LEARNING METHODOLOGIES AND THEIR SOFTWARE TOOLS

An Approach to Definition of Possible Use Scenarios

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Keywords: e-Learning, Learning methodologies, Software tools.

Abstract: e-Learning represents the opportunity to design and facilitate learning process, redefining the standard learning methods by using information technologies. The aim of this paper is to give a picture of the different use scenarios of the tools used to reach our purposes in respect of the methodologies intended to adopt. In particular, we analyze : specific relationships between e-learning tools, different usage methods, interaction types and educational aims. Using the proposed model, the teachers can create teaching solutions that exploit opportunities offered by the technology and aid students to learn in more effective way.

1 INTRODUCTION

Typically, e-learning is used to reduce unitary costs for production/distribution of learning resources and to increase the number of users. Direct interpersonal relationships results more effective then relationships mediated by ITC, but they are not replicable and more expensive both for the teaching assets (every new edition of a lesson has duplicated costs) and for the learning assets (caused by the need of teacher's presence). Consequently, the strategies offered by ICT learning solution reduce organizational costs for training and result more diffused.

In order to reach proposed learning aims adopting intended methodologies, we propose, as explained in this paper, a detailed picture about usage scenarios of analysed teaching tools.

In particular, we analyze some specific relationships between e-learning tools, different usage methods, type of interaction and educational aims.

2 THE CONTEXT

The planning and the articulating phases of learning processes are characterized by high chances to freely choose typologies and characteristics of different components used. For example, we refer to roles and relationships between students and teachers, to time dedicated to head-on lessons, to individual work, to deductive and inductive approaches, to interactivity level and to time dedicated to exercises.

Regarding on e-learning, these stages get more complexes because of the use of technology. All this gives an important role to actor's competences: if we suppose that a teacher is able to design and articulate a traditional lesson, the lack of consolidated learning models, the limited experience in technological tools use and more the lack of knowledge of their existence, can cause a possible inefficiency in the learning process.

So, the use of e-learning solutions has a double consequence : the opportunity of many potentialities but a bigger complexity due to the absence of experience. Then it is interesting to focus attention on a model able to present scenarios for e-learning process design.

Massimo Petrone M., Pasquariello E., Valente R. and Brunale M. (2010).
LEARNING METHODOLOGIES AND THEIR SOFTWARE TOOLS - An Approach to Definition of Possible Use Scenarios.
In *Proceedings of the 2nd International Conference on Computer Supported Education*, pages 277-283
DOI: 10.5220/0002798602770283

The model we presented is addressed to that actors that intend to use learning methodologies; it would be useful to helps teachers in designing learning solutions by using different opportunities offered by ICT.

3 LEARNING MODELS AND TECHNOLOGICAL TOOLS

During the development phase of our research, we proposed some innovative learning experiences regarding methodology and technological tools adopted.
Due to the lacking of a theoretical framework based on e-learning pedagogy, we don't impose particular constraints to teachers either regarding aims, teaching methodologies and technological choices to adopt, because we aim to obtain an experimental dataset.
To enhance the aspects related to the learner, we propose methods that are not substitutive but additional to existing learning offer; so, the activities to realize are intended not "instead of" but "together with" the existing.
To give a set of possible usage scenarios of used tools, we analyzed different forms. In particular, the one regarding teaching models and the one regarding technological tools.

3.1 Teaching Models

To focus on basic teaching models, we refer to three main paradigms of learning and in particular :

- Rational – informational;
- Systemic – interactional;
- Constructive – social.

Rational-informational paradigm refers to a teaching model based on contents transmission which use a learning process that consist in an actor who transmits contents to another who receive these contents. Thus the students read and use contents in passive way; in this model is not foreseen much interaction between students and teacher or between students and students and the student's evaluation usually consists in some tests.
On the other hand, Systemic-interactional paradigm refers to a cooperative teaching model. The lessons consists not only in supplying and using contents but, especially, in exchanging and comparing experiences and competences. Learning is done by teams and every member of a team give an important contribution to the learning process. It is the most diffused and effective model.
Constructive-Social paradigm consists to a teaching model based on laboratory approach. Work by team becomes very important. It aims to interaction willing to realize a product creating a learning community able to operate beyond time and space bounds of the physical class.
Starting from this paradigms we found that the different types of interaction, in presence or at distance, between actors involved in learning solution are:

- Teacher – student/s;
- Student/s- Student/s;
- Student-Computer.

Educational aims to reach the object to help students to learn are:

- learn to retrieve, organize and analyze information;
- activate critical thinking;
- stimulate students to be involved to cooperation;
- help to realize what learned in theory (deductive approach);
- promote learning-by-doing (inductive approach).

In table 1 [*S. Genone, C.Matri, L.Mari, 2002*] are presented all the entities mentioned before and their relationships. In particular :

- in columns EDUCATIONAL AIMS and INTERACTION TYPE are reported entries mentioned before;
- in column TYPE OF TOOL are reported type of tools that can be used;
- in column USAGE METHODS is described how instruments can be used, explaining time/space dimension (in presence/ at distance, in synchronous/asynchronous way).

3.2 Technological Tools

Employment of technological tools in e-learning determine often a digital divide between users regarding the available band, the higher familiarity in the use and the "integration" of these tools in daily life.
To limit mentioned digital divide is necessary to design every decision:

Table 1: Relationship between aims, interactions, tools and usage methods.

Educational Aims	Interaction Type	Type of tool	Usage methods
Learn to retrieve, organize and analyze information.	Teacher – Student/s	Forum	At distance – to communicate and exchange materials during meetings.
			At distance – to manage FAQs.
	Student/s – Computer	Animation	In presence or at distance - to support students in employment procedures.
		Movie	In presence – to support theory through presentation of a token.
		Glossary	In presence or at distance – used by students to make key concepts more clear.
		Multimedia presentation	At distance – by self learning, to revise and examine contents dealt at lesson.
		Hypertext structure	In presence – to organize arguments and relative contents for navigation by students.
			In presence – to show links and relationship between didactical resources.
			In presence – to give an unique view of dealt theme, presenting didactical resources through conceptual maps.
		Test	At distance – for self evaluation.
			In presence – to discuss results together.
Activate critical thinking	Teacher – Student/s	Forum	In presence – to open discussion regarding specific theoretical thematics.
	Student/s - Computer	Movie	In presence – to support theory through presentation of a token.
			In presence – to discuss starting from a real situation and gain the general conclusions.
		Multimedia presentation	At distance – by self learning, to revise and examine contents dealt during the lesson.
		Hypertext structure	In presence – to show links and relationship between didactical resources.
			In presence – to give an unique view of dealt theme presenting didactical resources through conceptual maps.
Stimulate students to be involved to cooperation	Teacher – student/s	Virtual community	In presence – to manage classroom in real time during practice.
			In presence – to allow the exchange of contributions and files in real time between teacher, students and student groups during driven exercises.
		Forum	In presence – to open discussions about specific theoretical thematics.
			In presence – to suggest exercises and get results of assignments.
	Student/s-student/s	Virtual community	In presence – to allow the exchange of contributions and files in real time between teacher, students and student groups during driven exercises.
		Forum	At distance – to communicate and exchange materials during meetings
	Student/s-computer	Movie	In presence – to discuss starting from a real situation and gain the general conclusions.

Table 1: Relationship between aims, interactions, tools and usage methods.(cont.)

Educational Aims	Interaction Type	Type of tool	Usage methods
		Business/game simulator	In presence - to apply the concepts presented in theory.
			In presence – to start from a real issue and reach the related theoretical concepts.
		Test	At distance – for self evaluation.
			In presence – to discuss results together.
Help to realize what learned in theory (deductive approach)	Student/s-computer	Animation	In presence or at distance - to support students in employment procedure.
		Exercise	In presence or at distance – to apply the concepts presented in theory.
		Movie	In presence – to support theory through presentation of a token.
		Business/game simulator	In presence – to apply the concepts presented in theory.
Promote learning-by-doing (inductive approach)	Student/s-computer	Exercise	In presence or at distance – to apply the concepts presented in theory.
			In presence – to start from a real issue and reach the related theoretical concepts.
		Movie	In presence – to discuss starting from a real situation and gain the general conclusions.
		Business/game simulator	In presence – to start from a real issue and reach the related theoretical concepts.

- referring to technological mix and integration between tools;
- giving attention at daily used instruments by users.

It's necessary, in particular, to analyze different possible uses of tools to:

- collaborative building of contents;
- materials sharing;
- knowledge structuring.

So, for each available software tool it's necessary to get the following information:

- aims;
- main function; (communications/collaboration/sharing/knowledge structuring)
- minor function (communications/collaboration/sharing/knowledge structuring);
- type of tool;
- type of interaction (synchronous/asynchronous - one to one, one to many , many to many);
- predominant contents type (text, audio, multimedia);
- required knowledge (high/medium/low);
- complex usage possibility (high/medium/low);
- Technological complexity
  - Client side (high/medium/low)
  - Server side (high/medium/low)
- Management complexity (high/medium/low)
- Spread level (high/medium/low)
- Costs (high/medium/low)

In table 2 is reported a form for evaluation of software solution individuated based on information mentioned before.

Table 2: Evaluation form for software tools.

Aims	
Main function(communications/collaboration/sharing/knowledge structuring)	
Minor function (communications/collaboration/sharing/knowledge structuring)	
Type of tool	
Type of interaction	Synchronous ⟷ asynchronous
	one to one ⟷ one to many ⟷ many to many
Predominant contents type	Text ⟷ audio ⟷ multimedia
Required knowledge	High ⟷ medium ⟷ low
Complex usage possibility	High ⟷ medium ⟷ low
Technological complexity	
- **Client side**	High ⟷ medium ⟷ low
- **Server side**	High ⟷ medium ⟷ low
Management complexity	High ⟷ medium ⟷ low
Spreading level	High ⟷ medium ⟷ low
Costs	High ⟷ medium ⟷ low

Table 3: Evaluation form for WIKI.

Aims: It allows to work together on web pages to add, develop and modify their contents	
Main function: collaboration / sharing	
Minor function : communication	
Type of tool	
Type of interaction	Synchronous ↔ asynchronous one to one ↔ one to many ↔ many to many
Predominant contents type	Text ↔ audio ↔ multimedia
Required knowledge	High ↔ medium ↔ low
Complex usage possibility	High ↔ medium ↔ low
Technological complexity	
- **Client side**	High ↔ medium ↔ low
- **Server side**	High ↔ medium ↔ low
Management complexity	High ↔ medium ↔ low
Spreading level	High ↔ medium ↔ low
Costs	High ↔ medium ↔ low

Table 4: Evaluation form for "BLOG".

Aims: It allows publication of contents promoting born of communities	
Main function: communication	
Minor function : archive	
Type of tool	
Type of interaction	Synchronous ↔ asynchronous one to one ↔ one to many ↔ many to many
Predominant contents type	Text ↔ audio ↔ multimedia
Required knowledge	High ↔ medium ↔ low
Complex usage possibility	High ↔ medium ↔ low
Technological complexity	
- **Client side**	High ↔ medium ↔ low
- **Server side**	High ↔ medium ↔ low
Management complexity	High ↔ medium ↔ low
Spreading level	High ↔ medium ↔ low
Costs	High ↔ medium ↔ low

4 PROPOSED PROTOTYPE TO DEFINE SCENARIOS OF TOOL'S UTILIZATION (E-LEARNING TOOLS)

Basing on considerations done on teaching model and technological tools, we explained a method that starts from the educational aims and reaches the different tools that can be used.
In particular, basing on information presented in Table 1:

- Educational aims;
- Interaction type;
- Instrumental type;
- Usage modes;

it is possible to individuate available software solutions that will be analyzed using aspects contained in Table 2.
Regarding the technological tools we decided to not define a list tools because:

- it cannot be comprehensive;
- it needs very frequent updates.

So we decided to create a collaborative web based application that using users experiences, permits to share knowledge. In our work the user can browse the different tools evaluated previously by others, and collaborate in evaluation of new tools. We foresee the need of an committee to ensure fair evaluations. Therefore we think to add a functionality that permits user's rating.

Table 5: Evaluation form for "SKYPE".

Aims : it allows communication by computer and from computer to telephone using VOIP	
Main function : Audio , video text communication	
Minor function : Sharing	
Type of tool	
Type of interaction	Synchronous ↔ asynchronous one to one ↔ one to many ↔ many to many
Predominant contents type	Text ↔ audio ↔ multimedia
Required knowledge	High ↔ medium ↔ low
Complex usage possibility	High ↔ medium ↔ low
Technological complexity	
- **Client side**	High ↔ medium ↔ low
- **Server side**	High ↔ medium ↔ low
Management complexity	High ↔ medium ↔ low
Spreading level	High ↔ medium ↔ low
Costs	High ↔ medium ↔ low

Table 6: Evaluation form for "WEB CONFERENCE".

Aims : It allows audio-video communication between peoples.	
Main function : communication/collaboration	
Minor function : Sharing	
Type of tool	
Type of interaction	Synchronous ↔ asynchronous one to one ↔ one to many ↔ many to many
Predominant contents type	Text ↔ audio ↔ multimedia
Required knowledge	High ↔ medium ↔ low
Complex usage possibility	High ↔ medium ↔ low
Technological complexity	
- **Client side**	High ↔ medium ↔ low
- **Server side**	High ↔ medium ↔ low
Management complexity	High ↔ medium ↔ low
Spreading level	High ↔ medium ↔ low
Costs	High ↔ medium ↔ low

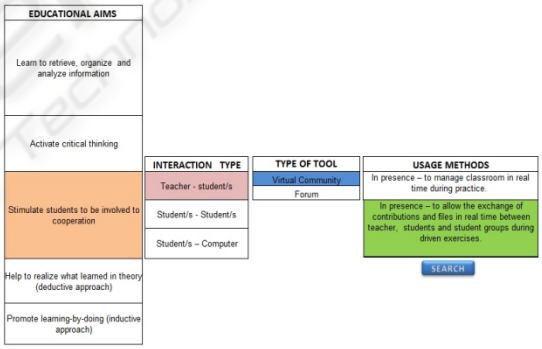
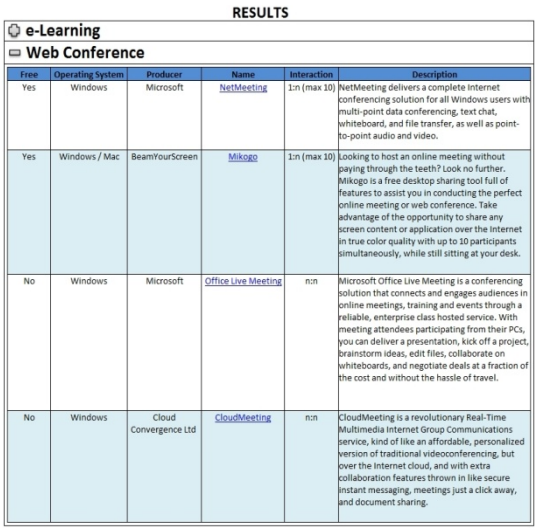


Figure 1: The choosing of the different tools.

5 CONCLUSIONS

The use of the model presented in this paper has revealed that different usage methods related to the same tools can match different educational aims: to properly design a didactical path is not enough specify instrument, but it's very important choose specific methodologies whereby instrument is intended to be used.
Therefore, thanks to the proposed prototype, planning and articulating phases for learning processes result in different learning context designs, in terms of instruments, interactions and usage methods.



RESULTS

e-Learning

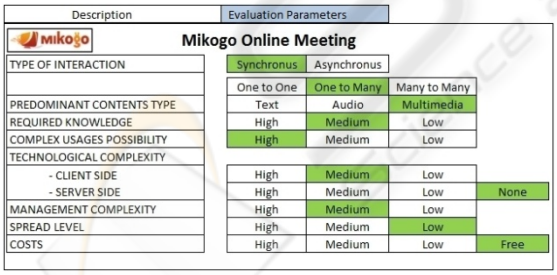
Web Conference

Free	Operating System	Producer	Name	Interaction	Description
Yes	Windows	Microsoft	NetMeeting	1:n (max 10)	NetMeeting delivers a complete Internet conferencing solution for all Windows users with multi-point data conferencing, text chat, whiteboard, and file transfer, as well as point-to-point audio and video.
Yes	Windows / Mac	BeamYourScreen	Mikogo	1:n (max 10)	Looking to host an online meeting without paying through the teeth? Look no further. Mikogo is a free desktop sharing tool full of features to assist you in conducting the perfect online meeting or web conference. Take advantage of the opportunity to share any screen content or application over the Internet in true color quality with up to 10 participants simultaneously, while still sitting at your desk.
No	Windows	Microsoft	Office Live Meeting	n:n	Microsoft Office Live Meeting is a conferencing solution that connects and engages audiences in online meetings, training and events through a reliable, enterprise class hosted service. With meeting attendees participating from their PCs, you can deliver a presentation, kick off a project, brainstorm ideas, edit files, collaborate on whiteboards, and negotiate deals at a fraction of the cost and without the hassle of travel.
No	Windows	Cloud Convergence Ltd	CloudMeeting	n:n	CloudMeeting is a revolutionary Real-Time Multimedia Internet Group Communications service, kind of like an affordable, personalized version of traditional videoconferencing, but over the Internet cloud, and with extra collaboration features thrown in like secure instant messaging, meetings just a click away, and document sharing.

Figure 2: Search results.

Description	Evaluation Parameters
Mikogo Online Meeting	
AIMS	Web conferencing, Online meetings, Remote support.
MAIN FUNCTION	Communication, Collaboration
MINOR FUNCTION	Sharing
TYPE OF TOOL	Virtual Community
DESCRIPTION	Mikogo is a free desktop sharing tool full of features to assist you in conducting the perfect online meeting or web conference. Take advantage of the opportunity to share any screen content or application over the Internet in true color quality with up to 10 participants simultaneously, while still sitting at your desk. Mikogo can be employed for a range of professional, academic, or personal uses, including: - online meetings - web conferences - product demonstrations - web presentations - remote support - webinars
WEB SITE	http://www.mikogo.com

Figure 3: Description of choosed tools.



Description	Evaluation Parameters			
Mikogo Online Meeting				
TYPE OF INTERACTION	Synchronus	Asynchronus		
	One to One	One to Many	Many to Many	
PREDOMINANT CONTENTS TYPE	Text	Audio	Multimedia	
REQUIRED KNOWLEDGE	High	Medium	Low	
COMPLEX USAGES POSSIBILITY	High	Medium	Low	
TECHNOLOGICAL COMPLEXITY				
- CLIENT SIDE	High	Medium	Low	
- SERVER SIDE	High	Medium	Low	None
MANAGEMENT COMPLEXITY	High	Medium	Low	
SPREAD LEVEL	High	Medium	Low	
COSTS	High	Medium	Low	Free

Figure 4: Evaluation parameters of choosed tools.

The teacher can individuate usage scenarios for different technological tools by following reference forms offered and, consequently, can realize formative solutions that, using opportunities provided by technologies, could help students to make learning more effective.

Experience derived from our prototype utilization could let, to increase awareness on teaching opportunities offered by ITC utilization.

Furthermore we expertise that collaborative use of our prototype, basing on users experiences, lead to a correct multidimensional evaluation of learning tools analyzed.

The goal we intend to reach is a correct and opportune use of learning tools for didactical aims. It becomes reachable trough the given possibility to express assessments, to share experience and to advise about correct use of interested tools.

In future, we intend to provide the opportunity to use different methodologies, or make our starting model better, acquiring user's feedbacks.

In addition we intend to improve our prototype to reach the goal of a close collaboration between teaching theoreticians and tools developers. This can be accomplished by introducing a set of collaborative instruments that allow users to suggest, ask and share information about tools, methodologies and their practical use.

Finally we would make our web application available through the Internet so it could be used by e-learning communities.

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