Learning Design:
Creating powerful technology-supported learning environments

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Introduction

The interest in learning and how to influence it have been around throughout history. For instance, in this country Seneca and Quintilianus wrote about learning and education in the first century

The scientific study of learning, however, only started at the beginning of the 20th century in the US with Thorndike as one of the pioneers

During that century several perspectives on learning succeeded each other, namely behaviorism, Gestalt psychology, cognitive psychology, constructivism

But overall, notwithstanding high expectations throughout the 20th century about the potential of the scientific study of learning for the improvement of educational practices, the relationship between research and practice remained a rather awkward and not very productive one

The situation started to change in the last decades of the 20ᵗʰ century, due to the emergence of the *learning sciences (LS):* a new interdisciplinary field based on research emanating from cognitive science, computer science, educational psychology, philosophy, sociology, anthropology and applied linguistics

The LS aim at better understanding of learning in different real-world situations, namely in classrooms, in workplaces, in the family, and in informal environments

Researchers in the LS apply a variety of methodologies, such as experimental and quasi-experimental designs as well as qualitative approaches

Important from an educational perspective is that they engage in design-based research focusing on the development and evaluation of innovative learning environments (LEs), and by so doing contributing to the improvement of instructional practices

Le scienze dell'apprendimento

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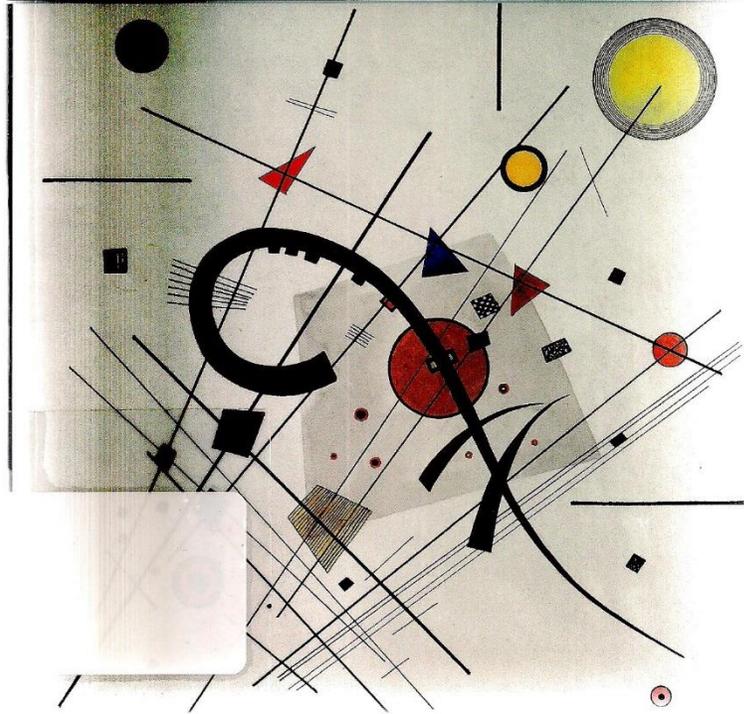
This pursuit of innovative educational practices was supported by rapid changes in society during the late part of the 20th century, especially the development toward a learning society

Indeed, it has repeatedly been observed that education has not been able to keep up with these changes

This has raised the challenge and the growing need to reform education in view of preparing the future generation for the learning society and for today's technologically complex and economically competitive world through the acquisition of high literacy skills, such as critical thinking, solving complex problems, regulating one's own learning, and communication skills

Interestingly, the interdisciplinary research in the LS has and still does substantially contribute to meet this need for new environments for learning by developing and elaborating new perspectives on *the ultimate goal of school education*, and on *the nature of learning* to achieve this goal

Overview

A perspective on the goal of education and the nature of learning

Against this background: the current state-of-the-art of the use of technology for learning in today's classrooms, its shortcomings and needed directions for the future

An example of learning design, namely a design experiment in which technology was used productively in fifth- and sixth-grade classrooms in the format of computer-supported collaborative learning (CSCL)

The latest cutting-edge use of educational technology, namely the MOOCs (Massive Open Online Courses)

Final comments

The goal of education and the nature of productive learning

Traditionally educational psychologists were focused on how to pursue and achieve the objectives of education, but not on determining those goals

However, learning scientists discovered that the challenge of educational reform required reconsidering also the objectives,

namely the need for a shift

- from the traditional focus of learning and teaching on the transition of (surface) knowledge
- toward the acquisition of deep conceptual knowledge and learning and thinking skills

Adaptive competence as the ultimate goal of education

In the report of the European Round-Table mentioned above today's learning society is defined in terms of the following characteristics:

- "learning is accepted as a continuous activity throughout life;

- learners assume responsibility for their own progress;

- assessment is designed to confirm progress rather than to sanction failure;

- personal competence and shared values and team spirit are recognized equally with the pursuit of knowledge;

- and learning is a partnership among students, teachers, parents, employers and the community working together" (p. 15)

Taking this into account, education at all levels must focus more than has been the case on developing and fostering in students' *adaptive expertise/competence* (Hatano & Inagaki, 1986; see also Bransford et al., 2006),

 i.e. *the ability to apply meaningfully learned knowledge and skills flexibly and creatively in a variety of contexts*

opposed to *routine expertise*, i.e. the ability to complete typical school tasks quickly and accurately but without understanding the process that was required to accomplish the task

Adaptive Competence (AC)

Taking also into account research on expertise in a variety of disciplines, there is today a fairly broad consensus that achieving AC in a domain requires the integrated acquisition of several categories of cognitive, motivational and affective components (De Corte, 2012: Ligorio et al.. 2015):

1. A well-organised and flexibly accessible *domain-specific knowledge base* involving the facts, symbols, concepts, and rules that constitute the content of a subject-matter field

2. *Heuristics methods*, i.e*.* search strategies for problem analysis and transformation which do not guarantee but significantly increase the probability of finding the correct solution through a systematic approach to the task (e.g. decomposing a problem into sub-goals)

3. *Metaknowledge*:

> knowledge about one's cognitive functioning (metacognitive knowledge; e.g. knowing that one's cognitive potential can be developed through learning and effort)

> knowledge about one's motivation and emotions that can influence learning (e.g. becoming aware of one's fear of failure in mathematics)

4. *Self-regulation skills:*

> skills for regulating one's cognitive processes (*cognitive self-regulation*; e.g. reflecting on a solution process)

> skills for regulating one's motivation and emotional processes (*motivational self-regulation*; e.g. maintaining attention and motivation to solve a given problem)

5. *Positive affect*: positive emotions and attitudes toward subject-matter domains and toward learning, and positive self-efficacy beliefs

Constructive learning as the road to AC

To pursue AC taking thereby into account the importance of contextual and social factors that affect learning, contemporary school learning should embody more than it has in the past the current prevailing perspective on learning as

*an active/constructive,
* cumulative,
* self-regulated,
* goal-directed,
* situated and collaborative
* individually different process of knowledge and skill building

These features of productive and meaningful learning are well documented by a substantial amount of LS research (De Corte, 2010; De Corte et al., 2015; National Research Council, 2000, 2005; Woolfolk, 2016)

Therefore they can and should guide educational practice

Active/constructive: learning is an effortful and mindful process in which students actively construct their knowledge and skills through reorganization of their already acquired mental structures in interaction with the environment

Cumulative: this characteristic stresses the important impact of students' prior formal as well as informal knowledge on subsequent learning.

Self-regulated: this feature refers to the metacognitive nature of productive learning; indeed, SR of learning means that students manage and monitor their own processes of knowledge building and skill acquisition

> The more students become SR, the more they assume control and agency over their own learning; consequently they become less dependent on external instructional support

> Because research shows that learners do not acquire sophisticated SR spontaneously, it is not only a feature of productive learning, but constitutes in itself a goal of a long-term learning process

Goal-oriented: effective and meaningful learning is facilitated by an explicit orientation toward a goal

> Therefore, it is desirable to support goal-setting activities in students

Situated and collaborative: learning is conceived as an interactive activity between the individual and the physical, social and cultural context and artefacts, and especially through participation in cultural activities and contexts

> In other words, learning is mostly not a purely "solo" activity, but a distributed one: the learning effort is distributed over the individual student, his partners in the learning environment, and the resources and (technological) tools that are available

Individually different: the processes and outcomes of learning vary among students due to individual differences in a diversity of aptitudes that affect learning,

> such as prior knowledge, conceptions of learning, learning styles and strategies, interest, motivation, self-efficacy beliefs, and emotions
> To induce productive learning in students instruction should take into account these differences

authors who argue in favor of direct instruction (e.g. Kirschner, Sweller, & Clark, 2006)

However, based on an analysis of the literature of the past fifty years, Mayer (2004) has concluded that guided discovery/constructive learning leads to better learning results than direct instruction

However, the learning environment should be characterized by an effective balance between
discovery and personal exploration,

and systematic instruction and guidance,

while being sensitive to learners' individual differences in abilities, needs, and motivation

Technology-supported learning: A brief state-of-the-art

The use of technology for education goes back about a century ago when Thomas Edison predicted that the motion picture would revolutionise education, and make books obsolete in schools (Cuban, 1986)

The revolution did not occur

The next cutting-edge educational technology, the radio evoked similar high expectations as is illustrated by the following quote from a 1932 book entitled *Radio: The assistant teacher* by Benjamin Darrow, the founder of the Ohio School of the Air and tireless promoter of radio in classrooms:

"The central and dominant aim of education by radio is to bring the world to the classroom, to make universally available the services of the finest teacher, the inspiration of the greatest leaders." (p. 79)

However, the radio has also never made it in education, and the same happened to its successors, school television in the 1950s and programmed instruction in the 1960s; big promises but ending in a blind alley

The latest cutting-edge technology, the computer and ICT, emerged in schools in the 1980s, and rose even higher optimism and expectations than its predecessors

But again so far these expectations have only partially materialized
The conclusion of the well-known historian of education of Stanford University, Larry Cuban in 2001still largely holds true:

> "The introduction of information technologies into schools over the past two decades has achieved neither the transformation of teaching and learning nor the productivity gains that a coalition of corporate executives, public officials, parents, academics, and educators have sought." (p. 195)

In this respect it is interesting to mention some results of the *Survey of schools: ICT in education. Benchmarking access, use and attitudes to technology in Europe's schools* commissioned by the European Commission (Directorate General Communications Networks, Content and Technology, 2013)

The survey was done in 31 countries (EU 27, Croatia, Iceland, Norway and Turkey), and provides a rich image of the situation in Europe

Here follow a small selection of the average findings, and one should take into account that there are often large differences between countries

Three interesting concept used in the presentation of the outcomes of the survey are:

* digitally supportive schools

* digitally confident and supportive teachers

* digitally confident and supportive students

Digitally supportive schools:

       * have policies about ICT integration in teaching and learning

       * provide concrete support measures such as
             - teacher professional development
             - provision of ICT coordinators

On average only 25-30 % of students in European countries are in such schools

In the survey Italy scores below this average

Fig. 8.1: Percentages of students by school type in terms of policy & support

Fig. 8.1a - at grade 4

Legend:
- School type 1: Strong policy & strong support
- School type 2: Weak policy & strong support
- School type 3: Strong policy & weak support
- School type 4: Weak policy & weak support

EU: 31% 17% 22% 31%

Fig. 8.1b - at grade 8

EU bar labels: 25%   25%   16%   34%

Countries (top to bottom): Czech_Rep, Slovenia, Ireland, Norway, Malta, Lithuania, Bulgaria, Slovakia, Denmark, Belgium, Estonia, Turkey, Austria, Portugal, Latvia, Spain, Sweden, EU, Finland, Poland, Hungary, Romania, Cyprus, France, Italy, Greece, Croatia

X-axis: 0% 20% 40% 60% 80% 100%

Legend:
- ■ School type 1: Strong policy & strong support
- □ School type 2: Weak policy & strong support
- ■ School type 3: Strong policy & weak support
- ■ School type 4: Weak policy & weak support

Fig. 8.1c - at grade 11 general education

	School type 1: Strong policy & strong support	School type 3: Strong policy & weak support
	School type 2: Weak policy & strong support	School type 4: Weak policy & weak support

Chart categories (top to bottom): Slovenia, Denmark, Norway, Malta, Estonia, Cyprus, Bulgaria, Romania, Lithuania, Poland, Croatia, Portugal, France, Spain, Belgium, Sweden, EU, Hungary, Latvia, Czech_Rep, Finland, Slovakia, Ireland, Turkey, Italy, Austria, Greece

EU values: 26% 15% 25% 34%

Fig. 8.1d - at grade 11 vocational education

Legend:
- School type 1: Strong policy & strong support
- School type 2: Weak policy & strong support
- School type 3: Strong policy & weak support
- School type 4: Weak policy & weak support

Countries (top to bottom): Slovenia, Norway, Lithuania, Bulgaria, Austria, Estonia, Portugal, France, Czech_Rep, Spain, Slovakia, Romania, Latvia, Poland, EU, Finland, Croatia, Italy, Belgium, Hungary, Sweden, Turkey, Denmark, Greece, Cyprus

EU: 25% 7% 34% 34%

Digitally confident and supportive teachers

* **have high confidence in their own ICT skills**

* **have positive beliefs about ICT use for teaching and learning**

* **have easy access to ICT infrastructure at school**

In the countries involved in the survey on average only 20-25 % of the students are taught by digitally confident and supportive teachers

Italy scores close to this average in grades 4 and 8, but below the average in grades 11 in general as well as vocational education

Based on these observations the survey rightly concludes:

" These findings pave the way for strongly recommending to policy makers at central/national, regional, local and school level to *massively invest in teacher professional development* as a necessary accompaniment to investing in school ICT infrastructure." (p. 15)

Another complementary recommendation of the survey:

"Policy makers should also dedicate attention to the creation and dissemination of good quality learning resources with the aim of increasing their use by teachers and students during lessons." (p. 11)

One can argue that in the past decades the introduction of technology in education was not managed appropriately by a good business model
From the 1980s computers were massively installed in schools, but the money was massively spent on hardware, whereas good software was often lacking

In accordance with the recommendations of the survey:

to make a chance to be successful in applying ICT in education

* only one third of the resources should be spent on hardware
* one third on the development and dissemination of high-quality
    software
* one third on training teachers in the appropriate application of ICT for
    teaching and learning

Digitally confident and supportive students

have high access to and use of ICT at home AND at school

The survey revealed that on average 30-35 % of the students in Europe are digitally confident and supportive students

Italy approaches this average in grades 8 and 11 general education, but scores below average in grade 11 vocational
One can conclude that also here there is substantial space for improvement

In sum, up to now the situation of ICT use in schools largely confirms Cuban's conclusion of 2001

So one of the conclusions of the survey is:
"There is still a long way to go before ICT permeates schools and teaching." (p. 155)

A few other interesting observations reported in the survey are the following:

* No overall relation was established between high levels of computer availability and the frequency of use by teachers and students
More computers is thus not a sufficient condition for their use

* Although teachers have been familiar with ICT for learning and teaching for some years they still use it mostly to prepare their teaching
They often find it difficult to apply ICT into their teaching; in this respect they need ongoing support, technical but especially also pedagogical, for example by ICT coordinators

This current situation raises the question about the reasons for the successive failures of technology applications to education

A major answer lies in the lack of good dialogue and especially the *persevering conflict between two very different approaches to learning with technology:*
        * *the technology-centered versus*
        * *the learner-centered approach* (Mayer, 2010)

Technology centered approach

the computer is just an add-on to an existing classroom situation without much concern about how the human mind works and how students learn effectively

As argued by Norman (1993), this approach starts from the idea that learners and teachers will adjust to the requirements of the technological tool instead of the tool adapt to the needs of the learners and teachers

Learner-centered approach

* focuses on how students learn
* technology is conceived as an aid and support for learning integrated and adapted to the LE that fits the needs of learners and teachers

This indicates at the same time the direction to go for research and development that aims at contributing to the improvement of classroom practices by designing powerful computer-supported LEs

The next section discusses an example of an intervention study that follows that direction

The study

      * aims at the development of a powerful computer-supported LE for math problem solving

      * is based on the perspective on the goal of education and the constructive nature of learning reviewed above

Because the focus thereby is on learning rather than on teaching, this approach should be called *learning design* rather than instructional design (see also Laurillard, 2016)

Designing a computer-supported collaborative learning environment for mathematics problem solving

Theoretical background

A CSLE was designed that facilitates the distributed learning of problem solving and problem posing skills in upper primary school children

In doing so two strands of theory and research were combined and integrated

- First line: the (meta-)cognitive aspects of collaborative knowledge building supported by Knowledge Forum (KF): a series of cognitive tools
    * for constructing and storing notes
    * for sharing notes and exchanging comments on them
    - for scaffolding students in their acquisition of specific cognitive operations and concepts (Scardamalia, 2004)
- Second: intervention research focused on the development in students of genuine mathematical problem solving skills in line with the view of constructive learning discussed above (De Corte & Verschaffel, 2006)

Combining these two strands of theory and research resulted in a LE wherein students, under the guidance of their regular teacher and using KF, learned

* collaboratively to solve and to pose math problems

* to communicate about and reflect on their problem-solving processes

starting from the shared descriptions and mutual comments on their solution strategies

The study also intended to elaborate an effective strategy to guide and support teachers in the embedded appropriate use of cognitive technological tools in their teaching of math problem solving

Aims and basic features of the collaborative LE

Overall aim:
   to guide and support upper primary school students in becoming more motivated, strategic, communicative, mindful, and SR solvers and posers of math problems

This general aim can be specified in terms of three subgoals:

   * **Acquisition by students, guided by the teacher and supported by the KF tools, of a five-step SR strategy for solving and posing problems**

   * **Developing in pupils positive beliefs and attitudes toward (learning) math problem solving**

   * **Acquisition by students of collaboration and communication skills in problem solving, using the technological tools involved in KF**

Key features of the LE:

* Use of a varied set of non-traditional, complex, realistic, and challenging problems that elicit and enhance the application of cognitive and metacognitive strategies

* Application of highly interactive and collaborative instructional techniques (esp. small-group activities and whole-class discussions) supported by KF

* Creation of a fundamentally changed classroom culture based on new social and socio-mathematical norms

* Gradual removal (taking into account students' increasing mastery of the problem-solving strategy as well as their skills in using KF) of the external regulation by the teacher in favor of SR by the learners

Specification and implementation of the LE

Each of the participating classes spent about two hours a week in the learning environment over a period of 15 weeks divided in 4 phases

Phase 1: 2 teaching learning units (TLU) of 1 week:
Introduction by the teacher and exploration by the students of the five-step problem-solving strategy and the software tool KF

Phase 2: 3 TLU of 1 week:
* Students solved in groups of 3 a problem presented in KF by a comic- strip character called FIXIT
* Initially they could use scaffolds given by FIXIT in the form of KF-notes providing strategic help for solving problems
* They imported their solution but also their solution strategy in KF, on which the teacher (through FIXIT) made comments in KF before the second lesson at the end of the week
* During that lesson a whole-class discussion was organized about the solutions and solution strategies of the different groups taking into account the teacher's comments (presented by FIXIT)

Traffic jam problem

Hello, here I am again.
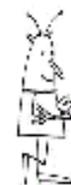
I've got a new 'Problem of the Week' for you. Did you read the news papers last week? Well, if you did, you probably have read the news about the huge traffic jams last Monday. On that day there were several traffic jams, due to a strike of the railway workers and a severe car accident near Brussels.

When a jam gets really long, we normally speak about a 'monster jam'. On the picture below you can see such a really long 'monster jam'. On the high way from Ostend to Brussels there was a enormously huge traffic jam, that was 25 km long at a given moment. I was wondering how many vehicles were in that trafficjam...

Help note for traffic jam problem

Have you noticed that we're dealing once again with a rather unusual problem? Unlike traditional word problems, the traffic jam problem does not contain all the data you need for solving the problem.
To find out how many vehicles there are in a 25-kilometers-long traffic jam, you must take in account several things that are not mentioned in the problem statement.
What do you have to take into account, before you can start calculating? Make a list of all these missing data. I'm sure you can find a lot of them, if you take a close look at the picture of the traffic jam.
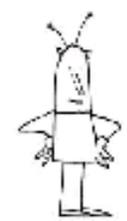
But I'm afraid that a simple list of missing data is not enough... You still have to find the proportions and the dimensions of these things.

Step 1:
- How many vehicles are there approximately in the traffic jam?
- The jam is 25 kilometers long and there are 3 lanes
- There are 3 lanes and there are cars as well as trucks and busses and there is always some space between 2 vehicles
- There are big cars and small cars

Step 2:
- We fill 1 lane up with trucks and busses
- On the second lane we place small cars of 3 meters long
- On the third lane there are big cars with a length of 4 meters
- The space between 2 vehicles truck is approximately 1 meter
- Now we can take everything together and we can start computing

Step 3:
- 25 kilometers = 25000 meters
- 25000 meters : 9 meters = 2777 (because a truck or a bus is 9 meters long). But between each truck or bus, there is always 1 meter. Therefore we have to take 10 meters (the 9 meters of the truck and 1 meter space). That makes 25000 meters : 10 meters = 2500.
- We take 4-meter cars and 3-meter cars and 1 meter between the cars. 25000 meters : 4 meters = 6250 cars and 25000 meters : 5 meters = 5000.
- That makes: 2500 trucks + 6250 little cars + 5000 bigger cars = 13750 vehicles

Reaction Note

Hello!! Thanks for all your answers! I think this 'Traffic Jam Problem' was a little bit more complicated than the first problem you tried to solve last week. Don't you think so?

Nevertheless you all have done a splendid job. So, let's have a look at all your answers. Just as last time, we will look at the solution process step by step...
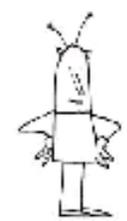
Step 1: I try to understand the problem

· What is the actual question?

That's obvious I think: how many vehicles are approximately standing in the traffic jam of 25 kilometers?

A key word in the question is 'approximately'. That means that you don't have to give an exact answer, but only an approximation or an estimation. That's very important!

Document: Done

Start   Web Knowle...   ik ben in leuven...   Bestandsbeheer   Microsoft Word   Microsoft Power...   14:33

Phase 3: 3 TLU of 2 weeks:
* Students continued to work on complex problems (2 weeks per problem) presented by FIXIT in KF
* The scaffolds were gradually withdrawn as students made progress
* They were encouraged to read the work of other groups and to comment on it in KF before the whole-class discussion at the end of the second week

Phase 4: 2 TLU of 2 weeks:
* In the beginning of each of the 2 week periods the groups had to pose a problem themselves which they imported in KF
* They had to solve at least one problem posed by another group
* Each group acted as coach for the other groups with respect to their own problem
* The products of all the work – problems posed, solutions given by the groups, and possible comments – were imported in KF, and were again the object of whole-class discussion and reflection at the end of the 2 week period

The learning environment was implemented in 2 fifth-grade and 2 sixth-grade classes of a Flemish primary school

A computer was available in each classroom

In addition teachers and students had access to a room with a large number of computers all networked to a common server

The design of the teaching materials and the interactions with the students via KF (through FIXIT) was done by the research team in consultation with the teachers

However, the lessons were taught by the regular classroom teachers who were also responsible

  * for coaching of the students during the small-group activities and
  * for monitoring the whole-class discussions

A pretest-posttest quasi-experimental design was used to assess the cognitive, metacognitive, and affective effects of the LE on the students

A variety of instruments:

> * a word problem test
> * several questionnaires
> * log-files analysis
> * classroom observations using video-registration
> * interviews with students and teachers

In addition qualitative data were gathered
> * about the implementation of the LE
> * about the changes in students' and teachers' mathematical thinking and
> > communication processes

Results

The cognitive, metacognitive, and affective effects of the CSCL-environment on the students were mixed

The results of the word problem pretest and posttest showed that the LE had

      * a significant positive effect on the PS competency of the 6th graders
      * but not of the 5th graders

Questionnaire data revealed no significant positive impact

      * on children's pleasure and persistence in solving word problems

      * nor on their beliefs about and attitudes toward learning and teaching math problem solving

However, the CSCL-environment yielded a significant positive influence

      * on students' beliefs about and attitudes toward (collaborative) learning in general

      * toward computer-supported learning in particular

Overall the observed effects were certainly not as strong as expected
Probably this is due to the fact that the LE overwhelmed the teachers as well as the students (especially the 5th graders) simultaneously with too many new components

Nevertheless the outcomes are promising: they support the standpoint that our current understanding of productive learning as a constructive, collaborative, and progressively more self-regulated process can guide the design of novel, technology-supported, but *also practically applicable LEs* that are powerful in view of boosting upper primary school students' competence in a domain

The data of the teacher evaluation forms administered throughout the intervention and the answers during the final interviews, showed that the teachers were very enthusiastic about their participation and involvement

Their positive appreciation of the LE related to both, the approach to the teaching of PS as well as the use of KF as a supporting tool for learning
For instance, they reported several positive developments observed in their pupils, such as a more mindful and reflective approach to word problems

The LE was enthusiastically received by most of the students

Throughout the lessons and in reaction to FIXIT's farewell note at the end of the intervention, they expressed that

> they liked this way of doing word problems much more than the traditional approach

Many of the students also reported to have learned something new, both

> * about information technology
> * about math problem solving

Niets leuker dan een goed vraagstuk

DIEST

In de Diestse basisschool Voorzienigheid doen de leerlingen van het vijfde en zesde jaar de jongste tijd niets liever dan vraagstukken oplossen. Via Internet chatten de jongeren nu over hun wiskundeproblemen, die er meteen een stuk anders uitzien dan de traditionele vraagstukken. Gisteren hadden ze er nog een hekel aan, vandaag vinden ze hun vraagstukken zowaar tof. Wij stonden erbij en zagen dat het kan.

De basisschool Voorzienigheid werkt mee aan een Europees project, dat geleid wordt door twee vooraanstaande professoren uit de onderwijswereld. ,,Vijf landen en acht universiteiten werken samen aan de ontwikkeling van verschillende vormen van computerondersteund samenwerkend leren. De KU Leuven ontwierp zo een programma om via het Internet een andere vraagstukkenstrategie te volgen. We willen van vraagstukken niet langer oersaaie wiskundeproblemen maken, maar realistische en levensechte vragen,'' vertelt Stijn Dhert, die het proefproject in de Diestse basisschool begeleidt.

,,We stappen af van de klassieke vraagstukken waar je de gegevens maar moet uit puren om het probleem op te lossen. Krijg je in het dagelijkse leven te maken met een probleem, staat de weg naar de oplossing ook niet meteen op papier. Bij de nieuwe vraagstukken moeten leerlingen zelf op zoek naar de gegevens die ze nodig hebben om een oplossing te bedenken. Een voorbeeld: tussen Brussel en Oostende staat een file van 25 kilometer. Hoeveel voertuigen staan daar ongeveer in? Ze moeten zelf onder meer op zoek naar de gemiddelde lengte van een wagen, de gemiddelde afstand tussen twee voertuigen en het aantal rijstroken. Voorlopig chatten de vijfde- en zesdeklassers over de vraagstukken met andere leerlingen uit hun klas. Vanaf volgende week doen ze dat met de leerlingen van een Amsterdamse school die ook in het project stapt.''

,,Intussen mogen we op basis van krantenartikels zelf vraagstukken bedenken,'' vertellen Romina, Stefanie en Elien, alias *De Tweety's*. ,,Dat is het leukst omdat we dan zelf niet moeten rekenen. Een ander groepje moet ons vraagstuk oplossen. Daarna mailen ze hun oplossing en geven wij er commentaar op. Dat is ook tof, want we schrijven er altijd iets geks bij. Vroeger waren vraagstukken helemaal niet tof. Nu wel, omdat we op de computer en op Internet mogen werken. Vooral Internet is tof. Daar kan je brieven mee schrijven waar geen postzegel op moet, en je leert er vanalles mee. Ik zou thuis heel graag Internet hebben. Ik zeur er al een hele tijd voor, maar het lukt niet. Papa heeft Internet op zijn werk, en ik op school en dat vinden mijn mama en papa al genoeg. Spijtig,'' vindt Stefanie (10).

De Surfers tokkelen ondertussen druk voort op de computer. Similia, Johan, Bernard en Babette controleren het antwoord op hun vraagstuk. ,,Ze losten het goed op,'' weet Bernard. ,,Maar wij losten hun vraagstuk ook juist op, hoor. Ze maakten het eigenlijk te makkelijk. Wij bedachten een moeilijker vraagstuk. Wil je het zien?'' Voor we het weten, kijken we naar een probleem van pretparken, die een investering moeten terugverdienen en zich afvragen hoeveel bezoekers daarvoor nodig zijn. ,,Niet makkelijk,'' kijkt Johan (11) tevreden. ,,Maar toch veel toffer dan die vraagstukken van vroeger.''

(VCR)
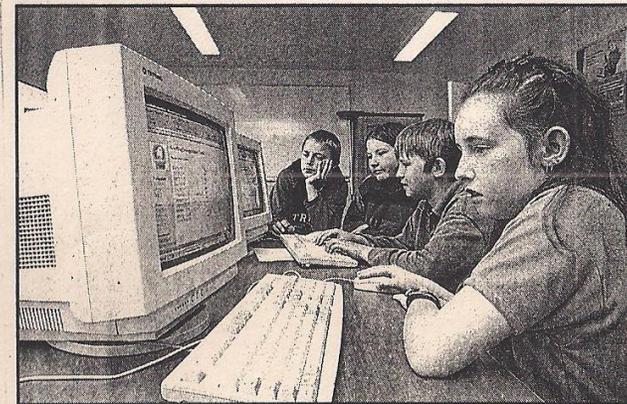
FOTO JEF COLLAER

In Diest chatten vijfde- en zesdeklassers over hun gloednieuwe vraagstukken, die ze nog leuk vinden ook.

Although the results are promising, their significance in view of the large-scale innovation of classroom practices should not be overrated

Indeed, the effective implementation of such new LEs places extremely high demands on the teachers; therefore, it requires substantial teacher support

Ample research evidence shows that introducing new learning materials based on a new view of learning and teaching does not lead easily nor automatically to a high-fidelity and sustained implementation

Teachers play an active role in the implementation of teaching and curriculum materials: they interpret the new ideas through their prior knowledge, beliefs and experiences and this often results in the integration, if not neutralization, in traditional practices

Therefore, as already argued, an indispensable condition for success is investing in intensive teacher training and professional development,
   whereby teachers are immersed in LEs that embody the new perspective on learning and teaching that they are expected to implement in their own classroom practice

MOOCs (Massive Open Online Courses): An educational technology breakthrough?

- **Initiated in the US in 2008: Massive Open On-line Courses movement has recently become a hype, especially in the international HE space**

- **The New York Times: 2012 to be the year of the MOOCs**

- **Since then the movement has raised a lot of interest and discussion**

- **It reached and evolved in Europe in the past years, especially since the launch in April 2013 of OpenupEd: a pan-European initiative around MOOCs coordinated by EADTU (European Association of Distance Teaching Universities)**

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- **Near the end of 2015 the European MOOCs scoreboard stood at 1705 (http://www.openeducationeuropa.eu/nl/european_scoreboard_moocs).**

MOOCs can be seen as the latest sophisticated development in e-learning that uses electronic media and ICT to create virtual LEs

In contrast to OER (Open Educational Resources), MOOCs not only disseminate content knowledge, but also involve a pedagogical component

MOOCs thus expand access to content to an educational experience through digital learning platforms

Although this applies in principle for all MOOCs, today MOOCs remain relatively poorly defined

The following definition (Jansen & Schuwer, 2015) is shared by many European partners in the MOOCs movement:

"online courses designed for large numbers of participants, that can be accessed by anyone anywhere as long as they have an internet connection, are open to everyone without entry qualifications, and offer a full/complete course experience for free." (p. 13)

Possible benefits or promises of MOOCs:

- **Promoting democratization of HE by providing open access to knowledge and training**
- **Transforming learning models, for instance, stronger focus on learning instead of teaching, more accent on pedagogy besides content**
- **Development of blended models of learning: well-thought out mix of online and classroom face-to-face teaching and learning activities**
- **Design of new forms of assessment and certification**

- **Important side-effect: induces in HE institutions more attention for and concern about teaching and learning, and can incite teachers to reflect on the content of their courses and the quality of their teaching**

Criticisms and limitations:

- **High drop-out rates, up to 90%, often because of lack of incentive or having no one to turn to for help**
- **More interest from advantaged students and more interest from non-formal than formal education**
- **Interest for MOOCs in traditional universities is at the most modest**
- **The educational quality of many MOOCs is weak: based on a traditional model of education ("new wine in old bottles")**
- **Notwithstanding claims of diversity and innovation, MOOCs involve the risk of increasing standardization, homogenization, and uniformity of knowledge and curricula in HE**

Looking into the future

In 2014 book *The war on learning: Gaining ground in the digital university* Elizabeth Losh argues:
"Yet there has been surprisingly little empirical study of student experience in MOOC education and a paucity of independent research in general." (p. 127)

Two very important unresolved issues that are lacking in the available investigations:
　　　*the quality of MOOC education
　　　*the assessment of student work

There is thus in a future perspective an urgent need for high-quality peer-reviewed research about MOOCs education
Such enquiry is the more important because there are signs of reluctance toward MOOCs on the side of the traditional colleges and universities
Therefore, at least two additional issues for research and development are:
　　　(1) the elaboration of an implementation strategy for the appropriate ICT
　　　　　integration, and
　　　(2) the professional development of teachers

THE WAR ON LEARNING

GAINING GROUND IN THE DIGITAL UNIVERSITY

ELIZABETH LOSH
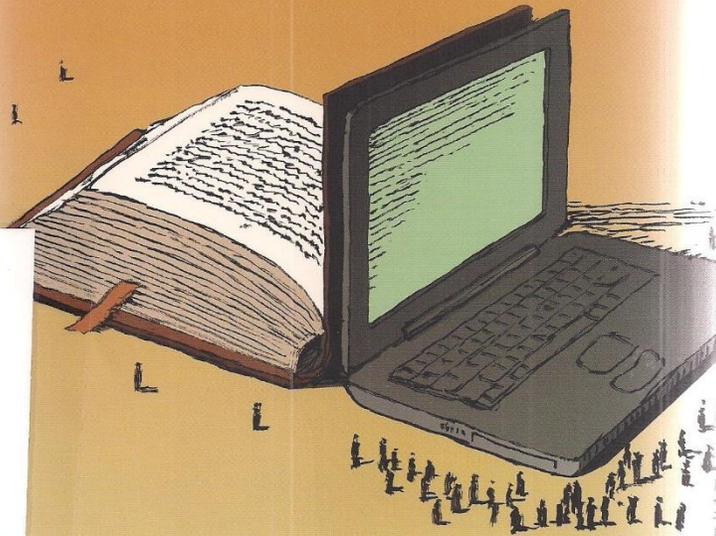
This needed research will not happen overnight, and an interesting issue is what can be expected with regard to MOOCs in the near future

There is by now not a clear answer, uncertainty being the only certainty

As illustrated by the recent book *From books to MOOCs? Emerging models of learning and teaching in higher education* (De Corte, Engwall, & Teichler, 2016), there are in this respect currently differences in vision and perspectives in educational circles

But there is certainly general agreement on one point:
   the MOOCs movement will have impact on the future of higher education and education in general

For instance, one likely trend might be the development of hybrid models combining online learning with classroom teaching, such as the flipped classroom model

From Books to MOOCS?
Emerging Models of Learning and Teaching in Higher Education
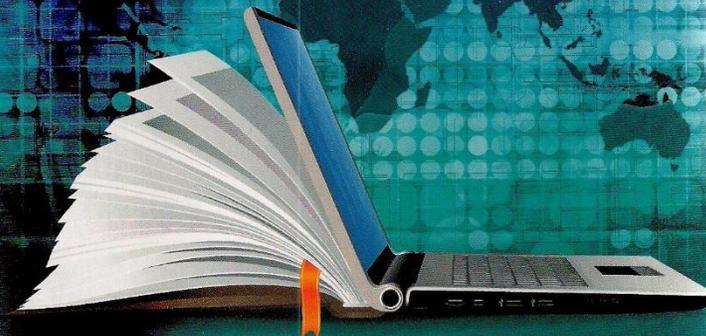
Edited by

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Lars Engwall
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PORTLAND
PRESS

Final comments

No doubt: technology can make a substantial contribution to the innovation and improvement of educational practices

However, it is obvious that the high expectations that rose in the early 1980s have so far not been realized

This was recently again confirmed in an article of the American magazine *Education Week* (June 2016). The conclusion of a survey of the Education Week Research Center involving 700 classroom teachers and school-based instructional specialists sounds:

"Teachers still struggling to use tech to transform instruction."

However, over the past years the educational technology and the educational research communities have become more and more aware of the weaknesses of past application of ICT for education

In this respect several recommendations can be put forward

First, a radical switch is needed from a technology-based approach to a _learning-centered approach_ (Mayer, 2010)
>   *based on a constructive perspective on learning
>   *considering technology as an aid and support for learning integrated in
>   and adapted to an innovative LE

Second, implementing this approach should be _supported by high-quality research, especially learning design research_ aiming at the development and evaluation of novel (collaborative) technology-supported LEs

In terms of Stoke's (1997) quadrant model of scientific inquiry, such design studies can correctly be situated in Pasteur's quadrant, which represents use-inspired basic research

Indeed, learning design experiments aim at the simultaneous pursuit of
>   * advancement of our theoretical understanding of the processes of
>   learning and teaching
>   * innovation and improvement of classroom practices (De Corte, 2014)

Third, in line with the recommendation in the 2013 *Survey of schools: ICT in education. Benchmarking access, use and attitudes to technology in Europe's schools,* substantial attention should be paid to *the training and professional development of teachers*

The survey recommends that all countries make ICT a compulsory component of initial teacher education, and argues that
 "Evidence shows also that increasing professional development opportunities for teachers is an efficient way of boosting ICT use in teaching and learning since it helps build highly confident and positive teachers." (p. 156)

But even if teachers have access and positive attitudes towards using ICT in their classroom practice, they often still need technological as well as pedagogical guidance and support

In this respect it is important that schools dispose of ICT coordinators who have sufficient expertise to provide the necessary support

We are confident of ourself

Thank you for your attention

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