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Un compromiso social

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RESEARCH-BASED LEARNING ENHANCED BY TECHNOLOGY IN HIGHER EDUCATION: A COMPARATIVE ANALYSIS OF TOOLS

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Research-based Learning, Higher Education, Tools Evaluation, ICT Tools, Technology-enhanced Learning Environments.

Abstract

Research-based Learning (RBL) is an approach that is gaining attention as a didactic method in undergraduate studies in higher education, as a way of emphasizing students' active role and engagement in learning, and simultaneously, fostering the development of key skills. By implementing this didactic strategy, students are expected to assume the role of researchers, starting with the exploration of a topic and identification of a research problem until the presentation and reflection on the obtained results. Each of the phases of the RBL can be accompanied by the use of a variety of digital tools, since they address a range of purposes connected to the research processes. However, studies related to how different digital tools can be didactically used in RBL scenarios have not been found so far. Therefore, the aim of this on-going study is to identify the didactic possibilities of digital tools to support RBL scenarios in higher education. The method is based on a tools evaluation and the development of functional maps to offer an overview of the tools fit to the specific RBL phases. As results, an example of a functional map is presented and different outputs (e.g., a tools catalogue) are identified. Finally, the conclusions highlight the contribution of the study regarding the future design and development of blended learning scenarios in RBL approaches.

Introduction / Framework

Research-based Learning (RBL) in Higher Education, also known as (Undergraduate) Student Research or Inquiry-based Learning (IBL), is defined by Brew, (2013, p.2) as a student-focused way of bringing research and teaching together. This approach fits well with the student-learning approach that the universities aim to put forward, which includes a shift from teaching to learning and the encouragement of students to become self-directed and engaged learners (Justice et al., 2007). In addition, RBL seeks to emphasize student engagement, par-

ticipation and inquiry and, at the same time, aims at developing epistemological aspects (e.g., dealing with challenges) and ontological aspects (e.g., developing personal and professional capabilities) (Brew, 2013). According to the main phases of the synthesized IBL framework developed by Pedaste et al. (2015, p. 54) and the RBL phases by Sonntag, Rueß, Ebert, Friederici and Deicke (2016), the RBL is constituted by the following steps:

1. Orientation, which aims at stimulating curiosity about a topic and addressing a learning challenge through a problem statement.
2. Conceptualization, which considers the exploration of related literature and the generation of research questions and/or hypothesis.
3. Investigation. Here three subphases can be clearly differentiated: the selection of methods and the development of the research design (before conducting the research), the exploration to obtain data related to the research question or experimentation in order to test a hypothesis (conducting the research), and the data interpretation (during and after conducting the research).
4. Conclusion, which is the process of drawing conclusions from the data in relation to the hypotheses or research questions.
5. Discussion. Here two phases that are separated in the model by Sonntag et al. (2016) are deployed: the presentation and discussion of the results though a communication process, and the reflection on the results and the whole research process.

The link between the research and technology has been claimed by some authors through the concept of augmented research or the research personal learning environment (PLE), which also connects to the development of self-regulated learning skills. In this sense, different authors support the idea of the students' use of technology for self-regulated learning (Carneiro, Lefrere, Steffens & Underwood, 2011; Salinas, 2004, 2008). Concretely, the concept of augmented research involves the enhancement of research with processes and tools that aim at a better knowledge management, based on the digitalization and public and open access of knowledge (González Calatayud & Román García, 2016; Peña-López, 2013). The same authors propose different tools for some of the research phases, though emphasizing the role of the postgraduate researcher and without the specific focus on the RBL.

Furthermore, whereas different authors offer theoretical frameworks and models regarding the implementation of RBL, there is a lack in the literature regarding the role of technology for each of those phases in higher education and in relation to the didactic possibilities of digital tools for RBL for any field. Therefore, this study is addressed at dealing with that literature gap and follows the work started in the university teacher training offer of the University of Oldenburg (Germany) regarding RBL supported by digital tools (Marín & Schirmer, 2018).

Objectives and Research Questions

The main objective of this exploratory study is to identify didactically suitable digital tools for individual and group RBL scenarios in higher education.

The research questions are the following:

- Which digital tools are suitable for individual and group RBL scenarios in higher education?
- How didactically suitable are those tools for each of the RBL processes according to their main functionalities?

Method

The method used in this study is the comparative analysis of tools. In order to conduct this analysis, two matrix tables with different criteria were designed. First of all, the phases and subphases of the RBL process according to the combined phases from Pedaste et al. (2015) and Sonntag et al. (2016) and the possibility to work individually and/or in-group with that tool were part of a first matrix table.

On the other hand, the technical characteristics were also regarded in a second matrix table, insofar as they influence their didactic use in higher education settings and enable teachers and instructional designers to prepare instructions to work with the tools towards the RBL-related objectives. Concretely, issues such as, e.g., tool category, the compatible platform (Web/ Desktop/ Mobile/ Cross-platform), the availability of the tool in different languages, the existence or non-existence of a cost for the software, the type of the license for the tool, the possibilities of connecting with other tools, or the type of data that the tool uses, were examined. These criteria are integrated in the search filter or classification that other recognized tools databases and catalogues use, e.g., the DiRT Directory for digital research tools (http://dirtdirectory.org), the Directory of Learning & Performance Tools (http://c4lpt.co.uk/directory-of-learning-performance-tools/) or Edshelf (https://edshelf.com/search/).

The initial selection of tools for their evaluation was based on the proposal of different tools categories for RBL group tools that was presented in Marín and Schirmer (2018)[1], which at the same time took into account catalogues as the previously mentioned.

In order to evaluate the functions of the tools according to the phases of the RBL process, functional maps are being developed (as in Salinas, de Benito, Marín, Moreno, & Morales, 2010).

1. The mindmap of the categories and tools can be found via this link: https://bit.ly/2suE5WS.

Results

The results of the study are in progress and are expected to include a tools catalogue derived from both matrixes and a collection of functional maps, which could be used later both by university teachers and/or students. Though the tools evaluation is still on going, a functional map for a tool included in the analysis is presented as an example in Figure 1. A brief description for didactic purposes regarding RBL is added below.

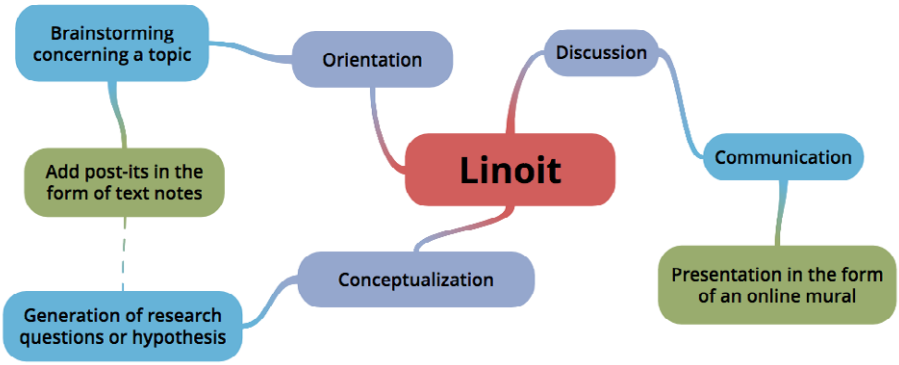

Figure 1. Functional map of Linoit.

The functions of the online pinboard tool Linoit are connected to different phases and subphases of the RBL, though it is especially useful in the first phases: in the orientation phase, by exploring and stimulating curiosity about a topic via brainstorming, and the conceptualization phase, in which different ideas for research questions or hypothesis could be generated, in both phases in the form of text notes or post-its. Linoit could be also considered for the phase of discussion, especially regarding the process of communication, by designing an online mural that includes notes with different web elements (video, images, audio, documents, links, etc.).

Conclusions

This study represents a first step towards assisting university teachers in developing didactic strategies that combine the RBL approach and the use of digital tools, in order to foster the students' development of a variety of 21st skills, which include the resolution of problems, dealing with complex situations and the abilities concerning digital competence.

Future work includes the further development of the RBL tools catalogue and functional maps, and especially, the description, development, implementation and evaluation of blended learning scenarios in higher education in which digital tools to support RBL are included, in a form that they could be openly reusable.

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