# IMPROVING THE PROFESSIONAL SKILLS IN GREEN CONSTRUCTIONS THROUGH ONLINE TRAINING

**Erasmus+ Strategic Partnership KA2**

**No. 2017-1- LV01-KA202- 035483**

## DESIGN INTERACTIVE MODULES

## O5 - Final Report

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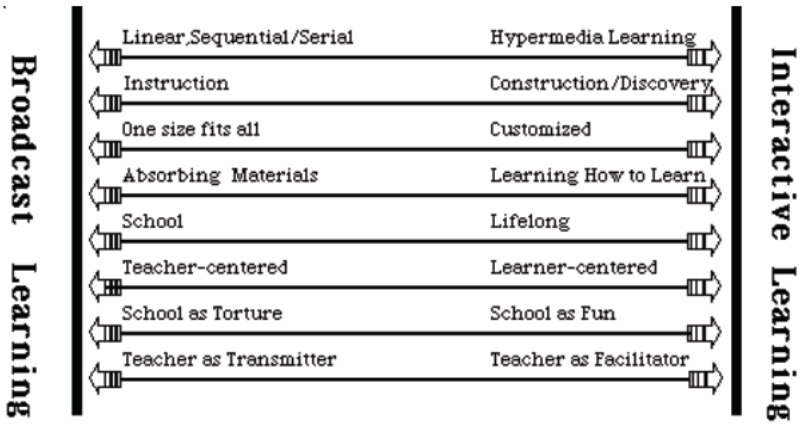
## 1. INTRODUCTION

Active learning is broadly defined as "any instructional method that engages students in the learning process" (Prince, 2004; Michael, 2006) and is associated with student engagement and critical thinking (O'Dowd & Aguilar-Roca, 2009). The flipped classroom offers the potential for on demand feedback and interaction with the educator through this active learning process. While active learning is not a new approach, more time and focus is given to it as a key element of the process. Using the flipped classroom approach, time is given to allow students to actively construct knowledge in a meaningful manner under the supervision and guidance of the educator. This allows both students and educators to assess and evaluate the learning (Huba &Freed, 2000) and, if necessary, "fix faulty models" (Michael, 2006).

Research shows that active learning is a powerful tool. The benefits for students is the development of abilities that are crucial for learners, such as, critical thinking, team-work and informational literacy. It encourages learners to be self-directed which is a significant skill that students will need to acquire in order to be successful in the 21st century.

The term '*interactivity*' originated from computer technology, referring to human-computer communication through the specific user interfaces and interactions with software systems. The term has a special, extended meaning related to educational multimedia because interactivity - shifting the learner's role from observer to participant - is a dominant factor in the improvement of the effectiveness of the learning process.

Donald Tapscott (1998) acknowledged that the increasing availability of digital media and technologies can represent the continuing shift to more interactive learning.




Learning technologies from broadcast to interactive learning



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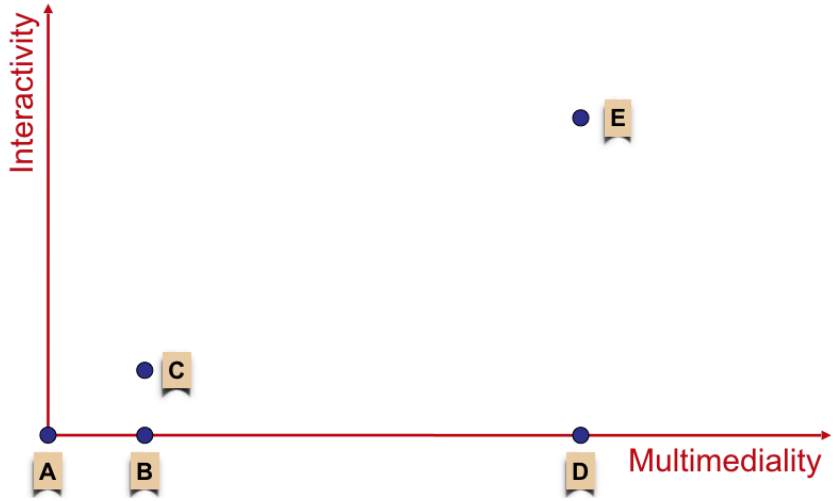
Let's try to place the educational resources in the underlying diagram in which an axis indicates the level of multimedia of the resource, the other indicates its interactivity. At the intersection of the axes (point A) there is a resource in which the degree of multimedia and interactivity is zero. Let us assume, for convenience, that this point corresponds to texts only (although, if you want to be picky, the printed text is also a medium and the reading operation is also an interaction between the reader and the printed page).




The traditional educational resources, I mean the books, consist of texts with some images, so they are placed on the axis of the abscissas (multimedia), but rather close to the origin of the axes: low multimedia and no interactivity (point B). A book that contains questions and the right answers, perhaps with feedback, starts to have a bit of interactivity (point C).

A resource containing text, images, a video and a simulation will be found far along the multimedia axis but may not have any level of interactivity (point D), but if the user can manipulate the simulation parameters and to see the effect and if the resource proposes different paths according to the right or wrong answer to questions, then it will be very forward also along the axis of interactivity (point E).

Thinking of where the resource we have available or we want to create is placed on this diagram can be useful. In particular it is appropriate to reason both on the level of multimedia and on that of interactivity.

The plurality of media helps understanding (the image above, for example, helps better understand the reasoning made) as well as playing a role in drawing our students' attention. But multimedia objects may require "passive" attention while it is important to promote the student's engagement, because it is what stimulates reflection. For example, think of the difference between having read the



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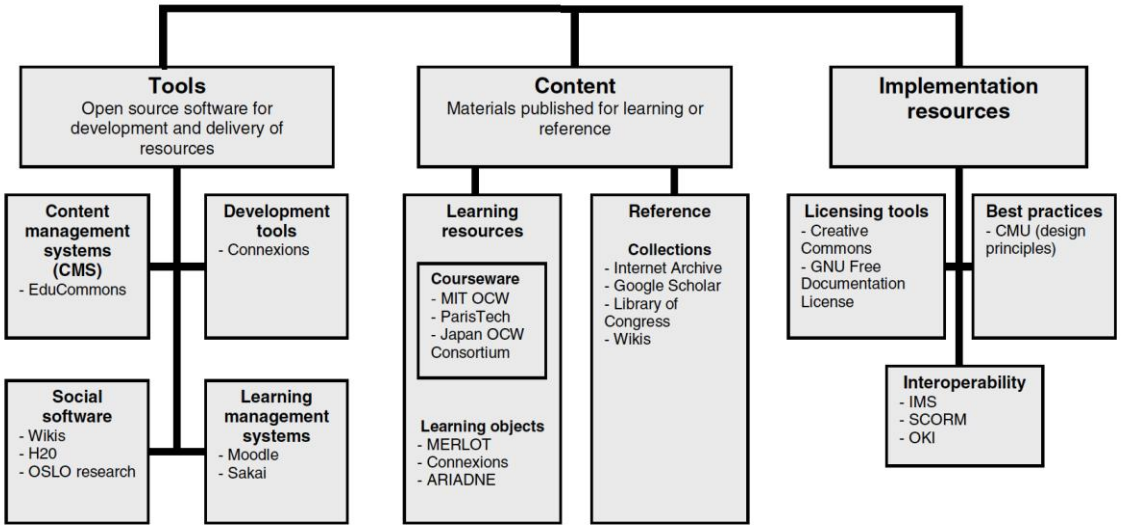
text above and having to respond to the request to place the points C, D and E in the correct position (with feedback if you did not put them correctly).

It is not a matter of surprising with special effects. It refers to pedagogical objectives and the context in which resources are used.

And it is important to realize that the transition to digital opens up non-existent possibilities in the old analogical didactics. In some cases, we simply want to make digital resources designed for the analogical context, but we should strive to imagine, in many cases, new resources, unthinkable in the analogical context.

## TYPES OF DIGITAL LEARNING RESOURCES

A wide variety of objects and online materials can be classified as educational resources, from courses and course components. Over time the term has come to cover not only content, but also learning and content management software and content development tools, and standards and licensing tools for publishing digital resources, which allow users to adapt resources in accordance with their cultural, curricular and pedagogical requirements. This illustrates the main groups of digital learning resources.




*Source*: Margulies, 2005.

Learning content: Full courses, courseware, content modules, learning objects, collections and journals



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Tools: Software to support the development, use, reuse and delivery of learning content, including searching and organization of content, content and learning management systems, content development tools, and online learning communities.

Implementation resources: Intellectual property licenses to promote open publishing of materials, design principles of best practice and localize content

## NEW TEACHING ROLES

The era of information society is not the first one when the importance of students' activity arose. Good teachers always knew exactly how important is not letting students be only the passive participants of lessons. According to the constructivist approach learning is creative process and its effectiveness depends on one hand on the personal talents of students and on the other hand on the environment. Knowledge is a result of social cooperation developed in interaction with the environment. Teachers are not responsible for giving new knowledge but for supporting student in "building up" their knowledge.

According to the objectivist approach knowledge and the abilities needed for solving a given problem can be exactly (objectively) determined. This precisely defined "knowledge pack" can be handed over to another person's as a finished product, who as a simple receiver, do not have to make any special activity or effort.

Teachers with objectivist approach:

- Summarizes knowledge in his/her presentations (assembles knowledge packs);
- Presents facts and logical coherences;
- illustrates how problems or tasks can be solved with the knowledge pack;
- Gives practicing exercises and evaluates the results.

Teachers with constructivist approach:

- Start with raising problems with examples and situations;
- Help students find the solutions, have students "discover" the method;
- Organize, complement and summarize thoughts upcoming during the solution process.

Teaching with objectivist approach is simpler from the teaching point of view and requires less investment but there is a high risk of providing unrealistic and less useful knowledge. Students enrolled from secondary schools to universities and not knowing how to calculate percentage (even with calculators) possibly have this kind of educational background.



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Certainly constructivist teaching cannot be applied always in every situation. In some cases "knowledge packs" must be provided and it is justified in higher education. However good teachers know exactly in what ratio these two methods should be applied.

Problem focusing tendency is getting more and more emphasized though as a pedagogical trend it is not new at all. It appeared in reform-pedagogy at the beginning of the 20th century[1]. In this approach problems selected according to students' needs (suitable for the features of age and individual environment) are put in the focus of the teaching / learning process.

According to the method passing any knowledge should be started with the upraising of such problems (examples) which are interesting for students and have some importance therefore suitable for raising interest. Learning is not just mediating knowledge but a process with students standing in the middle. According to this tendency we do not simply talk about learning but learning environment (this is what Dewey mentioned in the beginning of the 19th century) wherein:

- Students participate actively;
- teachers are not present as autocrats but as mentors and tutors;
- Knowledge is developed in cooperation and interactions as a result of social environment.

While in the 20th century teachers are monopolists of knowledge in the 21st century they are mates "learning managers" who can help with his or her profession finding the way in the mass information. The importance of student centered approach is being formulated again and again but the realization takes little progress and is getting ahead very slowly. The possible explanation of this problem is that developing practical, life like teaching / learning environment means an immense task for teachers.

The characteristics of educational systems in the industrial society are the following:

- Publication of facts, data, rules;
- Passing closed, finite, book standard knowledge;
- Homogeneous group learning;
- Frontal teaching, presentation.

Requirements in the informal society:

- Developing abilities and competences;
- Preparation for lifelong learning;

[1] The "discovering" problem solving method is described by the Hungarian mathematician and physicist György Pólya in his world famous book: The School of Thinking.



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- Personalized learning environment, heterogeneous groups;
- Constructivist approach, application of collaborative methods.

The objectives of education:

- Preparing for constant learning;
- Intelligent learning;
- Knowledge of digital writing;
- Problem solving skills;
- Communication skills;
- Developing social and life management skills.

What should (must) we the teachers give up? That we only present and check lessons. As parents (and as former students) we know exactly what an autocratic all-powerful teacher character means in shaping our children's (and what it meant in our own) fate.

The environment in information society makes impossible objectivist, autocratic teacher mentality. Teachers of the 21st century by keeping leadership – not as being the only owners of knowledge – must be present in the learning environment as learning motivating mentors and facilitators. The duties of facilitators are known from round table talks, usually participated by several experts with the aim of analyzing and overview jointly a definite problem and building a common standpoint. The duties of facilitators are to guide these talking the way participants should not digress from the given subject.

While teaching he/she continuously learns as well and is able to handle the situation when some students are ahead of him or her. Teachers must learn to use all the possibilities that network communication and IT technology can potentially provide:

- Able to access the newest information fast and cheaply;
- There are no barriers of continuous professional developments;
- Almost unlimited possibilities of professional cooperation.

Hopefully as IT tools become a part of education the burdens of administration become less and we can use these possibilities.

## DOCUMENTS

The document, composed of text and images, is the most traditional form of educational resource, although it is not the easiest to find as open content.



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What is this type of resource for? It serves to "convey" facts, events, principles, rules, axioms, scientific laws, to describe terms, classifications, methods, procedures, to construct "narratives" that connect and give meaning to facts, events, principles, ...

The digital document can be an improvement or a transformation of the analogical one according to what has just been said above about the notes.

## PRESENTATIONS

Presentations are probably the most widespread form of teaching resource, created to accompany the presentation of the speaker (possibly: of the teacher) highlighting the essential concepts of a speech by means of images, keywords, short sentences.

Initially they were transparencies to be projected on the screen using an overhead projector. But what made them popular was PowerPoint, so most users probably consider them to be born digital.

The SAMR model can also be applied to presentations, identifying:

- Substitution, the simple transition from analogue to digital slides,
- Augmentation, reproducing and modifying a digital presentation is much easier than doing it with one on transparencies and above all it is easy to distribute it to participants in a conference or to students in a class,
- Modification, for example the possibility to share it and work on it collaboratively,
- Redefinition, even a presentation if enriched with images, audio, videos and links becomes a multimedia book.

As already said, presentations are often used to accompany a lesson in the classroom. They are a good teaching resource if handed out to the students who participated in the lesson. They may not be understandable if distributed to others outside that context unless accompanied by an audio recording, but if so we move into the field of video.

## VIDEOS & INTERACTIVE VIDEOS

The lesson is like the theatre. The teachers/actors act in the presence of the students/spectators; the play takes place in a limited environment, the scenario can be changed, but not too much. The performance must have a linear trend and must be used in real time.
The educational video is like the cinema: the actors act only once (possibly repeating a scene until it is optimal), the different pieces can be recorded separately and in different places and then assembled together. Then an unlimited number of people can look at the result one or more times, interrupting and resuming it at their will.



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There is also a hybrid: the possibility of filming the theatrical performance. On the web there are many videos of this type: the filming of lessons, often university ones, done in a context and then made available (often, however, only to students of that course). Shooting at conferences has the same characteristics. These are useful resources, but created in a face-to-face context, not specifically designed for a different use.

I would group educational videos into three categories:

- *Video Lessons supported by slides or images. It is the one that comes closest to the traditional lesson: the teacher explains/illustrates a topic, accompanying it with images, often slides. The teacher might not even appear on video, sometimes she/he appears for some moments in the foreground just to make the video lessons more personal, sometimes when the slides are in the foreground the teacher who illustrates them appears in a small box.*
- *Video Tutorials. The video shows how something is done: it may be the use of software (in this case shows what happens on the screen), or of an instrument or a procedure (and this case it shows the operations/activities carried out by a person or a team).*
- *Documentaries. The video illustrates natural phenomena, current or historical events, geographical features, biographies, using videos and a narrating voice (the narrator may, of course, sometimes appear).*

*Videos have the power of moving images and the combination of images, sounds and speech. But traditionally they have a trans-missive nature: the student merely looks. But today it is very easy to make the videos interactive by inserting questions or other activities for the students, with the possibility that the path is diversified according to the answers. And here we can see again the logic of augmentation up to redefinition.*

As for redefinition: digital has introduced a disruptive novelty in the field of videos. In the past, to produce a movie, even a simple one, it required sophisticated instruments, which were not accessible to everyone. Today anyone - and therefore any teacher but also students (or perhaps, from the point of view of operational capacity, we should say any student but also their teachers) can, with a mobile phone and a computer, film, capture actions on the screen, animate a presentation, insert an audio, edit and distribute a video. Actually, the computer is not even indispensable, if you have good manual skills you can do everything directly from your smartphone. It is possible to assemble pieces of existing videos together and make them interactive by inserting comments, quizzes and choices.

It is a change that even allows us to redefine our teaching methods. The methodological model of the flipped classroom was born from the idea that the teacher can provide students with his lessons to study at home.

## INTERACTIVE IMAGES



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It is said: an image is worth more than a thousand words. And images have always been used in teaching. Just think of the walls of an elementary school, the maps hanging in the classrooms, the textbook illustrations.

Digital makes images easily searchable, acquirable, distributable and editable. Having an IWB in class allows teachers to insert, much more than in the past, images in their lessons.

A picture is worth a thousand words, but it is often appropriate, from an educational point of view, to add words to it: to explain it and comment on it. The added value lies in the combination of image and words (whether written or spoken). In this way they have always been used, by teachers in the classroom or on textbooks.

Today it is possible to create interactive images simply by clicking them, text windows appear, and you insert a Wikipedia page, or a YouTube video, or some music, an audio, another image, a web page. And therefore, an image can be, by itself, a complex didactic resource that the teacher creates for his own students or, even better that he creates together with them.

## MAPS

Maps are an important cognitive tool, both in the case that the teacher provides students with fully-completed maps, and even better, if he builds them together with the students or makes they build their own maps.

A map is a simplified representation of space that highlights the possible relationships between the components of that space. A map is used to orientate oneself in a space, to know how to move in it thanks to the simplification and highlighting of relationships.

### Geographical maps

They are a tool traditionally present in classrooms, an important support for the study of geography. There are different types: physical, political, historical and thematic. Digital has introduced significant improvements: with an IWB and an Internet access the teacher is no longer limited to a couple of maps but he can move among different kinds of maps. But, above all, tools such as Google Maps, Google Earth and Street View have made it possible to completely redefine this field, passing in a second from the real context of a map, from an overview to a detailed view.

### Concept maps

Concept maps, designed by Joseph Novack, have a reticular structure, which may not even have a precise starting point (even if this is present in most cases, like the one in the image below). Each node represents an elementary concept and is described with a label on a geometric shape (the shapes can be differentiated by type. The nodes are connected by relationships, generally represented as oriented arrows and provided with a descriptive label (generally a verb).



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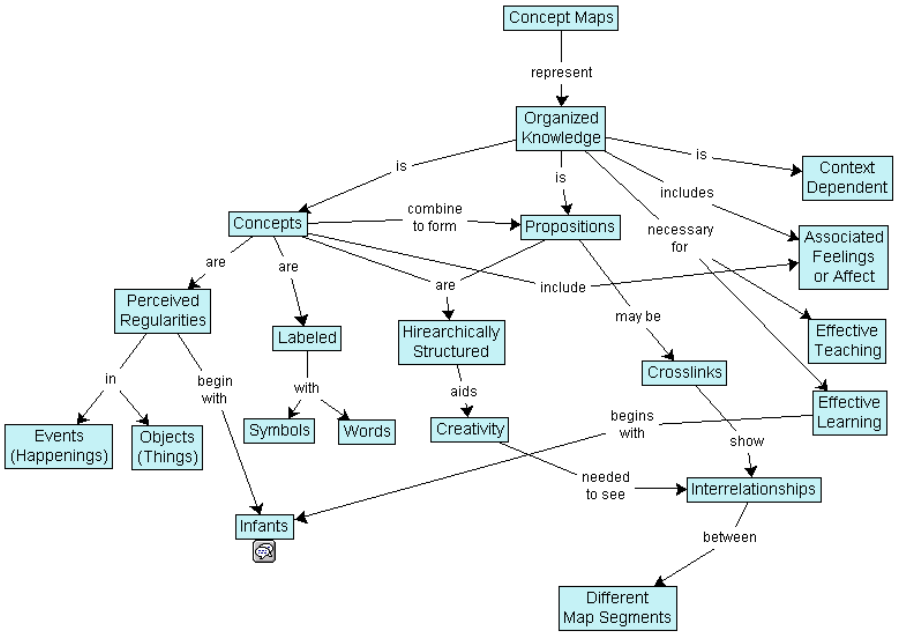


*From Wikimediacommons, Author Vicwood40*

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**Mind maps**

Mind maps have as their purpose the storage of concepts and information. They have a hierarchical-associative structure. It starts from a central concept from which the rays depart to associated concepts of the first level, which in turn can link to concepts of second level and so on, as in the images below.

The creator of this kind of maps, Tony Buzan, focused on evocatively: all the elements of a mental map must be rich in imaginative and colorful images, because they stimulate the right cerebral hemisphere, the functions of which support faculties such as creativity, memory, mental association. The elements must be described with single keywords and not with sentences, so as to leave room for new associations.

Even mind maps do not require digital, but digital allows the same improvements and transformations already indicated for the concept maps.



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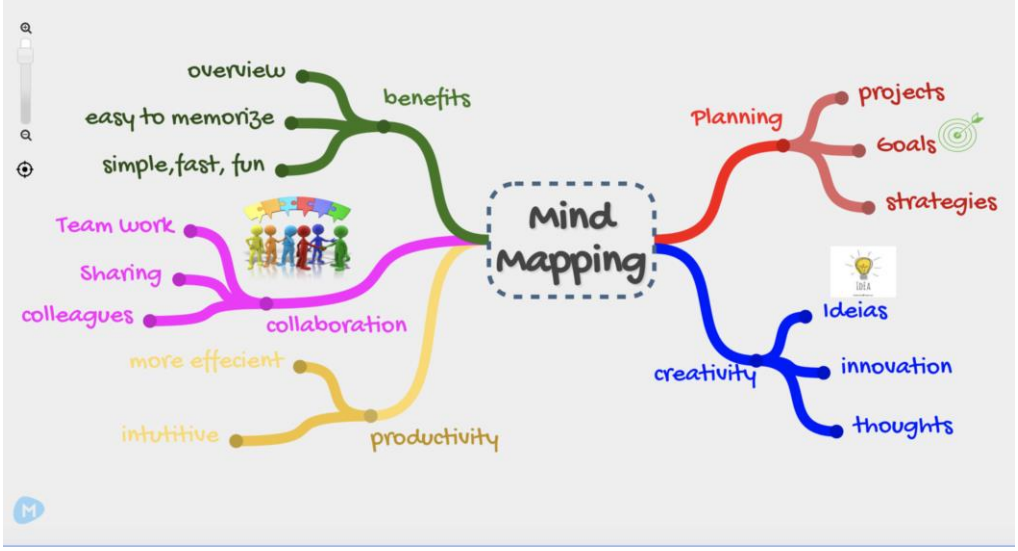


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## LEARNING GAMES

The attention to educational proposals based on the game has certainly grown in recent decades, coming out of the sphere of the kindergarten or primary school where it was previously confined.

The *learning games*, or serious games, are games specifically made to get that - through the game - a concept is reinforced, a historical or cultural event or a natural phenomenon is understood, or a specific skill is acquired. Traditionally there are table games, card games and role-playing games. Digital has allowed the spread of video-games and interactivity even in individual games.

As Wikipedia writes under "Educational games": *"Games are interactive play that teach us goals, rules, adaptation, problem solving, interaction, all represented as a story. They satisfy our fundamental need to learn by providing enjoyment, passionate involvement, structure, motivation, ego gratification, adrenaline, creativity, social interaction and emotion in the game itself while the learning takes place."* (Wikipedia-EN 11-4-2019).

Examples: Learning Apps – freely available in all European languages (https://learningapps.org/ ).

## SIMULATIONS



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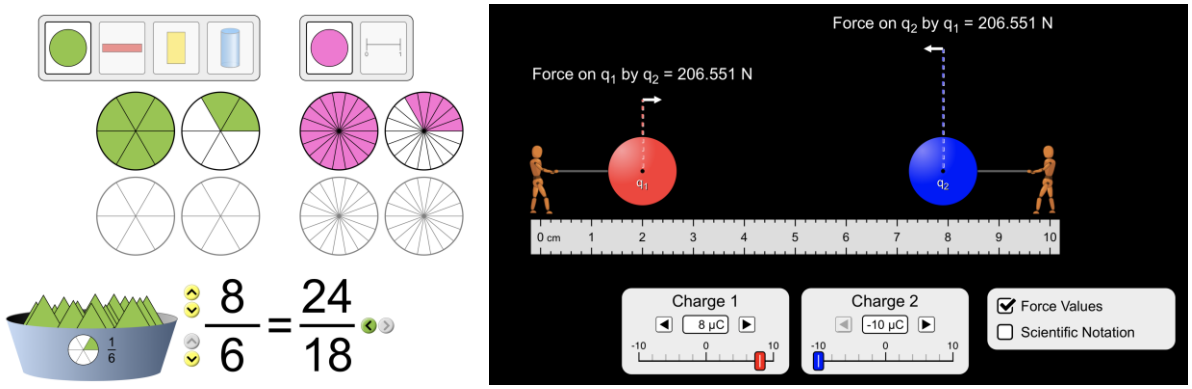
This is a non-existent typology of resources before digital: that is the possibility of modifying parameters and seeing the consequences or even acting in a virtual laboratory.

Two examples of the first type are shown in the image below and come from PhET - of the University of Colorado: a set of freely accessible simulations in mathematics, physics and chemistry.

On the left a simulation related to the equivalences between fractions: you can choose the type of object - pie, bar, cylinder, - the numerator and the denominator of the first fraction and the different equivalent fractions. On the right, a simulation of physics on Coulomb's law: the distance between the two spheres and the charge, positive or negative, of each of them can be modified; the arrows indicate the intensity of the attractive or repulsive force between them.




*https://phet.colorado.edu/sims/html/fractions-equality/latest/fractions-equality_en.html*

*https://phet.colorado.edu/sims/html/coulombs-law/latest/coulombs-law_en.html*

In many cases the simulations are dynamic, as in the image below: once the mass is fixed, the pendulum length, its initial position, the damping level due to frictions, ... we can see the pendulum moving progressively and slowing down until it stops, the continuous transformation between potential energy and kinetic energy and several other parameters: graphs and tables can be obtained.

## INTERACTIVITY IN MOODLE

### COMMUNICATION AND COOPERATION

In contrast to offline solutions, the great advantage of e-learning frameworks on the Internet is that there is the potential for communication and cooperation amongst participants. The “classic” communication opportunities are:

- E-mailing,
- Chatting,



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- Forum and
- Video conference.

This list will rapidly become longer as web technology (web 2.0 and the future semantic web) develops. The development of framework systems began in the 90s. First solutions are often criticized because they do not do anything but preserve the bad practices of traditional teaching within a modern technological environment. Such solutions have not become, or allowed to become, obsolete because as long as institutions based on today's system survive, the functions which support will also survive. On the other hand, and more importantly, modern frameworks are much more open than earlier ones. They tend to support cooperation and try to integrate the latest tools from web 2.0 technology. Moodle is an example of a web2.0 aware platform.

## THE CHARACTERISTICS THAT AN E-LEARNING 2.0 SYSTEM EXHIBIT ARE AS FOLLOWS:

Openness:

1. Learning environments should not create a closed 'isolated system'. They should be open to, and interoperable with, other systems and solutions.

Participation:

2. Teachers and students should cooperate in the development of the environment. Students should have the option to integrate external tools used by them. Teachers and students should work on the same platform with the same tools. Students should get the opportunity to create and share new lessons.

3. Participants should be able to tag their own contents freely. They should be able to develop their own taxonomy reflecting those parts of lessons which interest them most.

Motivation:

4. Learning environments should support participative activity in a user-friendly manner.

5. Learning environments should support developing communities, and should provide options for participants to get to know each other.

6. Teachers should be present in the learning environment. In addition to creating study materials they should emphasize organizing conversations and exchanging experiences

Tracking, evaluations, feedback:

7. Teachers/Administrators should have the functionality to track the learning of individual participants.



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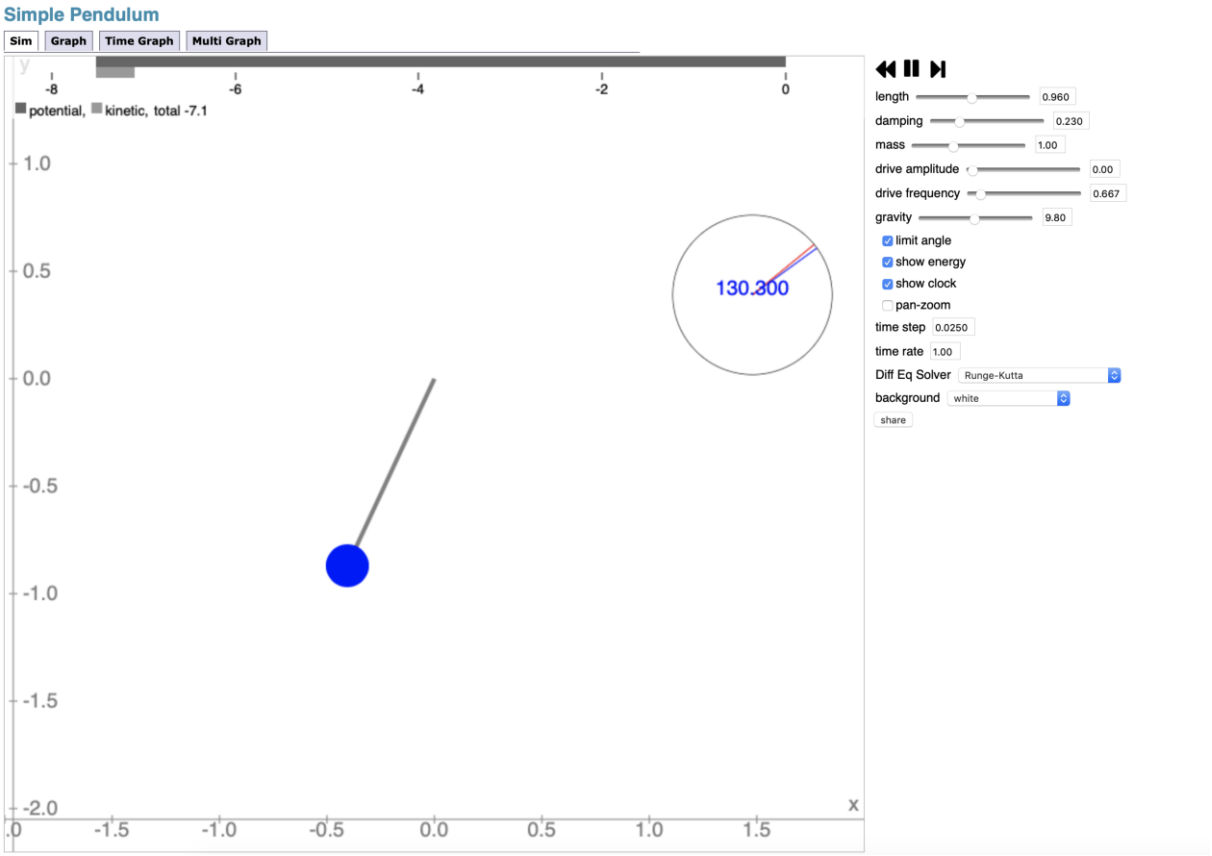
8. Teachers/Administrators should provide options for feedback.

9. E-learning systems should provide functionality participants to reflect on their learning.

10. Learners should have the option to express their opinions about the content offered.




https://www.myphysicslab.com/pendulum/pendulum-en.html



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And you can operate in real virtual laboratory, as in the images below.



*https://www.praxilabs.com/en/*

## QUIZZES

Quizzes and tests can perform different functions:

- Self-assessment by the student. The fact that the teacher does not know the result makes the student free to use the test when and how he wants without worrying that this will result in a negative assessment of him.
- Formative evaluation. This is a learning assessment on the basis of which the teacher defines her/his next learning path or simply tells students what to be more focused on.
- Summative evaluation. The result is to "give a grade" to the student.

Digital provides tools for the development of tests with automatic correction and with the possibility of corrective feedback that can significantly improve the traditional test methods. If you have a wide range of questions you can allow the student to undergo more different but always equivalent tests. You can customize the tests on the basis of the right or wrong answers provided, may be creating some more different kinds of questions. And the more you act on corrective feedback the more the test can become a real springboard for further follow-up learning paths.

The same considerations already made for many other resources apply to the tests. The tests, on paper, existed before digital. The tests produced in digital can be a simple substitution of the traditional ones. But it is immediate the augmentation constituted by new functionalities: the tests can be modified and reproduced more easily, they can be delivered to the students even on the net acquiring their answers, so it is not necessary that the students carry out the tests in the classroom.

The tests, and here we enter the field of modification, do not require the intervention of the teacher for the correction, as the identification of the error and subsequent explanation to the student. The test can be corrected automatically and corrective feedbacks can be given. And this opens up to the redefinition: the test can be integrated with explanations, videos, simulations giving rise to complex



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resources, not imaginable in the past. Furthermore, tests used on large numbers of students give rise to big data that can be analyzed to identify the questions with more errors and therefore to intervene on the test - to correct poorly formulated questions - or on the

## CONCLUSIONS

The Consortium agreed, that they use Lesson component of Moodle for implementing the core contents of the modules. The reasons for the decision were that the Lesson component offers much more options for interactivity than the Book component.

Both of them can include multimedia elements, but only the Lesson supports inserting quiz questions into the core text. This possibility makes the learning process more effective, as the students can control their knowledge at once after they read each part of the learning material.

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## PROJECT BASICS

- Acronym: Green construction
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- Title: IMPROVING THE PROFESSIONAL SKILLS IN GREEN CONSTRUCTIONS THROUGH ONLINE TRAINING
- Duration: 1 September 2017 – 31 August 2019
- Action type: KA2
- Program: ERASMUS+
- Participating countries: Latvia, Bulgaria, Germany, Hungary

## OBJECTIVES

The project proposal aims through the creation of transnational partnerships to develop training product with innovative multimedia modules to meet the identified needs of the European construction sector of green skills of low-qualified workers and young people who have a choice of profession. The project team will study and analyze the existing trainings in the field of energy-efficient construction in partner countries it takes the identified needs of the European construction sector, into account, and it will develop, test and validate the modules for continuing professional education, in the field of green construction.

## COORDINATOR: REZEKNE ACADEMY OF TECHNOLOGIES

Prof. Lybomir Lazov, E-mail: lyubomir.lazov@rta.lv

## TARGET GROUPS

- Primary target group: VET teachers
- Secondary target group: VET students

## PARTNERS

- Rezekne Academy of Technologies, Latvia
- Veda Consult, Bulgaria
- Schnellkraft Personalmanagement GmbH, Germany
- European Center for Education, Science and Innovation, Bulgaria
- iTStudy Hungary Számítástechnikai Oktató- és Kutatóközpont Kft., Hungary





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