publisher in Hungary, Mozaik who is really active within this field. When you purchase their schoolbooks, you can register on their site and find extra exercises and games for use in the lessons. You can find a registration code at the end of each book, and using these, students gain access to the website of the company. Available on their website:

- digital versions of the books
- "mozaBook" is a software tool for educational presentations that can be purchased by schools, teachers, parents and students. It can be customized to different user needs, to be used for home learning, or at school by teachers on interactive boards.
- "MozaWeb" is for home learning: there are over 1000 3D models, several hundreds of educational videos, pictures, audio materials, applications and games accessible online, linked to different subjects and curricula. Mozaweb can be accessed through a web browser, it needs no installation.
- "mozaMap" contains digital maps for interactive boards; it extends the toolkit of the geography and history lessons. The elements of these thematic maps can be set up and used individually, making the preparation and management of lessons easier.

- "Euklides" is a plane geometry editor: it helps in solving plotting exercises easily and quickly. Elements can be moved and played around with to make geometry visually more understandable.
- "Euler3D" is a 3D editor: it shows spatial formations and surfaces visible, they can be edited while providing the highest mathematical control.

Furthermore, on the international market of educational methods, this development is relevant.

The basic idea behind this development is to ensure the update of teaching material. In general, the process of facilitating the teacher with actual and new material is organized on a central level. The responsibility as to which information will be added to the knowledge base is assigned to the publisher. These environments do not, or at best in a very limited way, facilitate the addition of knowledge to the knowledge base by teachers of students themselves.

**Web-based learning**

Within different places in the educational field we can identify a development towards introducing web-based environments to facilitate the educational process. This is a rather broad field of developments in many cases based on facilitating learning by means of – often open source – environments that can offer both a standard set of educational materials but also enable teachers and students to organize their own material. Many developments within it can be mentioned here. We give some examples:

An often used environment in Hungary is, in this respect, Geogebra, a tool to be used in teaching Mathematics dynamically. Geogebra is the Graphing Calculator for Functions, Geometry, Algebra, Calculus, Statistics and 3D Math. Students like it because it makes mathematics evident; it sets up a link between geometry and algebra in a new, visual way. The benefit for teachers is that it enables them to stick to teaching. Although it does not replace them, but lets them do what they can the best: TEACH!

Geogebra is dynamic software for mathematics, for all levels of teaching, combining geometry, algebra, spreadsheets, graphic visualization, statistics and analysis on an easy-to-handle platform. GeoGebra has become the lead service provider of the development dynamical mathematics software (Germany, Austria, France, Sweden USA), in the field of teaching natural sciences, technology, engineering and mathematics (STEM), what is more also in the innovation of learning and teaching all around the world.



Figure 3 Geogebra on the world map

In the same line of development, we also refer to the Khan Academy. A web-based learning environment in the field of math-education. An important difference between GeoGebra and Khan

Academy is the limited opportunity to add your own knowledge to the knowledge base of the Khan Academy. Whereas GeoGebra offers a development environment, Khan doesn't offer this function.

A third example of this development is the use of standard Social Media facilities such as wiki's. An example of a development in this field is the website www.adaptivecycle.nl. This site is developed based on a standard mediawiki platform. All the content is developed by the students who participated in classes on virtual organization in a dynamic context. The literature part of this wiki offers a description of almost 300 relevant articles on organizational change. Even though the objective of the wiki was only on facilitating students in successive years of the course the wiki generated international attention of students studying organizational change. The site generates around 15000 visits per month on finding relevant literature, as shown by the heat map in Fig 4 the visitors originate from all over the world. This development is interesting because the knowledge base was only built based on the input of the in the traditional sense so called 'students'. In our view in this case they played the role of researcher / teacher. This directly links the development to the roles model as described earlier.
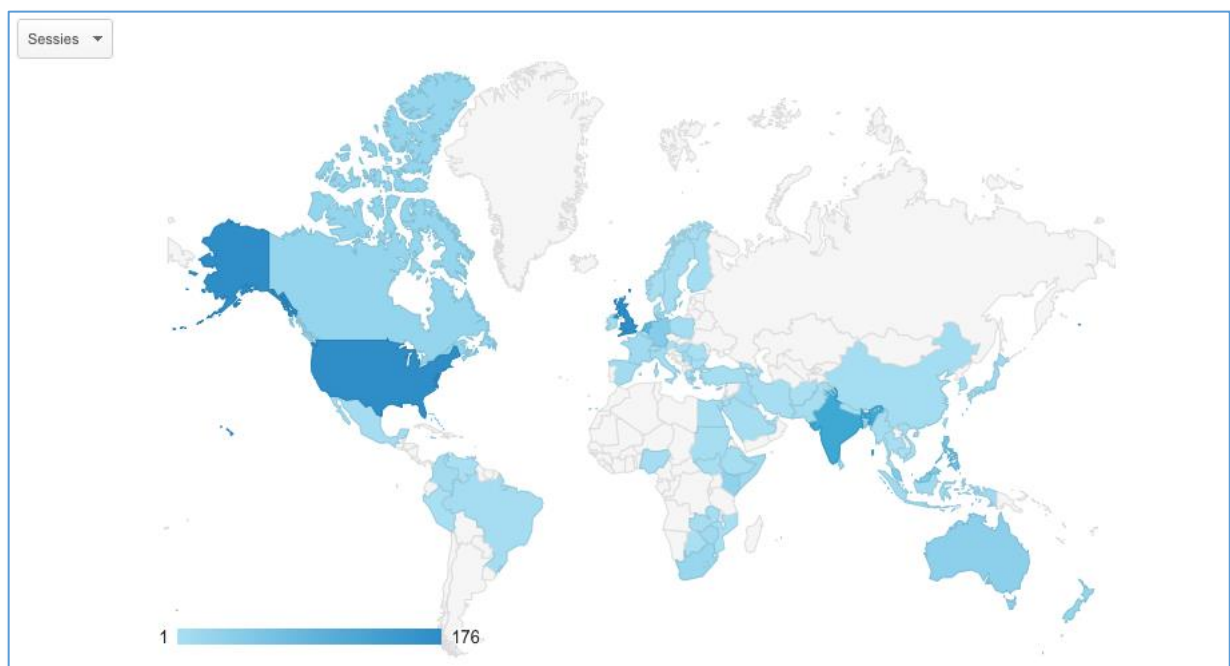


Figure 4 Wiki adaptivecycle.nl is used from all over the world

## IV.    ASSESSMENT OF IT DEVELOPMENTS

### HOW FAR ARE STUDIED DEVELOPMENTS ABLE TO COVER THE FOUR LEARNING THEORETICAL APPROACHES

### Flipped classroom

As mentioned before, the flipped classroom concept is based on a different organization of the learning process. There is no strict limitation regarding who is allowed to contribute to the learning process in the sense of knowledge development. Flipped classroom approaches can easily be applied in a behaviourist or cognitivist approach of teaching. The flexibility of this approach is that it also facilitates learning as a social process where people work together in discovering new fields of knowledge. Compared to many traditional learning approaches, the flipped classroom

concept can thus easily be applied in a constructivist or connectivist approach. In that sense it is a valuable contribution to the learning repertoire in modern teaching.

**Commercialised learning methods**

Assuming that learning is the transfer of knowledge from teacher to student, the development of a knowledge base is one of the main topics learning methods have to deal with. Commercial parties working on the development of learning methods are focusing especially on the development of such a knowledge base. The reason behind this focus is the commercial value of the knowledge base. In modern IT supported learning methods intellectual property is a key issue in current learning models. The concepts of (social) constructivism and the connectivism approach assume a cooperative way of working on the development of the knowledge base for the learning process which isn't in line with the approach of commercialized learning methods with its centralized knowledge base development.

**Web-based learning**

As shown above, the web based learning setting covers a broad field of applications. In the examples as described above we see more or less commercial parties facilitate the development of new learning models. In this respect the same arguments, as described for commercialized learning methods, can be used.  In some cases – like the Khan Academy – the development seems to be based on any kind of engagement towards future developments in society. The third example that we described as a method for web based learning – the website www.adaptivecycle.nl - tries to support the curiosity of people by sharing knowledge and skills.

The examples of the Geogebra and Khan Academy are mainly based on the theoretical approaches of Behaviourism and Cognitivism. The development of the knowledge base is mainly centralized even though Geogebra offers functionality to the teacher to develop their own material. The wiki 'www.adaptivecycle.nl', as with other Social Media based environments, are mainly focusing on the theoretical approaches of (social) constructivism and connectivism. The broad field of applications makes it difficult to summarize in general on the ability of supporting the learning theories.

## HOW DO STUDIED METHODS DEAL WITH LEARNING BY SHARING?

**Flipped classroom**

It is obvious, that in the flipped classroom setting the role of teacher is often taken over by students. Students often play the role of the researcher too, when they search for new information, or for the most up-to-date information on the net. In this case, teachers might become practitioners who justify the relevance of the knowledge the students come up with.

**Commercialised learning methods**

The change of roles in the commercialized methods is not so obvious. Although it is not their own teacher, they usually still play the role of a student during the lesson. The strength of this method is rather in visualization, presenting the lesson in a state of the art way, raising the students' attention to the problems. After the students have become familiar with the new material, they can form a team, together with their teacher, and research the subject.

**Web-based learning**

In the method of web-based learning, we can follow the way teacher and student switch roles again and again. At a certain point, the focus is on the work of one of the students, his or her exercise book is projected on the wall, and the others can follow his/her way of thinking and solving the problem. Of course they would learn from his/her failures, and get involved in problem solving more intensively.
This method definitely facilitates both learning by experimentation and through practice. Students can experiment, try different solutions or different ways leading to a solution, and see the results immediately in a visualized way.

**HOW DO STUDIED METHODS DEAL WITH MODERN APPROACH TO LEARNING?**

**Flipped classroom**

1.  **The process of acquiring, making accessible and where necessary, developing new knowledge and skills.**
    This approach is often used in vocational training, where due to ongoing changes in technology, it is quite impossible to provide students with up-to-date schoolbooks. Besides this, teachers have to pay attention to the enormous amount of information available on the internet, and as to how they can incorporate the continuous online availability into their concept, so that students look at learning as an experience.
2.  **The actual teaching process.**
    The instructional films of the 'Video teacher' don't take away too much time at the beginning of a lesson. So they start the lesson by watching the video. They then ask questions, which gives feedback to the teacher as to where extra explanation is needed. After some explanation from the teacher, they start discussing the topic and as they are short and to the point, they establish the mood and the transfer of knowledge.
3.  **Assessment and quality assurance.**
    For example in Hungary an open source Flipped Classroom environment is available for primary education (http://www.videotanar.hu).  There are 850 videos, 850 tests, 17,000 questions available for learning, repetition and competition as part of a community. It's free of charge. They are tried and tested, the quality of the videos is guaranteed. On the international market many other examples can be referred to. But often teachers themselves develop their own material that is often shared with other educational institutions. In this case quality assurance may become an issue.
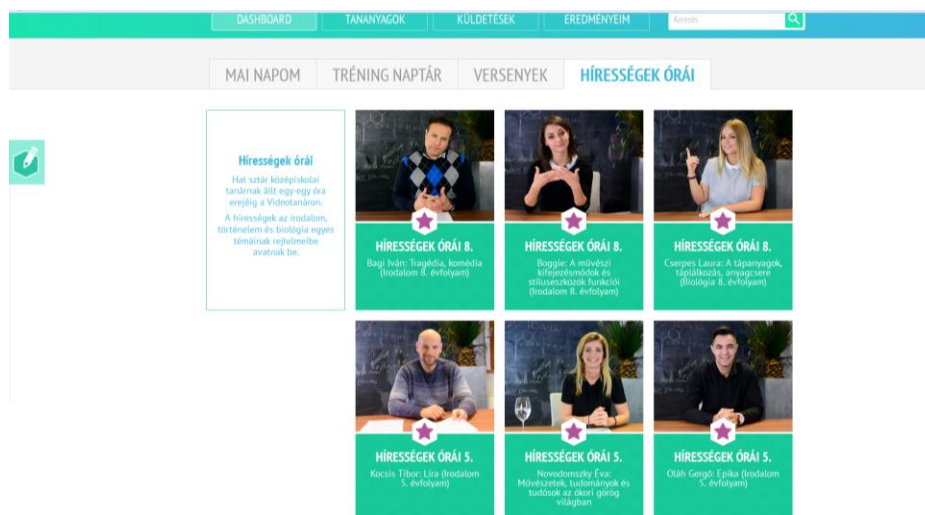


**Commercialised learning methods**

As an example we studied the learning methods as offered by Mozaik, a publisher in Hungary. Other exampled could be added.

1.  The process of acquiring, making accessible and where necessary, developing new knowledge and skills.
    The digital material is provided with the books. Developing new knowledge for others than the publisher is not an option here.
2.  The actual teaching process.
    The access to practical demonstrating material is very useful. Teachers are supported by 3D presentations and easy-to-understand and exciting videos, capturing the attention of the students.
3.  Assessment and quality assurance.

Along with the content of the books, the quality of the digital material is carefully scrutinised centrally. Therefore quality is not an issue here.
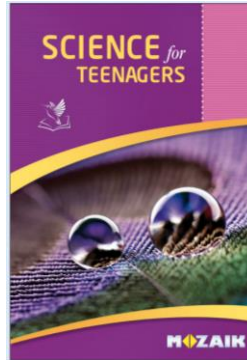






**Web-based learning**

As the examples we used, under this category of development, differ quite a lot a general conclusions are difficult to draw. Below for example some remarks:

1. The process of acquiring, making accessible and, where necessary, developing new knowledge and skills.
   In the case of Geogebra, under the supervision of the teacher, new knowledge can be added with the help of the digital tool.  In the case of Khan adding material is centrally organized, it works in the same way as commercialized learning methods even though there is no commercial motive. In the case of the Wiki, adding knowledge is assigned to all involved in the learning process.

2. The actual teaching process.
   In all three cases, during the lesson, less time is spent on explanation by the teacher, and more on discussion and testing the knowledge of students and how they master the new skills. Underachievers can be helped by those playing the teacher role; smarter students can be given the chance to develop.
3. Assessment and quality assurance.
   In the Geogebra and Khan cases the QA issue is more or less covered due to the mainly centralized approach of learning. In the case of the Wiki there is no formal QA solution implemented. Basic assumption here is that social control will solve this issue.
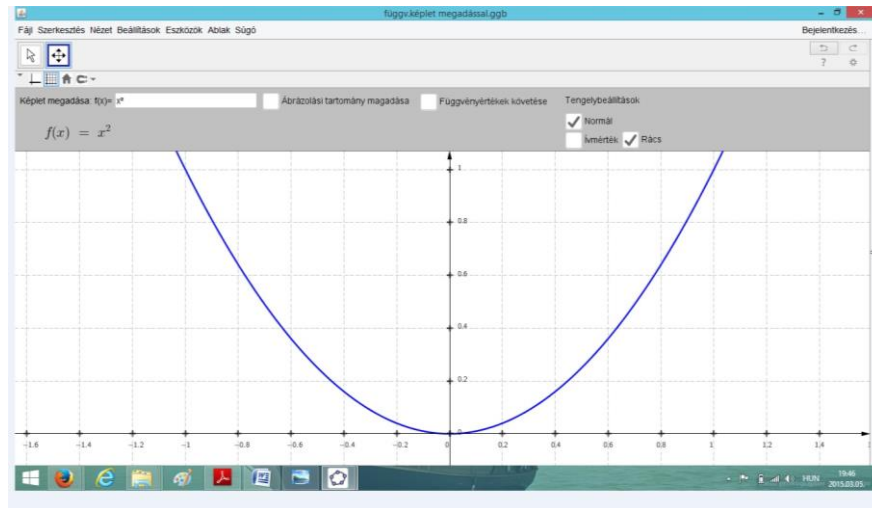


# V.    IT DEVELOPMENTS PLACED IN AN INTERNATIONAL CONTEXT

As the focus in our research is on a different view re learning in general, the identification of a specific target audience isn't an easy task. Where traditional learning, in many cases, focuses on the transfer of knowledge from teacher to student, in this research we extend it to get a broader view on learning and the role of technology in this field. In our view, education should not only focus on transferring knowledge but also on the issue of finding the right knowledge. The sources of knowledge and skills are much broader than in the traditional approach where the teacher and/or researcher play a crucial role. In our approach we assume that everyone can be a source of knowledge and skills. Combining the acquired knowledge and skill towards new insights, and making it available for future use, means that the educational process has to be organized in a completely different way. Thus a new way of quality assurance has to be developed because the source of the knowledge and skill will not automatically be trustworthy enough. Below you find two examples of settings where this alternative approach of learning is of real value given the actual societal setting. These examples give an indication of the target groups for which this approach might be valuable.

**(THE NETHERLANDS) THE ORION FOUNDATION – NEW NEEDS FOR SPECIAL NEEDS EDUCATION**

In the Netherlands the educational system facilitates pupils who have, for whatever reasons a requirement for special needs (physical or mental) education. This is done by organizing what is called schools for special education. The number of pupils, attending this type of education, has grown over the last decades to an – according to the government – too high a level. So a new policy was developed – appropriate education. The objective is to keep the pupils with special needs in regular schools as long as possible. Unfortunately the teachers in these schools do not have the required level of knowledge to supervise these types of children. They are facing the situation that they have to gather the knowledge they need for this new task from all the sources

they are able to gain access to. The knowledge will be made available partly by the former schools for special needs education but also by way of the exchange of experiences between regular schools, being an important source of knowledge. So a broad range of alternative sources will be used and the issue of quality assurance within this field is not automatically covered.

The ORION foundation is responsible for public schools for Special Needs Education in Amsterdam. The number of pupils in these schools is declining because of the above mentioned new policy of the government. For many of the regular schools the specific knowledge of ORION can be of great value. But it is really difficult for these schools to gain access to these sources; some of the specialists who worked for ORION were fired etc. Gaining access, organizing and unlocking the knowledge is not only the task of the regular schools themselves. The ORION schools are also able to make their special knowledge more accessible, for example by organizing knowledge centres. A growing need for technology, facilitating this process, is necessary. Mainstream education will greatly benefit from a situation where the way of organizing the learning process and the technology support, propagated by way of this project, may be effectuated. Certainly, in this situation, new ways of organizing the quality assurance have to be implemented.

**Using new technologies by ORION**

Following this line of reasoning, along with the technology applications in learning as described in this article, we may conclude that ORION will not take advantage of learning approaches mainly based on the transfer of knowledge from teacher to student. This transfer will have to take place, but the sources of knowledge may vary a great deal. The role of the knowledge centres that are under development within ORION is highly focusing on organizing the access to the knowledge where ever it comes from. Assigning the task of building a knowledge base to commercial parties will in most cases be inadequate to deal with the learning requirements of this specific learning setting. De-linearized learning appears to be a much better approach to learning. Approaches based on (social) constructivism and connectivism might in that respect have a much higher impact on the effectivity of learning.

**(ITALY) FACILITATING MIGRANTS IN LEARNING THE LANGUAGE OF THEIR NEW COUNTRY**

In current times a huge stream of new migrants has been entering Europe. They all have a need for learning the language and every country expects that they integrate fully into the society. In the current practice the number of immigrants has risen to such an extent that the educational institutions are no longer able to facilitate all of them immigrants in their educational needs, so different approaches have to be found. In the past, television, radio and other media were used to offer language courses etc. but the needs of new migrants are so broad that this way of working is no longer able to cover all needs. A growing need for Self-Organization in the learning process appears to be key in this situation. Finding knowledge, organizing it and assuring an appropriate quality of the used knowledge are key elements in this specific case. Technology can play a facilitating role in organizing this new approach to learning in this specific context. This situation is difficult when we take into account the findings that came out of a deep analysis conducted by the European Research Institute of 300 migrants/asylum seekers which has provided this data: 35% - illiterate (unable to read and write), 45% - basic knowledge, 19% - vocational studies or knowledge, 1% - university studies, 100% - is a frequent internet user (source: European Research Institute (ERI),          Italy)

**Seeking new technologies for migrants**

Also in the case of this example organizing the learning processes along the lines of de-linearized learning has the ability to be really helpful in improving the effectivity of learning. The arguments for underpinning this reasoning can partly be found in the inability of traditional learning to facilitate these learning requirements. Simply put, the abilities of the current educational systems are highly surpassed by these requirements. In the examples mentioned above, and the

reasoning behind them, these examples may offer some indications for possible solutions to deal with this specific educational setting.

## VI.     SOME CONCLUDING REMARKS

In this article we studied modern IT developments within education in relation to a new approach to learning. This approach is called de-linearized learning and in this paper our focus was on how to measure the effectiveness of IT development in learning. This approach to learning focusses not only on the traditional learning setting of regular education but also pays attention to the special requirements related to Lifelong learning.

We carried out the analysis along three lines, (1) learning theories, (2) roles approach in the actual learning process and (3) the link to de-linearized learning.  It became clear that the three IT developments we studied are not always able to deal with the new requirements related to our view on learning. Further research is necessary. Crucial questions we face are among others:

1.  How do we make use of the broadly spread knowledge in society for improving the quality of the learning process?
2.  When introducing the roles approach to learning what measures should we utilise to be able to ensure high quality education?
3.  When sources of knowledge are so widely spread, how do we organize assessment of the learning process in combination with the quality assurance issue?

As we have seen in the different IT developments we studied, a clear cut approach to answering these types of questions isn't available yet. It is our firm belief that an interesting field of study arises.

## VII.     ABOUT THE AUTHORS

### *Judit Dömölki*

Judit Dömölki is an economist having extensive experience in the development and usage of ICT systems within both business and education. She is an expert on EU funding and has been involved in several R&D projects as a researcher. Being a mother of three children, and having been on the board of the School Foundation for 10 years organizing and managing projects for primary schools, she has experience of the challenges faced from both sides of the fence. Her interests lie in the informal ways of learning, so as to preserve the inborn creativity and innovative nature of children.

### *Toon Abcouwer*

Toon Abcouwer works at the University of Amsterdam. His research interest is on how organizations deal with crisis situations. Especially the different roles that information, and information systems, play in the various phases of crisis handling holds his special interest. It is crucial for management to learn to deal with the problem of integrating those roles into one single Information systems infrastructure.

It is his belief that traditional governance approaches only offer a partial solution for that.

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