Eliciting Requirements for Learning Design Tools

A Semio-Participatory Approach

Alessandro Arpetti[1,2], M. Cecília C. Baranauskas[1], and Tommaso Leo[2]

[1] Institute of Computing, University of Campinas, UNICAMP, Campinas, Brazil
{alessandro.arpetti,c.baranauskas}@ic.unicamp.br
[2] Department of Engineering Information, Marche Polytechnic University, Ancona, Italy
{a.arpetti,tommaso.leo}@univpm.it

Abstract. The need to properly design educational intervention, representing explicitly what students and teachers are planned to do, has been acknowledged in literature. Thus, Learning Design (LD) tools, if made accessible and usable by teachers, can bring significant benefits potentially improving results of educational practices. Although effort has been made in developing systems to support the learning design process, literature has shown they have not yet reached a sufficient spread among teachers. This paper investigated the subject by conducting semio-participatory practices with a group of teachers at a distance, to understand the meaning they make to issues regarding learning design practices and representations, aiming at eliciting user requirements for a prospective LD tool.

Keywords: Learning Design, Requirements Analysis, Semio-Participatory Practices.

1 Introduction

In recent decades, significant socio-cultural changes and the rapid evolution of information and communication technologies have significantly modified the educational scenario, introducing greater complexity and numerous challenges to ensure the effectiveness of education. Regarding the use of technology in education, it has been acknowledged the need to properly design educational interventions, representing explicitly what students and teachers are planned to do (Beetham, 2007). In this scenario, Learning Design (LD), i.e., the design of educational actions, is a key factor that, if made accessible and usable by teachers, can bring significant benefits potentially improving results of educational practices (Lockyer, Bennett, Agostinho, & Harper, 2009).

The term “Learning Design” began to appear in the late 90's, in studies related to the Instructional Design field (Persico et al., 2013), although there is not yet a shared vocabulary within the research community. As highlighted by Dobozy (2011), the field itself is called "learning design" (Dalziel, 2006), "instructional design" (Chu & Kennedy, 2011), "curriculum design" (Ferrell, 2011), "educational design" (Goodyear

C. Rensing et al. (Eds.): EC-TEL 2014, LNCS 8719, pp. 1–14, 2014.

& Ellis, 2007), "design for learning" (Beetham & Sharpe, 2013) and "design-based learning" (Wijnen, 2000). Another relevant position defines the field as "pedagogical planning" (Earp & Pozzi, 2006; Gutierrez, Valigiani, Jamont, Collet, & Kloos, 2007). Agostinho (2006) provides a general definition for the process of LD as the representation of teaching and learning practices using a notational format. The aim of this practice is to create a plan of an educational intervention that can serve as model or template, adaptable by a teacher to suit his/her context and needs. Within a more technical point of view, Koper (2006) defines LD as the description of the teaching/learning process that occurs in a unit of learning (e.g., a course, a lesson or any other designed learning event). It represents the learning activities and the support activities that are performed by different persons (learners, teachers) in the context of a unit of learning. For this purpose, the IMS Learning Design specification aims to represent the LD in a semantic, formal and machine interpretable way. On the other hand, paying more attention to the sharing of experiences and professional growth of teachers, Conole (2013) defines LD as a methodology useful to guide teachers to make more informed decisions, through the elicitation of pedagogical and practical knowledge. This general definition is not restricted to units of learning, but includes the design of resources and individual learning activities right up to curriculum-level design. From this perspective, the main purpose of LD is to help make the design process more explicit and shareable. As a research area, LD includes both the understanding of the design process, as well as the development of LD resources, tools and activities.

Starting from IMS-LD specification (R. Koper, Olivier, & Anderson, 2003), many LD representations, software tools and design frameworks have been developed in the last years (Conole, 2013). Nevertheless, despite these efforts, no evidence has been presented yet regarding simplifying the design process or gaining a wider audience among teachers not specialized in LD or not proficient in the use of technology (Arpetti, Baranauskas & Leo, 2013a; Goodyear, 2005; Katsamani & Retalis, 2013; Oliver & Littlejohn, 2006).

This paper investigates the subject by conducting a study with teachers of Italian as second/foreign language, located in different countries, aimed at understanding the meaning they make to a prospective system intended to support their practices of LD. This work is part of the Ledita (Learning Design for Italian Language) research project (Arpetti, Baranauskas & Leo, 2013b) that aims at developing practical solutions and theoretical knowledge related to LD. The project is inspired by the Educational Based Research methodology (McKenney & Reeves, 2012) and is developed with the collaboration of a group of Italian language teachers. Following the first research phase, devoted to the analysis and exploration of the problem through a usability evaluation of the latest generation LD software tools and an investigation of teachers‟ design practices, this paper describes and discusses results of the predesign phase, which was intended to clarify the raised issues and specify user requirements for the development of a LD software tool.

In order to promote a better understanding of end user needs and develop solutions closer to their teaching realities, we adopted the Semio-Participatory approach, based on the assumption that "including the user in the design process is vital to make sure

we are creating systems that make sense and that are part of the users‟ context of life" (Baranauskas, 2009). Inspired by Organizational Semiotics (Liu, 2000), the Semio-Participatory framework integrates the system design with social and participatory practices: the technical level of technology design (the software system) presupposes knowledge of formal (forms and rules) and informal (meanings, intentions, beliefs, responsibilities) social levels, understood by the analysis of signs carried by messages of participatory practices. Among the methods and artifacts proposed by these theories for problem analysis and requirements specification, we selected the Group Elicitation Method (GEM) (Boy, 1997) and the Problem Articulation Method (PAM) (Liu, 2000). The selection of these methods was motivated by their effectiveness in facilitating the communication among the participants on the problem clarification, definition and sharing of signs in their usefulness for the elicitation and specification of requirements. To facilitate the participation of teachers involved in the research project, we adapted these methods and artifacts for use in remote and asynchronous mode, through forums and shared editable documents in the project website. This paper describes the process and the results of the semio-participatory activities for the user requirement analysis of a LD software tool. The text is organized as follows: Section 2 illustrates the results of participatory requirement analysis activities; Section 3 presents the study findings; Section 4 discusses the results and Section 5 illustrates the conclusions of the study.

2 The Study

The Ledita project counts on about 90 participants, who are teachers of Italian as second/foreign language from 16 countries. All teachers had a Liberal Art education with a multidisciplinary background and most of them had a tertiary education and a multi-years teaching experience. They were asked about their relationship with technology and none of them said to have a negative one, whereas the majority declared to have a good or excellent relationship. The most commonly used technologies were computer, smartphone and tablet in private life, and computer and interactive whiteboard in professional life. With regard to their experience with software tools, all the participants used Internet; most of them had an e-mail address, an office software suite and some of them a graphics program and a video-editing tool.

In this study, interactions among teachers took place in an asynchronous way through the project website, where participants used forums, editable web shared documents (Google Drive) integrated in the website and specific forms for the completion of research activities.

The selection of participants for the activities conducted in the requirements phase was made through proposition to volunteers among teachers involved in Ledita project. The number of participants was 7, as suggested by GEM methodology, and we maintained this group along all the activities. The selected teachers come from Argentina, Brazil, Greece, Ireland and Italy and, as the others, are specialized in teaching Italian as second / foreign language. All the teachers had participated in previous LEDITA‟s research activities, usually carry out LD in their teaching practice

and were previously introduced to the main software tools available for educational design and planning.

After discussion through an initial forum about some actual LD representations and tools, the teachers completed GEM activities in order to explicitly describe the concepts that characterize an ideal LD tool and to hierarchically classify these concepts. After reaching a consensus, results were critically discussed and teachers proceeded to the PAM activities. The aim of this second group of activities was: a) to elicit interested parties in the prospective software tool, with the Stakeholder Analysis artefact; b) anticipate possible problems and propose solutions, with the Evaluation Framing artefact and, finally, c) organize and discuss the results, highlighting eventually open issues, with the Semiotic Ladder artefact.

The next subsections describe the GEM as well as the PAM, their artefacts and the way they were used.

2.1 The Group Elicitation Method

The GEM (Boy, 1997) is a participatory practice we can locate in the initial stages of the software lifecycle, which aims at eliciting end-users‟ knowledge for the design of new user interfaces and complex human-machine systems. This participatory design method consists of the elicitation of important concepts from end-users‟ viewpoints and in deriving a consensus among the participants, using a brainstorming technique combined with a decision support system. A GEM session is usually composed by six phases: 1) Formulation of issue statements; 2) Generation of viewpoints; 3) Reformulation of viewpoints into more elaborate concepts; 4) Generation of relationships between these concepts; 5) Derivation of a consensus; 6) Critical analysis of the results.

The original phases of GEM were adapted to fit our research scenario in which the subjects had to participate at a distance, as follows:

Formulation of issue statements. For the formulation of issues statements, based on the list proposed by Nielsen et al. (1986), a structured interview was created and proposed to participants through a shared web document that teachers could simultaneously edit. The questions, translated into Italian, were as follows: What is the goal of the engineered system that we plan to design or evaluate?; How is the system or its equivalent being used (current practice, observed human errors); How would you use this system (users‟ requirements)?; What do you expect will happen if the corresponding design is implemented (e.g., productivity, aesthetics, quality of work product, quality of work life, and safety issues)?; How about doing the work this way (naive or provocative suggestions)?; What constraints do you foresee (pragmatic investigation of the work environment)?

Generation of viewpoints. This phase consisted of a “brainwriting”, a collaborative written brainstorming, aimed to highlight the points of view of the participants in relation to the questions posed in the structured interview. In this study the viewpoints were collected through their collaborative writing of a single document using Google Drive. The participation of the teachers in this activity lasted 3 days, with contributions and comments inserted directly into the shared document.

Reformulation of viewpoints into more elaborate concepts. For the elaboration of viewpoints into concepts, participants highlighted possible important concepts in the text and then analyzed and developed a list of concepts by means of combinations and divisions, always using collaborative writing through Google Drive.

Generation of relationships between these concepts. For the identification of relationships between concepts a form was created in the project website in which participants had to choose whether a concept was more important (+1), equally important (0) or less important (-1) compared to all other concepts mentioned. The objective of this artifact, called "triangular matrix", is to serve as decision system for the classification and organization of concepts obtained from previous stages.

Derivation of a consensus. For the derivation of consensus, a data analysis of each participant's matrix obtained during the phase 4 was carried out, by the creation of a global matrix of the scores assigned to the relationships between concepts. Starting from the global matrix it is possible to derive the consensus, which is expressed with 4 parameters: 1) The mean priority (MP) of a concept corresponds to the mean of the scores assigned to a concept with respect to the other concepts by all the participants. The value range of the mean priority is the interval [-100, +100]; 2) The interparticipant consistency (C) of a concept corresponds to the mean of the standard deviations of all global scores; 3) The mean priority deviation (D) or stability of a concept corresponds to the standard deviation of the mean priority with respect to the global scores of a concept; 4) The global consensus (GC) expresses a global score of the group consensus on the investigated issue.

Critical analysis of the results. Finally, results obtained from previous phases were presented to the participants, who have analyzed and commented on them using a forum in the website project.

2.2 The Problem Articulation Method

The PAM (Liu, 2000), developed in the later 1970s by Ronald Stamper within the MEASUR (Methods for Eliciting, Analyzing and Specifying Users‟ Requirements) research project, provides a set of techniques and tools that enable to understand and clarify problems. By using the method, undesirable omissions from analysis and specification can be reduced. Specifically, for the Ledita project, the same participants of previous GEM activities, always in remote and asynchronous activities, have used three artifacts: 1) Stakeholders Analysis, 2) Evaluation Framing, 3) Semiotic Ladder.

Stakeholder Analysis. This artifact allows investigating the involved parts that direct or indirectly influence or interest the information system under analysis. It is based on the technical, formal and informal levels of participation and organizes the stakeholders into five categories: Operation, Contribution, Source, Market and Community. To carry out this analysis, a document in Google Drive was prepared with the five stakeholders categories that participants filled in with their suggested stakeholders.

Evaluation Framing. The second activity consisted in completing the results obtained from the stakeholder analysis, by anticipating, for each stakeholder category, problems, questions and related issues and suggesting possible solutions (Baranauskas et al., 2005). For this activity, we prepared a Google Drive document with a table that,

resuming the results of the Stakeholder analysis, added 2 columns to every stakeholder category: the first concerning problems/questions related to those stakeholders, and the second concerning ideas/solutions related to the raised issues.

Semiotic Ladder. To complete the PAM, participants filled in the Semiotic Ladder, an artifact useful to organize the different levels of requirement information. Besides the traditional semiotic division of syntax, semantics and pragmatics, the Semiotic Ladder of Stamper (1996) adds three new levels: "Physical World", "Empirics" and "Social World" (Table 1).

The activity of the participants in this study consisted in completing the various levels of the Semiotic Ladder starting from the stakeholders list suggested in previous analysis and indicating open questions and possible solutions for each level of the ladder. As for precedent activities, participants wrote their contributions directly in a web-shared document created with Google Drive.

Table 1. Original Semiotic Ladder (from Liu 2000)

Human information functions	SOCIAL WORLD: beliefs, expectations, culture, functions, commitments, contracts, law, ...
	PRAGMATICS: intentions, conversations, negotiations, communications, ...
	SEMANTICS: meanings, propositions, validity, truth, significations, denotations, ...
The IT platform	SYNTACTICS: formal structure, language, logic, data, records deduction, software, files, ...
	EMPIRICS: pattern, variety, entropy, channel capacity, noise, redundancy, efficiency, codes, ...
	PHYSICAL WORLD: signals, traces, physical distinctions, hardware, component density, speed, economics, ...

3 Results

Results from GEM and PAM activities were collected in text documents and spreadsheets and manually elaborated for analysis.

3.1 Findings on the Group Elicitation Method

For GEM activities, the teachers‟ participation was intense and every point of the issue statements was commented with the creation of articulated and connected viewpoints. Then, through several rounds of elaboration, 12 concepts were highlighted, interpreting and organizing the five-page document created in previous phases. The selected concepts were: 1) Support to Design, 2) Graphical Representation of Designs, 3) Consideration of Educational Needs, 4) Support to Reflection, 5) Economy (Time), 6) Ease of Use (Short Learning Curve), 7) Sharing of Designs, 8) Reuse of Designs, 9) Collaboration, 10) Author Identification, 11) Aesthetics (Look and Feel), 12) Software Compatibility.

In the generation of relationships between the concepts, we obtained a triangular matrix for every participant. By collecting the triangular matrix of all participants, we obtained the Global Score matrix (see Table 2). In this Table, the value of a single cell is related to the sum of all scores assigned by a participant in the triangular matrix to the relations of that concept with all the other concepts.

Table 2. Concepts Relationships Global Score Matrix

Concepts	Single Participants' Score							Global Score (GS)
	1	2	3	4	5	6	7	
Support to Reflection	7	3	-3	-1	6	4	7	23
Consideration of Educational Needs	7	2	1	-5	6	4	6	21
Ease of Use (Short Learning Curve)	0	6	-3	9	1	3	1	17
Economy (Time)	4	9	-1	7	-8	-2	3	12
Reuse of Designs	2	4	-2	6	3	4	-5	12
Support to Design	-2	2	3	-5	2	-1	8	7
Sharing of Designs	2	-6	0	5	3	2	-6	0
Software Compatibility	2	8	-2	-5	0	3	-8	-2
Graphical Representation of Designs	-1	-3	3	-5	-2	-6	7	-7
Collaboration	-5	-5	-5	6	5	1	-6	-9
Author Identification	-7	-9	9	-11	-9	-5	-5	-37
Aesthetics (Look and Feel)	-9	-11	-1	-1	-8	-7	-2	-39

Observing the Global Score obtained by each concept, we can notice that "Support to Reflection" and "Consideration of Educational Needs" were the most important concepts for participants, followed by "Ease of use (short learning curve)", "Economy (time)", "Reuse of designs" and "Support to Design", all with a positive score. "Sharing of designs" was understood as neutral, whereas "Software Compatibility", "Graphical representation of designs", "Collaboration", "Author identification", "Aesthetics (Look and feel of the software)" received a negative evaluation in relation to other concepts, meant to be less important.

In relation to the consensus analysis, results of Table 3 show that Mean Priority reflects the Global Score, with a sufficient uniformity of evaluation among the participants, except for the two most and, especially, the less important concepts, for which Mean Priority Deviation increases to exceed 5 points. These last values have therefore reduced the level of homogeneity, as we can see even from the relatively high Inter-participant Consistency value and from the Global Consensus that is slightly negative.

Table 3. Consensus Analysis

Concepts	Mean Priority	Mean Priority Deviation
Support to reflection	29,87	3,44
Consideration of educational needs	27,27	3,14
Ease of use (short learning curve)	22,08	2,54
Economy (time)	15,58	1,79
Reuse of designs	15,58	1,79
Support to Design	9,09	1,05
Sharing of designs	0	0
Software Compatibility	-2,6	0,3
Graphical representation of designs	-9,09	1,05
Collaboration	-11,69	1,34
Author identification	-48,05	5,53
Aesthetics (Look and feel)	-50,65	5,82
Interparticipant Consistency: 4,34		
Global Consensus: -2		

3.2 Findings on the Problem Articulation Method

Results of the Stakeholder Analysis reported 19 stakeholders potentially interested in the system. Grouped in the categories of analysis, they are: Operation (Teachers, Students, Authors of didactical materials, Curriculum administrators), Contribution (Project participants, Software developers, Researchers), Source (Italian language teachers, Web system), Market (Universities involved in the research, LD software tools, Sponsors), Community (School directors, Faculty chairs, Media, Students‟ families, Teachers‟ families, Libraries, Scientific community). Figure 1 shows the results of stakeholder analysis in the Google Drive created by the participants.

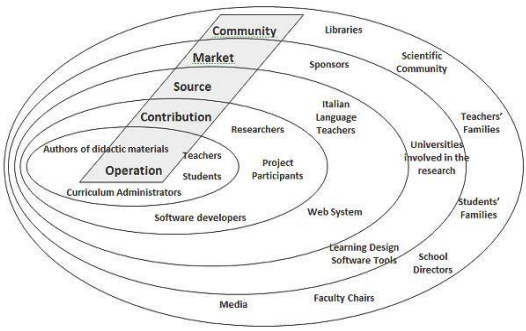

Fig. 1. Stakeholder Analysis

For the Evaluation Framing, participants filled in the predisposed form with 13 questions/problems and 11 ideas/solutions to solve these issues. Table 4 shows an excerpt of the Evaluation Framing structure, related to source stakeholders.

Table 4. Excerpt of Evaluation Framing

Source		
Stakeholders:	**Questions and Problems:**	**Ideas and Solutions:**
- Italian Language Teachers - Web system	If the system is a web application, it needs an Internet connection to work. If a connection is not available, the system turns unusable.	Make available a system version that can be used without an Internet connection and provide the ability to upload the material developed offline when a connection is available.

Finally, results of the Semiotic Ladder show a good participation for the three first levels (social world, pragmatics and semantics) and a more synthetic participation for the more technical levels (syntactics, empirics, physical world). Table 6 shows an excerpt of the Semiotic Ladder.

Table 5. Excerpt of Semiotic Ladder

	Elements:	**Open Questions:**
Social World	Allow teachers' reflection on their teaching practice and facilitate a more efficient use of technologies in education	Could culture, values and emotions of teachers affect the use of software? Are there laws that may create obstacles to the sharing of designs and resources? How to ensure com-

4 Discussion on the Main Findings

Results of the GEM activities showed essentially a strong interest of the participants in issues that are closely related to the practice of teaching. The main indication that comes from the elicitation and hierarchy of these concepts is the importance of LD as a moment of reflection and professional growth. This affirmation arose from the priority of “Support to Reflection” concept and from two explicit references in viewpoints for design practice as opportunity for professional growth. The supporting action is seen as a design flexibility that allows the “Reuse of designs” (appeared in concepts) and the revision and adaptation of designs to “Educational needs” (both in concepts and viewpoints).

This request for flexibility opens a new scenario in the horizon of LD tools to date, characterized by two main tendencies. The first is to support the design process via a

user-friendly visual design environment, based on specific design principles and philosophies (Katsamani & Retalis, 2013); the second, is to help and guide teachers to take decisions during the design process (Masterman & Craft, 2013). However, teachers request a freer design process that is able to support and not constrain their ideas, choices and decisions. The flexibility is especially required by teachers' interest in ensuring the valorization of LD actors and resources. For the actors, the consideration of all possible subjects of an educational action is important, be they children, adults, and elderly or with special needs (four participants mentioned these during the generation of viewpoints). Concerning the resources, in facilitating the reuse and dissemination of educational materials previously created (three mentions in the viewpoints). The reuse of a LD is also motivated by the considerable amount of time required to design ("Economy" concept). In order to minimize this problem, a strong demand for usability and simplicity of the software emerged from teachers ("Ease of use" concept).

The importance attributed to the reflection on teaching practice and to the reuse of projects after a re-adaptation to the new context of use has contributed to the positioning of sharing of designs with other teachers in a secondary position ("Share of designs" concept collected MP = 0). This indication seems to go against the viewpoint of many LD experts, who argue that the sharing of designs between the community of practitioners is fundamental (Conole, 2008; Davinia Hernández-Leo et al., 2011). This is probably due to the fact that teachers have understood the sharing of designs as a not very useful activity if automatically done and not accompanied by reflection and the possibility to adapt the design to their needs (two teachers explicitly affirmed this in the viewpoints). This could also be due to the fact that there is no common language for describing online and face-to-face educational experiences (Dalziel, 2012).

Analyzing the viewpoints created by participants during GEM activities, we can highlight some interesting aspects. First, text emerged as a main representation modality for the design and graphical representations were limited to marginal roles. Furthermore, participants have always reported text editors as the main design tool that allows describing educational activities in detail. This indication contrasts with the current trend of LD software tools, for which, the representation is mainly graphical, using flowcharts, columns or concept-maps (Conole, 2013).

Little significance was given to the possibility of designing in a collaborative way (no explicit mention in the viewpoints and negative score for the mean priority of "collaboration" concept). This indication highlights the importance and uniqueness of the relationship between designer, educational context and teaching materials (reported in three different parts of the document). In this relation, the teacher/designer him/herself is seen as part of a system and not as the owner of an educational project (as shown by the negative score for the mean priority of the „author identification" concept). Another point is the possibility of taking into account the copyright rules for the use of specific educational resources. This element has been considered in GEM viewpoints, in the Evaluation Framing and in the Semiotic Ladder.

Concerning the more technical aspects, teachers have shown interest in a system that can adapt to multiple operating systems and devices. This request was made in

order to make the system accessible by schools with poor technological structures. Finally, a lack of interest, although with a few exceptions, in the aesthetics of the software, reaffirming the need for simplicity and familiarity with the most common systems, especially text editors.

In relation to PAM activities, the stakeholder analysis has enriched the relationship between teachers, context and learning materials emerged from GEM, emphasizing the need to consider, in addition to teachers and educators, creators of educational materials, pedagogical coordinators and school managers. The presence of these stakeholders has led the discussion within the evaluation framing through aspects related to the management of the copyright for educational materials and the license to be applied to the software. The emerged intention, in line with current trends, was to move toward open materials and resources, allowing the interaction with the web for their retrieval, and to distribute the software with a free use license.

Another element of reflection was the difficult relationship of many teachers with technology, although they had considered themselves as knowers of technology in the first phase of the Ledita project. This difficulty appeared in relation to the use of tools other than those they are accustomed (office suite and graphic programs), and the frequent limitation of technological resources of the schools. In this regard, teachers stressed the importance of compatibility of the system with different devices, to provide simple and quickly visible instructions of use, and to generate a printing version of LDs, in order to facilitate the activities in the classroom, even in the absence of technological resources.

The Semiotic Ladder, finally, has encouraged a lively dialogue among teachers that has enriched previous discussions and has allowed analyzing elements of extreme importance for the development of the software. First, at the level of the social world, the reference to design as a tool for reflection on professional practice; efficiency in the use of technology in education has strengthened the demand for the development of an open system that makes the web a source of stimulation for the exchange and dialogue between cultures. This interpretation gives a new importance to the sharing of designs, which is not seen as an end, but as a motivation to the improvement and professional growth by means of the example and the re-elaboration of designs.

To this end, with the pragmatic level, the demand for flexibility of the software is found to be of fundamental importance for the success of the system. To allow adequate representation and fruitful sharing of designs, it is necessary a dynamic categorization of the elements that compose the designs. This could be achievable by allowing the customization by teachers, to suit their specific needs and better adapt to the educational context. In fact, one of the main limitations encountered by participants during the initial analysis of existing systems was the narrowness of some categorizations and the lack of possibility to add new elements.

Concerning flexibility and the good usability of the system, the semantic level brought the need to provide searching tools to explore all the possible design contents and combine the textual representation of the designs with a graphic summary that allows a global overview on the elements that compose the designs. Syntactic, empirical and the physical world levels have focused the attention on the development of a web-based system, that should allow safe access to users through a free registration

service and the ability to be used on different types of devices, including desktop computers, laptops and tablets.

Summarizing, the main user requirements indications for the prospective LD tool, as resulted of this study, are listed as follows:

- Reflection and professional growth are the main aims for design practice and sharing. This indication requires the use of high level language and the selection of metaphors closer to teaching practice;
- Reuse of design is important for time economy and to stimulate the sharing of experiences, but only if designs can be modified and adapted to the new context of use;
- Flexibility is a key factor to adapt designs to every educational context. It is referred to the definition and orchestration of actors, resources and activities, using dynamic categorizations;
- Usability and simplicity are important for the diffusion among teachers;
- Text is the preferred modality of representation, whereas a graphical representation is useful for a global overview of the design;
- The system should be a web application to allow the use of different operational systems and devices;
- The use of free web resources allows avoiding copyright issues for didactical material.

5 Conclusion

LD is a key element to achieve positive educational results, but systems available today to support the LD process have not yet reached teachers and an adequate level of usability. This paper investigated the subject by conducting a study with teachers of Italian as second/foreign language, to understand the meaning they make to a prospective system intended to support their practices of LD.

This study involved the use of semio-participatory practices with a group of teachers at a distance, to understand the meaning they make to issues regarding LD practices and representations, aiming at eliciting user requirements for a prospective LD tool. The participatory requirement analysis activities carried out with the teachers have revealed aspects of the professional world of potential end-users and their needs and expectations. These participatory activities were well received by the participants and the remote asynchronous modality of participation has allowed us to complete the activities within a reasonable time and with a sufficient level of detail and involvement.

Analyzing the results, it was possible to synthesize a number of practical indications useful for developers interested in development informed by the practice of the main interested parties, who can rely on contextualized and well-argued information. Future works in this investigation involve the formalization of a conceptual framework able to support reflection and professional growth within the practice of educational design and the development of a system capable to respond to the user requirements emerged from this study.

References

1. Agostinho, S.: The use of a visual learning design representation to document and communicate teaching ideas. In: Proceedings of the 23rd Annual ASCILTE Conference: Who's Learning? Whose Technology?, Sidney, pp. 3–7 (2006)
2. Arpetti, A., Baranauskas, M.C.C., Leo, T.: Making Design Easy: a Usability Evaluation of Latest Generation Learning Design Tools. In: Herrington, J., Couros, A., Irvine, V. (eds.) World Conference on Educational Multimedia, Hypermedia and Telecommunications (EDMEDIA), pp. 960–965. AACE, Victoria (2013a), http://www.editlib.org/p/112076 (retrieved)
3. Arpetti, A., Baranauskas, M.C.C., Leo, T.: Learning Design and Teaching Practice: Outlining an Iterative Cycle for Professional Teachers. In: 2013 IEEE 13th International Conference on Advanced Learning Technologies, pp. 280–284. IEEE (2013b), doi:10.1109/ICALT.2013.87
4. Baranauskas, M.C.C.: Socially aware computing. In: ICECE 2009 VI International Conference on Engineering and Computer Education, pp. 1–5 (2009)
5. Baranauskas, M.C.C., Schimiguel, J., Simoni, C., Bauzer Medeiros, C.: Guiding the Process of Requirements Elicitation with a Semiotic-based Approach. In: 11th International Conference on Human-Computer Interaction, pp. 100–111. Lawrence Erlbaum, Las Vegas (2005)
6. Beetham, H.: An approach to learning activity design. In: Beetham, H., Sharpe, R. (eds.) Rethinking pedagogy for a digital age: Designing and delivering e-learning. Routledge, London (2007)
7. Beetham, H., Sharpe, R. (eds.): Rethinking Pedagogy for a Digital Age: Designing for 21st Century Learning. Routledge, New York (2013)
8. Boy, G.A.: The group elicitation method for participatory design and usability testing. Interactions, 27–33 (1997)
9. Chu, S.K., Kennedy, D.M.: Using online collaborative tools for groups to coconstruct knowledge. Online Information Review 35(4), 581–597 (2011)
10. Compendium Institute (2013), http://compendium.open.ac.uk/institute/ (retrieved January 05, 2014)
11. Conole, G.: Tools and resources to guide practice. In: Rethinking Pedagogy for a Digital Age: Designing for 21st Century Learning, pp. 1–25 (2008)
12. Conole, G.: An overview of design representations. In: Proceedings of the 7th International Conference of Networked Learning (NLC 2010), Aalborg, Denmark, pp. 482–489 (2010)
13. Conole, G.: Designing for Learning in an Open World. Springer, Berlin (2013)
14. Conole, G., Weller, M.: Using learning design as a framework for supporting the design and reuse of OER. Journal of Interactive Media in Education 2008(1), 1–13 (2008)
15. Dalziel, J.R.: Lessons from LAMS for IMS Learning Design. In: Sixth IEEE International Conference on Advanced Learning Technologies (ICALT 2006), vol. (3), pp. 1101–1102 (2006)
16. Dalziel, J.R.: The Larnaca Declaration on Learning Design (2012), http://www.larnacadeclaration.org
17. Derntl, M., Neumann, S., Oberhuemer, P.: Propelling Standards-based Sharing and Reuse in Instructional Modeling Communities: The Open Graphical Learning Modeler (OpenGLM). In: 2011 IEEE 11th International Conference on Advanced Learning Technologies, pp. 431–435. IEEE (2011)
18. Dobozy, E.: Typologies of Learning Design and the introduction of a "LD-Type 2" case example. eLearning Papers 27(27), 1–11 (2011)

19. Earp, J., Pozzi, F.: Fostering reflection in ICT-based pedagogical planning. In: Proceedings of the First International LAMS Conference, pp. 35–44 (2006)
20. Ferrell, G.: Transforming curriculum design: transforming institutions, pp. 1–4. Briefing (February 2011)
21. Goodyear, P.: Educational design and networked learning: Patterns, pattern languages and design practice. Australasian Journal of Educational Technology 21(1), 1–12 (2005)
22. Goodyear, P., Ellis, R.: Students interpretations of learning tasks: Implications for educational design. In: Proceedings of the ASCILITE 2007 Conference, pp. 339–346 (2007)
23. Griffiths, D., Beauvoir, P., Sharples, P.: Advances in Editors for IMS LD in the TENCompetence Project. In: 2008 Eighth IEEE International Conference on Advanced Learning Technologies, pp. 1045–1047. IEEE (2008)
24. Gutierrez, S., Valigiani, G., Jamont, Y., Collet, P., Kloos, C.D.: A Swarm Approach for Automatic Auditing of Pedagogical Planning. In: Seventh IEEE International Conference on Advanced Learning Technologies (ICALT 2007), pp. 136–138. IEEE (2007)
25. Hernández-Leo, D., Romeo, L., Carralero, M.A., Chacón, J., Carrió, M., Moreno, P., Blat, J.: LdShake: Learning design solutions sharing and co-edition. Computers & Education 57(4), 2249–2260 (2011)
26. Katsamani, M., Retalis, S.: Orchestrating learning activities using the CADMOS learning design tool. Research in Learning Technologies Supplement 21, 1–12 (2013)
27. Katsamani, M., Retalis, S.: Making learning designs in layers: The CADMOS approach. In: Proceedings of the IADIS Multi Conference on Computer Science and Information Systems, pp. 305–312 (2011)
28. Koper, R., Olivier, B., Anderson, T.: IMS learning design information model. IMS Global Learning Consortium (2003)
29. Koper, R.: Current Research in Learning Design. Educational Technology & Society 9(1), 13–22 (2006)
30. Liu, K.: Semiotics in information systems engineering. Cambridge University Press, Cambridge (2000)
31. Lockyer, L., Bennett, S., Agostinho, S., Harper, B.: Handbook of Research on Learning Design and Learning Objects: Issues, Applications, and Technologies, vol. 2. IGI Global, Hershey (2009)
32. Masterman, E., Craft, B.: Designing and evaluating representations to model pedagogy. Research in Learning Technologies Supplement 21, 1–14 (2013)
33. McKenney, S., Reeves, T.C.: Conducting Educational Design Research, p. 234. Routledge, New York (2012)
34. Nielsen, J., Mack, R.L., Bergendorff, K.H., Grischkowsky, N.L.: Integrated software usage in the professional work environment: evidence from questionnaires and interviews. ACM SIGCHI Bulletin 17, 162–167 (1986)
35. Oliver, R., Littlejohn, A.: Discovering and describing accessible and reusable practitioner-focused learning. In: Proceedings of Theme of the JISC Online Conference: Innovating e-Learning, pp. 30–33 (2006)
36. Persico, D., Pozzi, F., Anastopoulou, S., Conole, G., Craft, B., Dimitriadis, H.D., Kali, Y., Mor, Y., Pérez-Sanagustín, M., Walmsley, H.: Learning design Rashomon I through different approaches. Research in Learning Technologies Supplement 21 (2013)
37. RELOAD Reusable eLEarning Object Authoring & Delivery (n.d.), http://www.reload.ac.uk/ (retrieved January 05, 2014)
38. Stamper, R.: Signs, Information, Norms and Systems. In: Holmqvist, B., et al. (eds.) Signs at Work, pp. 349–397. Walter de Gruyter, Berlin (1996)
39. Wijnen, W.: Towards Design-Based Learning. Eindhoven: Eindhoven University of Technology. University of Eindhoven, NL: OGO brochure, No2. Educational Service Center (2000)