

The Development of a Mediation Artifact for Representing Teaching Practices: A Study Connecting the Areas of Design and Learning Design

Patrícia B. Scherer Bassani^(✉), Igor Escalante Casenote, Eduardo Guilherme Albrecht, and Diego Mergener

Feevale University, Novo Hamburgo, RS, Brazil
{patriciab, igor, eduardoalbrecht, diegom}@feevale.br

Abstract. Learning activities can be codified through different forms of representation. These are known as mediation artifacts. The design of a sequence of activities using a mediation artifact generates a document which can be shared with other teachers in order to exchange ideas for using digital technologies in the classroom. This research aims to contribute to the studies on mediation artifacts by introducing the design process of the development of a mediation artifact which articulates studies between Design and Learning Design. The research, based on a qualitative approach, was organized into three phases: (a) learning design study meetings; (b) the design process of the mediation artifact; (c) validation with pre-service teachers. The main characteristic of the produced mediation artifact is that it is based on a conceptual map model and it has been organized into colors and icons. An amount of 76 icons were organized into four groups: yellow for learning tasks, including learning outputs; purple for learning tools and resources; red for representing the involvement and/or support of the actors in a learning task; and a social media special group. The mediation artifact was tested within two groups of undergraduate teacher formation students using the conceptual map tool available on GoConqr.com. Results pointed out that the use of a visual pattern can facilitate the comprehension by teachers from different countries and languages; the proposed model does not require much time for appropriation; the online tool GoConqr is an interesting space for sharing learning practices using the mediation artifact.

Keywords: Educational technology · Learning design · Mediation artifact

1 Introduction

The activities or tasks which can be a lecture, a debate, a research, an exercise, and others, are the basic unit of the teaching and learning process. A sequence of activities is a set of ordered, structured, and articulated tasks meant to achieve certain educational goals [1].

Learning activities can be codified through different forms of representation such as text, visual/graphical representation, taxonomy, etc. These are known as mediation artifacts due to their role of mediating the design of sequences of activities [2].

The sharing of learning activities with the use of technologies is in the center of the studies of the Learning Design area [3]. The core concepts of Learning Design are guidance (ways for helping teachers to learn new methods and technologies), representation (tools and models for representing practices), and sharing (a way of enhancing the use of digital technologies in education) [3].

This study focuses on the representation and it aims to contribute to the studies on mediation artifacts for representing practices [2–10].

There are many tools that can be used to design a learning activity. Some of them were developed based on Learning Design concepts like CompendiumLD [11] or Web Instant Collage [12]. These tools are available only in English and require from the teachers considerable time for appropriation [2, 5, 6]. Tools for the development of conceptual maps, such as Mindomo [13], Popplet [14] and GoConqr [15] can also be used for representing learning activities [2, 5–7].

The design of a sequence of activities using a mediation artifact generates a document which can be shared with other teachers in order to exchange new ideas for using digital technologies in the classroom. This final document needs to follow a standard model in order to be understood and reused by others. However, studies on learning design show that there isn't currently a consistent model for learning design [2, 4]. Furthermore, workshops with teachers showed that existing representations are complex [2–4].

This study is complementary to an ongoing research project called *Pedagogical practices on cyberspace* and aims to promote the development and the documentation of learning activities with technologies in elementary schools based on Learning Design studies [5–7]. How can we, thus, develop a model for representing practices that can be easily understood and used by teachers to promote the sharing and reuse of learning activities with technologies?

This paper presents the design process of the development of a mediation artifact which articulates studies between Design and Learning Design.

In the following section we present a reflection about mediation artifacts for representing practices, followed by the research path presenting the design process of a mediation artifact. Subsequently, we discuss the proposed model and finish the paper by presenting the findings and making recommendations for future research.

2 Mediation Artifacts for Representing Practices

There are different mediation artifacts that can be used for representing practices such as models, narratives or case studies, vocabularies, diagrammatic or iconic presentations [2]. Each mediation artifact has its own characteristics and allows different degrees of abstraction and detailing. This way, different mediation artifacts highlight different aspects of a learning activity.

An individual example of a sequence of teaching and learning activities is called a *learning design*, and the implementation of a learning design with a particular group of students is called a *running learning design* or a *running sequence* [3].

The recording of a learning activity using a mediation artifact based on text is very used by teachers/professors especially in a lesson plan format. However, the diversity

of presentation formats and non-standardized detailing reveals two possible problems [6, 7]:

- (a) a very superficial detailing of the learning activity which makes it difficult to be understood and reused;
- (b) an excessive detailing of the learning activity which makes it difficult to be applied in other contexts.

There are many interesting proposals for using visual representation as a mediation artifact [2–7].

Oliver and Herrington [8] proposed a framework for representing learning designs which comprises three interconnecting elements: learning tasks, learning resources, and learning support. They proposed a representation based on a temporal sequence.

This framework [8] was used in the context of the Learning Design project developed by the Australian Universities Teaching Committee (AUTC) [9, 10]. In this project the team created a graphical representation mechanism to describe and document a generic learning design which is known as a Learning Design Sequence.

The representation of a Learning Design Sequence uses the following graphical notation [9, 10]:

- (a) Squares: represent tasks;
- (b) Triangles: represent resources;
- (c) Circles: represent supports.

Figure 1 shows an example of a representation using temporal sequence of an activity. There are three tasks that students undertake in a sequence and each task has an appropriate teacher’s support. There is a resource available for the development of Task 1.

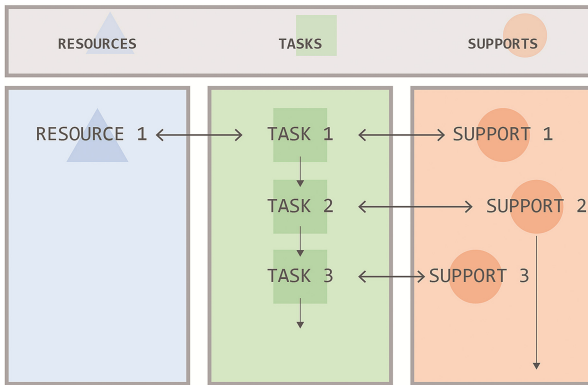


Fig. 1. Example of a learning design sequence (Source: created by authors based on [9, 10]) (Color figure online)

The Compendium LD [11] is a tool for representing learning designs. It provides a set of icons to represent the components of learning activities, as shown in Table 1.

Table 1. Learning design icons and their functions defined in the CompendiumLD tool

Icon	Function
	Role
	Task
	Tool
	Resource
	Learning output
	Stop

A learning activity in CompendiumLD comprises actors (students and teachers/professors/tutors), who perform actions (learning tasks such as discussing, etc.), making use of tools (e.g. online forums, text editor) and resources (e.g. course texts and videos) [11]. Figure 2 presents an example of a learning design produced using CompendiumLD tool.

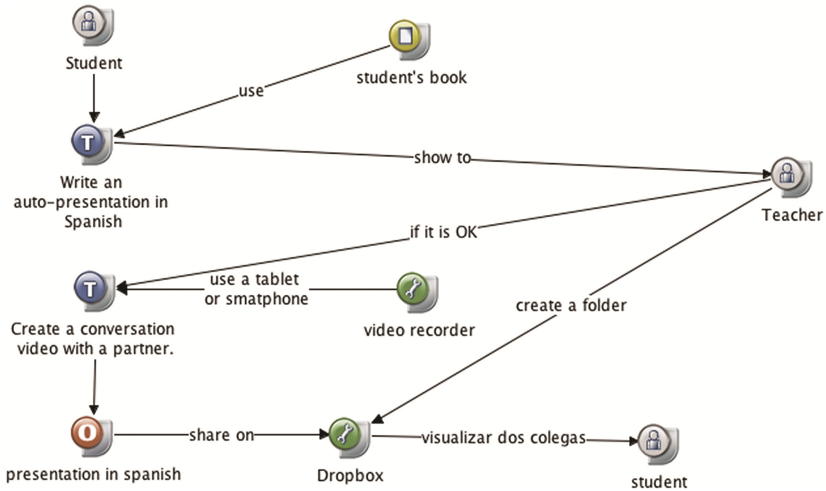


Fig. 2. Example of a learning design using CompendiumLD (Source: created by authors)

Tools for the development of conceptual maps, such as Mindomo [13], Popplet [14], and GoConqr [15] can be used for representing learning activities as well [2, 5–7]. Studies point out that these tools are relevant spaces to enhance the recording and sharing of learning activities. Another important point to highlight is that there are many free online conceptual map tools available, and they are easy to use. However, the learning design produced by teachers/professors in these tools needs to follow a standard model in order to be understood and reused by others [6].

The next section presents the research path for the development of a mediation artifact which articulates studies between Design and Learning Design.

3 The Research Path

The research, based on a qualitative and exploratory approach, was organized into three phases:

- (a) learning design study meetings;
- (b) the design process of the mediation artifact;
- (c) validation with pre-service teachers.

Each phase is detailed below.

3.1 Study Meetings

Study meetings between educational technology researchers and designers were the first research phase. These meetings aimed to discuss the Learning Design area, the ongoing project, and the first research results about mediation artifacts using conceptual maps [5–7]. It was also a space to discuss the problem: the lack of a common visual representation and the necessity to develop a non complex representation of a mediation artifact.

Based on these studies we defined the guidelines to the design process:

- (a) the concept of sequence of activities proposed by [1] is the basis of the design, and the organization of these sequences in a learning design will follow the representation proposed by [10];
- (b) the proposed model for the development of a learning design must be easy to apply using an online conceptual map tool [6];
- (c) the model must be constructed based on colors and images so that teachers of all languages can use it;
- (d) the graphical representation can follow the model used by CompendiumLD tool [11], using icons to represent learning tasks, actors, tools, resources, and learning outcomes.

3.2 The Design Process of the Mediation Artifact

The second phase, involving the design process, was conducted by the Design Center of Feevale University. The design team conducted a design process that comprehended three stages (Table 2):

- (a) informational, where the problem was analyzed;
- (b) creative;
- (c) technical.

The briefing was the first activity. The discussions carried out within the study meetings were important for the problem comprehension. Besides, the design team explored tools for representing teaching and learning activities including learning design tools and conceptual maps tools. The data organized during this *informational phase* was the basis of the *creative phase*.

The *creative phase* started with the definition of the concept which guided the mediation artifact development: the use of a visual language based on icons.

Table 2. Methodology used by the design team

Informational	Creative	Technical
Briefing	Definition of the concept	Application
Former research	Brainstorming	User manual
Theme Search	Icon classification	Simulation
Analysis	Visual language	Presentation
	Color's study	

The mediation artifact has been organized into colors and icons. Each color represents a component of the leaning design: the actors in red, the tasks in yellow, the resources in purple, the tools in pink, and the learning outputs in green.

Some icons were developed using AIGA's (American Institute of Graphic Arts) pictograms which are design standards for visual communication and are based on professional ethics issues in the design area. However, there are icons developed from scratch especially for this project (Fig. 3).

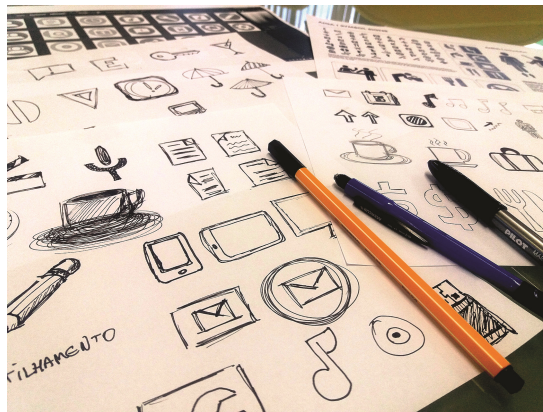


Fig. 3. The creative process for the development of the icons (Source: created by authors)

The development of the icons involved a study of flat colors with shadows for contrast and differentiation between groups of icons for the purpose of better aesthetics and logic. After color studies and layout tests the icons were digitalized in vector images (Fig. 4).

Additionally, there is another group of icons to represent social media tools (Fig. 5). Social media can be used as a resource or as a tool.



Fig. 4. Icons and colors to represent a learning design (Source: created by authors) (Color figure online)

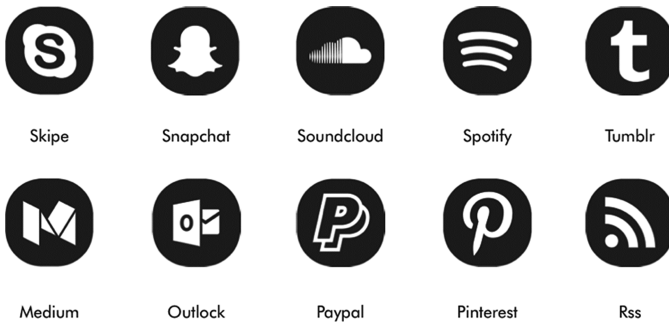


Fig. 5. Icons for social media representation (Source: created by authors)

The main characteristic of the produced mediation artifact is that it is based on a conceptual map model. Conceptual maps are usually employed in educational contexts and teachers and students are familiar with this kind of tool. Thus, in the visual pattern created, a learning design is composed by a group of coloured text boxes with an icon, as shown on Fig. 6.

The visual pattern (Fig. 6) was tested on the online conceptual map GoConqr [15]. This tool was selected based on previous studies which indicated that it enables both the sharing and the remix of the documents produced [6].

At the end of the *technical phase* an amount of 76 icons were organized into six groups: the actors in red, the tasks in yellow, the resources in purple, the tools in pink, and the learning outputs in green, and the social media special group. These icons are available online combined with the user manual¹.

¹ <https://drive.google.com/open?id=0B11Dz2CC6oyoSTdTcW5oVWttUEE>.

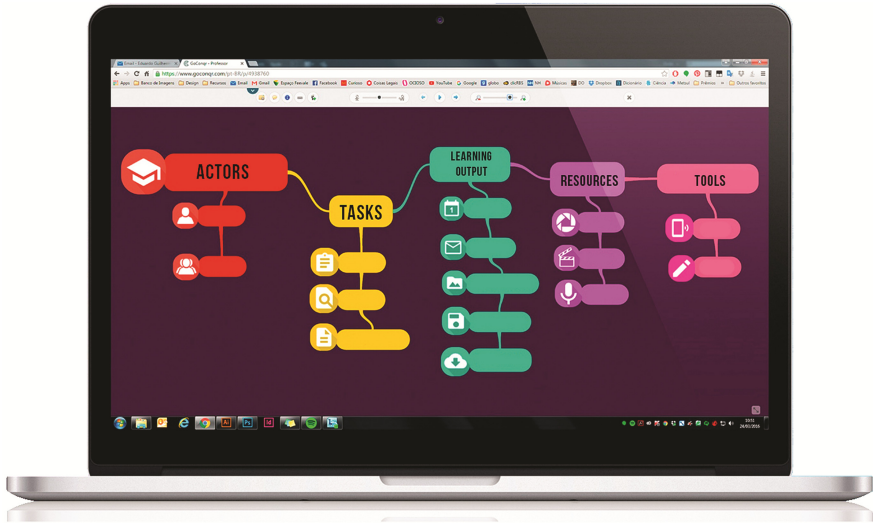


Fig. 6. Preliminary viewing of the visual pattern created (Source: created by authors) (Color figure online)

3.3 Testing the Mediation Artifact

Finally, in the third phase of the research the design solution was tested with two groups of undergraduate teacher formation students. The data were collected from observation in locus, digital photography, and from the learning designs produced by students using the proposed graphic pattern in the online tool GoConqr.

The first testing was realized in the first semester of 2016 and involved a group of undergraduate teacher formation students majoring in English/Portuguese. This group used the model to represent sequences of activities designed for a Portuguese Course for Foreign People. They produced five sequences of activities in GoConqr platform using the proposed mediation artifact². The Figs. 7, 8, and 9 show three of these sequences of activities.

On Fig. 7 we can see that the colors of the icons don't match the colors of the text box as proposed. On this (Fig. 7) there is a list of tasks (in yellow) in vertical order, indicating a sequence to follow, but there are tasks represented side by side. Thus, according to Fig. 7, the comprehension of the sequence of activities could be complicated.

² The documents are available online: <https://padlet.com/patriciab/yhisuily538b>.



Fig. 7. Example of a sequence of activities using the mediation artifact (Source: https://www.goconqr.com/pt-BR/p/5787738-Aula-de-Portugu-s-para-estrangeiros-EaD-mind_maps) (Color figure online)

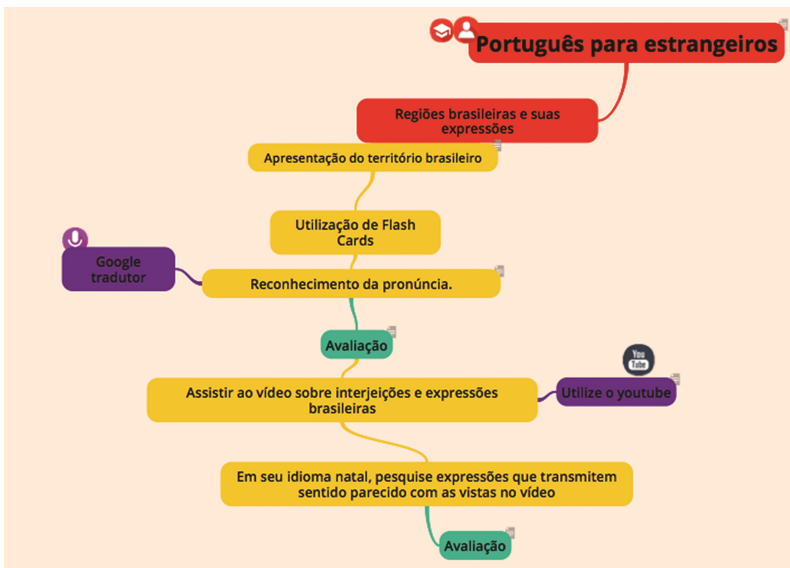


Fig. 8. Example of a sequence of activities using the mediation artifact (Source: https://www.goconqr.com/pt-BR/p/5558697-Portugu-s-para-estrangeiros-mind_maps) (Color figure online)

On Figs. 8 and 9 we find the same problem with the colors of the icons. On Fig. 8 the students represented the sequence of activities in a comprehensive way. However,

on Fig. 9 there is a list of learning outputs (represented by a green text box) isolated from the tasks.



Fig. 9. Example of a sequence of activities using the mediation artifact (Source: https://www.goconqr.com/pt-BR/p/5820445-Sin-nimos-e-ant-nimos-da-l-ngua-portuguesa-mind_maps) (Color figure online)

This first testing revealed two issues:

- (a) the students had difficulty in differentiating tools and resources and this generated a confusion of colors between the text box and the icons, breaking the proposed visual pattern;
- (b) the lack of information of how to organize the learning design elements generated some non-comprehensible sequence of activities (Fig. 10).

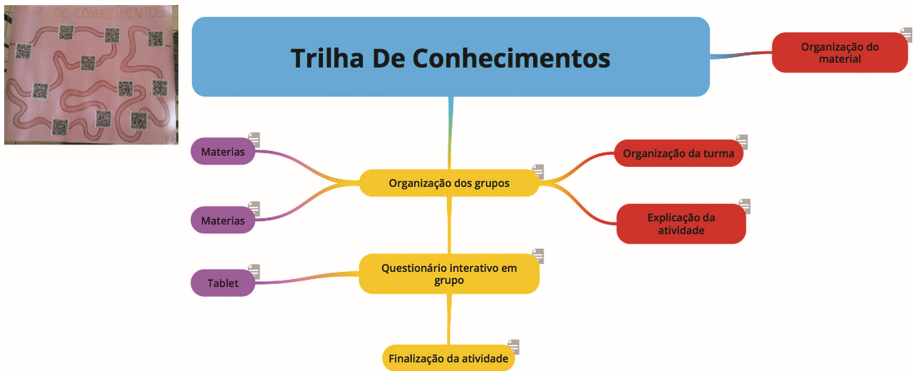


Fig. 10. Example of a sequence of activities using the mediation artifact (Source: http://www.goconqr.com/pt-BR/p/7161286-Trilha-De-Conhecimentos-mind_maps) (Color figure online)

Based on these first results we realized the importance of defining, in a formal way, the structure of the mediation artifact meant to guide the representation of the sequence of the activities.

Based on the [9, 10] studies we defined a transparent structure:

- (a) learning tasks should be represented on a list in the center;
- (b) learning tools and resources for each learning task should be represented on the left;
- (c) the involvement and/or support of the actors in a learning task should be represented on the right.

The second testing involved a group of undergraduate teacher formation students enrolled in an Education and Technology course during the second semester of 2016. This group of students had the opportunity of verifying the documents produced by the first group and they received a quick explanation about the transparent structure they should follow in order to organize the learning design elements. They produced 15 sequences of activities³ in GoConqr platform using the proposed mediation artifact. The Figs. 10 and 11 show some of these sequences of activities.

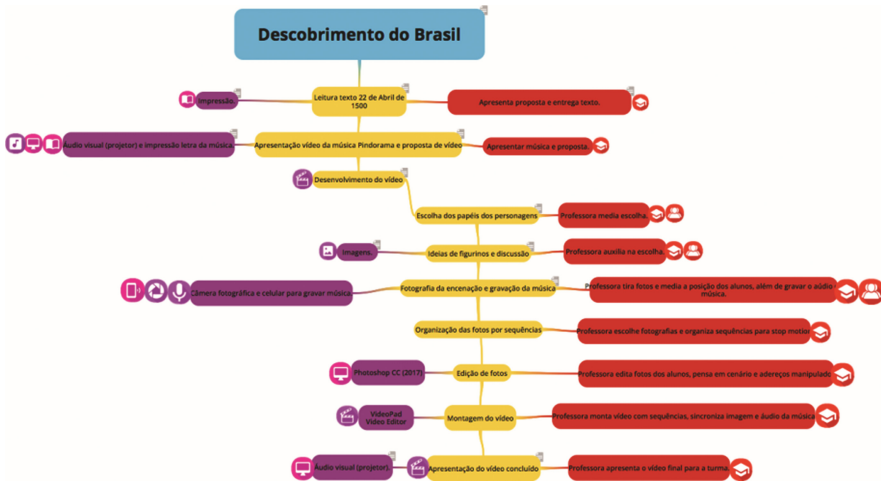


Fig. 11. Example of a sequence of activities using the mediation artifact (Source: https://www.goconqr.com/pt/p/7017545-Descobrimto-do-Brasil-mind_maps) (Color figure online)

The second testing revealed important issues about the mediation artifact:

- (a) the students, as well as the first group, had difficulty to differentiate tools and resources, and it generated a confusion of colors between the text box and the icons;
- (b) some students didn't apply the icons in the learning design;

³ The documents are available online: <https://padlet.com/patriciab/4bhif3qn4ofx>.

- (c) the proposed transparent structure based on [9, 10] was efficient and the learning designs developed by students showed an organized sequence of activities related to the appropriate resources, tools, and supports.

The next section presents an analysis of the mediation artifact based on these two testing experiences.

4 Discussion

The mediation artifact was tested within two groups of undergraduate teacher formation students. The documents were produced in the GoConqr platform [15] using the conceptual map tool. This tool was chosen because [6]:

- (a) it is possible to attach a note to a text box: this feature enables the production of a learning design with two layers, the main layer presenting the general idea of the activities, and a second layer detailing in depth each activity;
- (b) it is possible to insert a link to an external resource: this feature enables the creation of links to resources and tools as web pages or another online conceptual map (in this case it's possible to create integrated learning designs);
- (c) the conceptual maps are available online through a public link;
- (d) it is possible to use a remix feature (one person can reuse and adapt an existing conceptual map).

The students within both groups had to produce a sequence of activities with technologies using the proposed mediation artifact. The documents produced by students are available online⁴ and were analyzed based on document analysis [16, 17]. The document analysis makes use of static documents available online which do not involve interaction between individuals [16].

Bowen [17] suggests that documents can serve to a variety of purposes as a part of a research. In the context of this research, the documents provided means for tracking change and development of the mediation artifact.

The first testing revealed a very relevant issue: the lack of information of how to organize the learning design elements. This problem affected seriously the results and some students produced a non-comprehensible sequence of activities. Based on this information, a transparent layer was proposed in order to guide the organization of these elements.

The first testing also revealed a problem with the visual pattern. The students had difficulty in differentiating tools and resources and this generated a confusion of colors between the text box and the icons, breaking the proposed visual pattern. We decided to proceed to the next testing before making some changes in the visual pattern.

The second testing showed that the proposed transparent structure was efficient and the learning designs developed by students showed an organized sequence of activities.

This second test, however, confirmed the need to redesign the visual pattern once the same problem appeared: the observation of the students *in locus* during both testings

⁴ <https://padlet.com/patriciab/yhisuily538b> - <https://padlet.com/patriciab/4bhif3qn4ofx>.

revealed that they had difficulty in seeing the difference between tools and resources. Although a resource can be understood as a content-based artifact, and a tool as an artifact designed to support a specific task, the distinction between a resource and a tool is becoming blurred because the same tool can be used by the teacher/designer to create content and also by the students to create their own representation of subject matter [18].

Furthermore, the observation *in locus* and the analysis of the documents showed that students had also difficulty to understand a learning output as something different from an evaluation task.

Based on these findings, we developed a new design pattern for the mediation artifact (Fig. 12) based only in three groups of colors:

- learning tasks, including learning outputs, should be represented on a list in the center using the yellow color;
- learning tools and resources for each learning task should be represented on the left using the purple color;
- the involvement and/or support of the actors in a learning task should be represented on the right and using the red color.

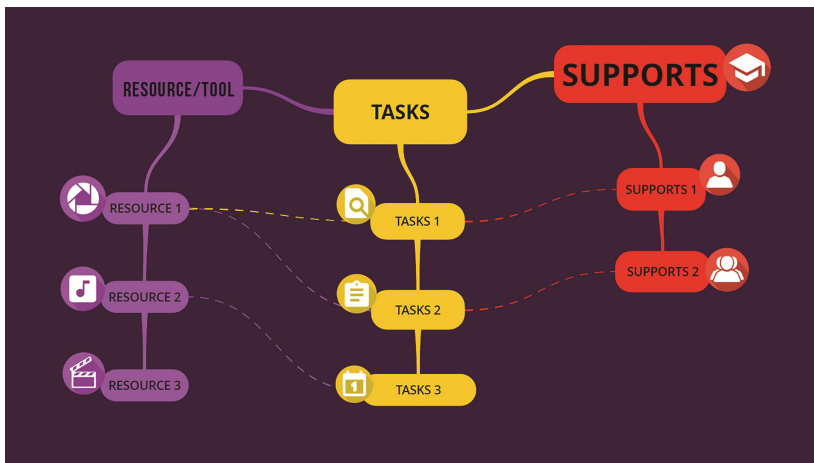


Fig. 12. Final visual pattern of the mediation artifact (Source: created by authors) (Color figure online)

At the end of the research process an amount of 76 icons were organized into four groups: the actors/support in red, the tasks/learning outputs in yellow, and the resources/tools in purple, and the social media special group. These icons are available online combined with the user manual⁵.

⁵ <https://drive.google.com/open?id=0B11Dz2CC6oyoSTdTcW5oVWttUEE>.

5 Final Comments

This study is complementary to an ongoing research project called *Pedagogical practices on cyberspace* which aims to promote the development and the documentation of learning activities with technologies in elementary schools based on Learning Design studies.

In this paper we described the research path meant to produce a mediation artifact for representing learning activities. This research had as starting point the following question: How can we develop a model for representing practices that can be easily understood and used by teachers to promote the sharing and reuse of learning activities with technologies?

The development of the mediation artifact articulated studies between Design and Learning Design. The mediation artifact was tested within two groups of undergraduate teacher formation students. The conceptual map tool available on online platform GoConqr.com [15] was used to produce the learning designs using the mediation artifact.

The analysis of the learning designs produced using the proposed mediation artifacts revealed:

- (a) the use of a visual pattern with different colors and icons to represent the learning design elements can facilitate the comprehension and the use by teachers from different countries and languages;
- (b) the proposed model does not require much time for appropriation;
- (c) the online tool GoConqr is an interesting space for sharing learning practices using the mediation artifact.

Although the research showed that online conceptual maps are a relevant and feasible space for producing and sharing learning designs using the proposed mediation artifact, we understand it would be interesting to develop a mobile application using our graphical pattern.

Future works should involve tests using the mediation artifact in a broader context, focusing on teachers and/or professors, and workshops to disseminate the study.

Acknowledgments. We thank the National Council for Scientific and Technological Development - CNPq/Brazil (<http://www.cnpq.br>) for providing financial support for this study. We would also like to thank Feevale University (<http://www.feevale.br>) for making possible this research.

References

1. Zabala, A.: *A Prática Educativa*. Artmed, Porto Alegre (1998)
2. Conole, G.: *Designing for Learning in an Open World*. Springer, New York (2013)
3. The Larnaca Declaration on Learning Design. <https://larnacadeclaration.wordpress.com>
4. Falconer, I., Finlay, J., Fincher, S.: Representing practice: practice models, patterns, bundles. *Learn. Media Technol.* **36**(02), 101–127 (2011)
5. Bassani, P.S.: Documentação de atividades de aprendizagem com uso de tecnologias. In: III Jornada de Atualização em Informática na Educação, pp. 106–143. SBC, Brazil (2014)

6. Bassani, P.S., Lima, C., Dalanhol, D.: Documentação e compartilhamento de atividades de aprendizagem: um estudo sobre repositórios de prática e artefatos de mediação. *Revista e-Curriculum*, vol. 14, pp. 1423–1453. PUCSP, São Paulo (2016)
7. Bassani, P.S., Bassani, R.: Production and sharing of learning activities with technologies: designing for learning in teacher formation courses. In: ATINER'S Conference Paper Series, No:EDU2016-1901. Atiner, Atenas (2016)
8. Oliver, R., Herrington, J.: *Teaching and learning online: a beginner's guide to e-learning and e-teaching in higher education*. Edith Cowan University. Centre for Research in Information Technology and Communications (2001)
9. Oliver, R., Harper, B., Hedberg, J., Wills, S., Agostinho, S.: Formalising the description of learning designs, in quality conversations. In: *Proceedings of the 25th HERDSA Annual Conference*, Perth, Western Australia, 7–10 July 2002
10. Learning Design. http://www.learningdesigns.uow.edu.au/project/learn_design.htm
11. Compendium LD. <http://compendiumld.open.ac.uk>
12. Web Instance Collage. <http://pandora.tel.uva.es/WIC2>
13. Mindomo. <http://www.mindomo.com>
14. Popplet. <http://www.popplet.com>
15. Goconqr. <http://goconqr.com>
16. Hewson, C., Laurent, D.: Research design and tools for internet research. In: Hughes, J. (ed.) *Sage Internet Research Methods*, pp. 165–193. Sage, London (2012)
17. Bowen, G.: Document analysis as a qualitative research method. *Qual. Res. J.* **9**(2), 27–40 (2009)
18. Beetham, H.: An approach to learning activity design. In: Beetham, H., Sharpe, R. (eds.) *Rethinking Pedagogy for a Digital Age*, pp. 26–40. Routledge, New York (2007)