



Universidade de Aveiro  
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**Lorena Azevedo de  
Sousa**

**DESENVOLVIMENTO DE RECURSOS  
EDUCACIONAIS ABERTOS PARA EDUCAÇÃO  
DOUTORAL: UMA ABORDAGEM DE INVESTIGAÇÃO  
E DESENVOLVIMENTO**

**DEVELOPMENT OF OPEN EDUCATIONAL  
RESOURCES FOR DOCTORAL EDUCATION: A  
RESEARCH AND DEVELOPMENT APPROACH**



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RESEARCH AND DEVELOPMENT APPROACH**

Tese apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Doutor em Multimédia em Educação, realizada sob a orientação científica do Doutor Luís Francisco Mendes Gabriel Pedro, Professor Associado, e do Doutor Carlos Manuel das Neves Santos, Professor Auxiliar, do Departamento de Comunicação e Arte da Universidade de Aveiro

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## palavras-chave

Educacionais Abertos, educação doutoral, Technology-Enhanced Learning, Educational Research Design

## resumo

Recursos Educacionais Abertos (REA) são materiais de aprendizagem, ensino e pesquisa disponíveis em qualquer meio e formato, que estão em domínio público ou sob uma licença aberta que permite a qualquer pessoa interagir com o recurso por meio dos 5R – reter, reutilizar, revisar, remixar e redistribuir. Embora os REA possam trazer inúmeros benefícios para a educação, ainda há certa resistência ao seu uso a nível doutoral e no ensino superior em geral. A questão de pesquisa que norteou esta investigação foi *quais características podem contribuir para o desenvolvimento de REA para a educação doutoral*. Sob o enfoque metodológico da Educational Design Research, este estudo consistiu em três fases principais: análise do contexto, desenvolvimento e avaliação formativa, e avaliação semi-somativa. Na primeira fase, foi realizada uma revisão sistemática da literatura para analisar o uso de REA na educação doutoral e um inquérito por questionário foi conduzido entre doutorandos, pesquisadores e professores para identificar quais características poderiam contribuir para o desenvolvimento desses REA. Poucos artigos relacionados ao uso de REA na educação doutoral foram encontrados e os resultados do questionário indicaram que os doutorandos, pesquisadores e professores preferiram recursos que estejam devidamente referenciados, com rigor científico e criados por uma pessoa ou instituição conceituada. Ter uma licença aberta ou permitir adaptação, por exemplo, não foram características consideradas prioritárias para eles. Na segunda fase, como o design-based research (DBR) é o método de investigação mais utilizado na área de TEL e é também aquele em que os doutorandos e doutores carecem de uma maior formação, foi desenvolvido um protótipo de REA sobre DBR que passou por três ciclos de avaliação formativa. No Ciclo 1, os especialistas validaram seu conteúdo científico; no Ciclo 2, foram oferecidos workshops sobre H5P para avaliação da ferramenta utilizada; e no Ciclo 3, o protótipo foi avaliado por meio de workshops sobre DBR. À medida que o feedback era recebido em cada ciclo, ajustes e melhorias eram feitos no protótipo. Na terceira e última fase, foi realizada uma avaliação semi-somativa para fazer os últimos ajustes no protótipo do REA. Por meio de entrevistas, quatro especialistas em métodos de pesquisa e/ou DBR avaliaram a versão final do protótipo, considerando os aspectos mais positivos, negativos e sugestões de melhoria. Embora alguns tenham sugerido que os aspectos visuais poderiam ser mais apelativos, o conteúdo do protótipo teve uma avaliação positiva e atingiu seus objetivos. A versão final do recurso tem sido divulgada em programas de doutoramento em TEL em toda a Europa. Esperamos que este REA possa contribuir para o aprendizado de DBR e que este estudo possa conscientizar estudantes de pós-graduação sobre a importância dos REA para a educação, principalmente para a área de TEL.

**keywords**

Open Educational Resources, doctoral education, Technology-Enhanced Learning, Educational Research Design Recursos

**abstract**

Open Educational Resources (OER) are learning, teaching, and research materials available in any medium and format, that are in the public domain or under an open license that enables anyone to interact with the resource through the 5R activities – retain, reuse, revise, remix, and redistribute. Although OER can bring numerous benefits to education, there is still some resistance to its use at the doctoral level and in higher education in general. The research question that guided this investigation aimed to understand *which characteristics can contribute to the development of OER for doctoral education*. Under the methodological approach of Educational Design Research, this study consisted of three main phases: context analysis, development and formative evaluation, and semi-summative evaluation. In the first phase, a systematic literature review was carried out to analyse the use of OER in doctoral education, and a survey was conducted among PhD candidates, researchers, and practitioners to identify which characteristics could contribute to the development of these OER. Few articles related to the use of OER in doctoral education were found and the results from the survey indicated that PhD candidates, researchers, and practitioners preferred resources that were properly referenced, had scientific rigor, and were created by a reputable institution or person. The characteristics of having an open license or allowing adaptation, for example, were not considered a priority to them. In the second phase, as design-based research (DBR) is the most used research method in TEL and the one in which PhD students and PhD holders need more training, an OER prototype about DBR was developed and went through three cycles of formative evaluation. In Cycle 1, experts validated its scientific content; in Cycle 2, workshops about H5P were offered to evaluate the tool used; and in Cycle 3, the prototype was evaluated through workshops about DBR. As feedback was received in each cycle, adjustments and improvements were made to the prototype. In the third and last phase, a semi-summative evaluation was performed to make the last adjustments to the OER prototype. Through interviews, four experts in research methods and/or DBR evaluated the final version of the prototype, considering the most positive and negative aspects, and suggestions for improvement. Although some have suggested that the visual aspects could be more appealing, the content of the prototype had a positive evaluation and achieved its objectives. The final version of the resource has been disseminated in doctoral programs in TEL around Europe. We hope that this OER can contribute to the learning of DBR and that this study can raise awareness about the importance of OER to education, especially in the area of TEL.

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## List of acronyms and abbreviations

ICT	Information and Communication Technologies
OER	Open Educational Resources
TEL	Technology-Enhanced Learning
DE-TEL	Doctoral Education for Technology-Enhanced Learning
EA-TEL	European Association of Technology-Enhanced Learning
jTELSS	Summer School on Technology-Enhanced Learning
EC-TEL	European Conference on Technology-Enhanced Learning
FOSS	Free and Open-Source Software
OCL	Open Content License
OPL	Open Publication License
CC	Creative Commons
MIT	Massachusetts Institute of Technology
OCW	OpenCourseWare
UNESCO	United Nations Educational, Scientific and Cultural Organization
OECD	Organisation for Economic Co-operation and Development
5R	Retain, Reuse, Revise, Remix, Redistribute
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
EDR	Educational Design Research
GDPR	General Data Protection Regulation
DBR	Design-based Research
LTI	Learning Tools Interoperability
LMS	Learning Management Systems
UEQ	User Experience Questionnaire

## CHAPTER 1: INTRODUCTION

*If you have an apple and I have an apple and we exchange these apples then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas.*

(George Bernard Shaw)

The advent of the Internet and new Information and Communication Technologies (ICT) have built new conditions for the emergence of knowledge societies, which are societies capable of identifying, generating, and disseminating information to apply knowledge for human development (UNESCO, 2005). The wealth and prosperity of a knowledge society are established by the priceless resource of ideas. Although this capacity of gathering and analysing information has existed throughout human history, the idea of a knowledge society comes from the increase in data creation and information dissemination that have been provided by the innovation of ICT.

In a digital world where ideas are disseminated at the click of a button, a vast number of digital resources have been created and made available at little or no cost. But we need to be careful because not all these resources available on the Internet are open and can be reused, revised, and redistributed. Most of them are released without clear license terms and are automatically protected by copyright, not being allowed to be reused without the owner's permission. These copyright laws emerged at a time when the expenses to print, distribute, and sell a book were significant. However, in a digital era, using copyright can be an obstacle to extending access to educational resources for all learners of a knowledge society. Education is viewed as a basic human right and, because of this, using Open Educational Resources (OER), which are resources available under open licenses or in the public domain that enable legal use, adaptation, and redistribution, can be considered essential to guarantee a more inclusive society.

Despite all the benefits, such as making learning more accessible, reducing costs for students, and optimizing time when creating materials from scratch, higher education institutions are still resistant to embracing the use of OER (García-Holgado et al., 2020). This tendency is also evident in doctoral education, where OER was one of the least referenced sources when PhD candidates and PhD holders were asked which learning sources they used to deepen their knowledge on Technology-Enhanced Learning (TEL) topics, doctoral training topics, and research methods (Albó, 2022).

The Doctoral Education for Technology-Enhanced Learning (DE-TEL) project was an Erasmus+ project that brought together nine European universities and the European

Association of Technology-Enhanced Learning (EATEL) to exchange their best practices, with the aim of creating a new internationally designed program and OER to better integrate the doctoral programs in TEL and support PhD students in this area.

As a PhD student in Multimedia in Education at the University of Aveiro, one of the members of this consortium, and a professor in the area of TEL at a University in Brazil where she intends to work in post-graduation programs in TEL, this researcher saw this project as a great opportunity to better know the different doctoral programs in Europe and develop resources that could support not only her own learning but also the learning of her colleagues and other PhD students in Europe. Although this researcher was not a specialist in open education and OER before, she has experience in developing materials for online courses and believes in a more inclusive education through the opening of these resources.

## **1.1 Research questions and objectives**

The research questions that guided the present study were:

RQ1. How are OER used in doctoral education?

RQ2. Which characteristics can contribute to the development of OER for doctoral education?

RQ3. How do PhD candidates, practitioners, and researchers define OER?

RQ4. Which characteristic should an OER developed for doctoral education have?

RQ5. How do the users evaluate the developed OER?

The objectives were:

- to analyse the use of OER in doctoral education.
- to identify the characteristics that can contribute to the development of OER for doctoral education.
- to analyse the PhD candidates, practitioners, and researchers' concept of OER.
- to develop an OER for doctoral education in TEL.
- to evaluate the developed OER in doctoral education in TEL.

## **1.2 Structure of this thesis**

This thesis consists of five chapters. Chapter 1 introduces the topic of this thesis, contextualizes the problem, and presents the research questions and objectives that guided this study.

Chapter 2 offers an overview of the theoretical background that supports and justifies this current study. Firstly, it outlines the DE-TEL project and its objectives. Secondly, it presents the OER and some definitions. Then, it presents a systematic review of the use of OER in doctoral education and a systematic review of systematic reviews on the legal and technical aspects of OER.

Chapter 3 describes the methodological approach applied in this study, the Educational Design Research, and its three main phases - context analysis, development and formative evaluation, and semi-summative evaluation. It details the instruments and procedures adopted in the process of data collection and data analysis of each phase.

Chapter 4 presents the results and a discussion of the three phases of this study. Regarding the first phase, the results of a survey conducted in the context analysis are presented. Then, this chapter describes the development of the prototype and the formative evaluation that was carried out through workshop sessions. After that, it discusses the results of the semi-summative evaluation conducted through interviews with experts.

Chapter 5 brings a summary of the main results of this study, listing some of its limitations and suggestions for further research. This chapter is also dedicated to a reflection on the contributions to the field of TEL.

Finally, the bibliography and the list of appendices are displayed.



## **CHAPTER 2: LITERATURE REVIEW**

This chapter is divided into four main sections regarding the theoretical foundations which support and justify this current study. The first section outlines the Doctoral Education for Technology-Enhanced Learning (DE-TEL) project and its objectives. The second section presents an overview of Open Educational Resources (OER), with a brief history and some definitions. The third section presents a systematic review of the use of OER in doctoral education. And the fourth section presents a systematic review of systematic reviews on the legal and technical aspects of OER.

### **2.1 Doctoral Education for Technology-Enhanced Learning Project**

Technology-Enhanced Learning (TEL) is recognized as an interdisciplinary field of research since it intersects several academic disciplines related to teaching and learning, such as education and psychology, and technology, such as computer science and information science (Kalz & Specht, 2014; Scanlon & Conole, 2018). According to Bourdeau and Balacheff (2014), TEL is a standard term used predominantly in Europe “to designate a field of research aimed at improving learning by integrating current technologies and designing innovative ones” (p.1). Sometimes related expressions, such as Educational Technology, Digital Education, and Learning Engineering, are used internationally as synonyms (Pammer-Schindler et al., 2020). In a summarized manner, it investigates how technology can be used in education and, because of this, the approach adopted in TEL investigations combines researchers with different experiences, knowledge, and practices, resulting in multidisciplinary studies (Scanlon & Conole, 2018).

Although interdisciplinary investigations bring innovative solutions to ordinary problems since they adopt diverse methodological perspectives and experiences, guaranteeing that this investigation is well-articulated at a level beyond superficial is still a challenge. As academic institutions are usually structured along disciplinary groups, interdisciplinary projects may consume more planning time and integration (Bitterberg et al., 2014). Pammer-Schindler et al. (2020), for instance, have found that most doctoral programs are associated with a single discipline and argue that doctoral training in TEL “needs to be situated at the intersection of disciplines in order to facilitate innovation” (p.1).

In order to integrate the programs for doctoral education in TEL in Europe, nine European universities<sup>1</sup> and the European Technology-Enhanced Learning Association (EA-TEL) founded the Doctoral Education for Technology-Enhanced Learning (DE-TEL) project (EA-TEL, 2021; Fominykh & Prasolova-Førland, 2020). The DE-TEL project aimed at identifying the best practices in doctoral programs in TEL, developing a proposal for a new internationally recognised program, and developing high-quality and sustainable OER for this new program “to support better curricular integration and avoid fragmentation of the digitisation agenda in Europe” (Fominykh & Prasolova-Førland, 2020, p.38).

Between September 2020 and February 2021, a survey was implemented as an online questionnaire, and 229 participants from 40 different countries answered it, being 103 PhD candidates, 92 PhD holders, and 26 Master’s degree holders. The survey aimed at collecting background information on the current practices and the challenges of doctoral education in TEL and finding out what topics are useful and relevant to this area but have few resources available so that the project could improve doctoral education in TEL by designing a new curriculum and materials. It had 31 closed and open-ended questions distributed into seven sections: professional background, thematic content, general PhD training topics, research methods, learning sources, challenges, supervision and mentoring, and personal background (Albó et al., 2022; EA-TEL, 2021).

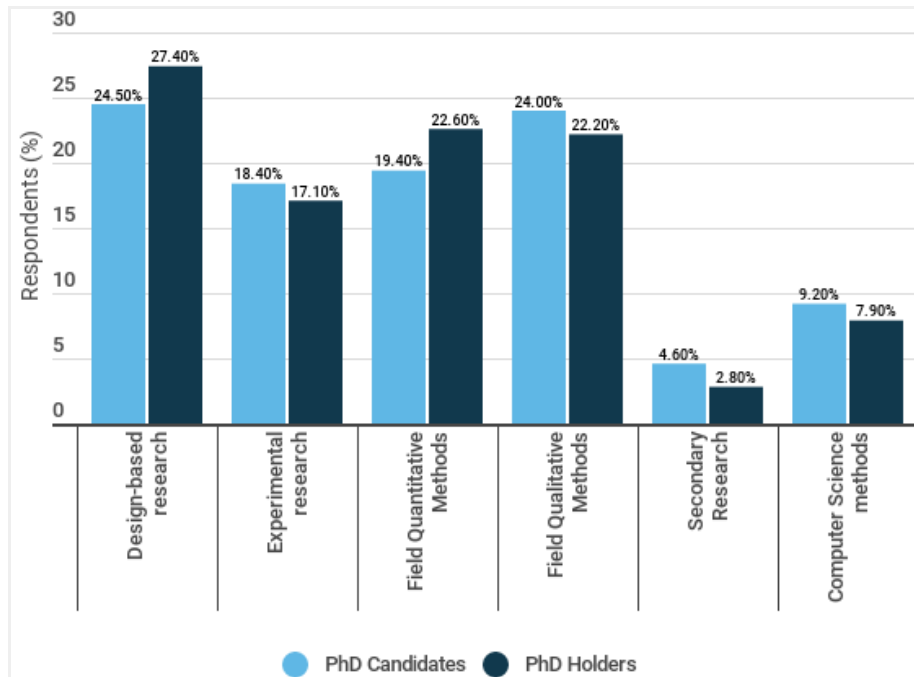
The main findings reveal that the TEL topics with major training needs and fewer materials available were artificial intelligence in education, personalized and adaptive learning, and smart/intelligent learning environments. The topics with highly-needed training but with some materials available are pedagogical patterns, learning analytics, visualization/visual analytics, and self-regulated/informal learning. The topics with moderately-needed training are gamification, mixed and augmented reality, and engagement/emotion/affect. Regarding the general PhD training topics, PhD candidates believe that they need training and educational materials in the area of academic writing and publication, dissemination of research results, and project management. Similarly, the topics selected by PhD holders were academic writing and publication, project management, research ethics, and dissemination of research results (Albó et al., 2022; EA-TEL, 2021).

When asked to select the item that best described the general methodological approach of their PhD research, PhD candidates reported that design-based research (24.5%) and qualitative methods (24%) were the most used research methods, followed by quantitative

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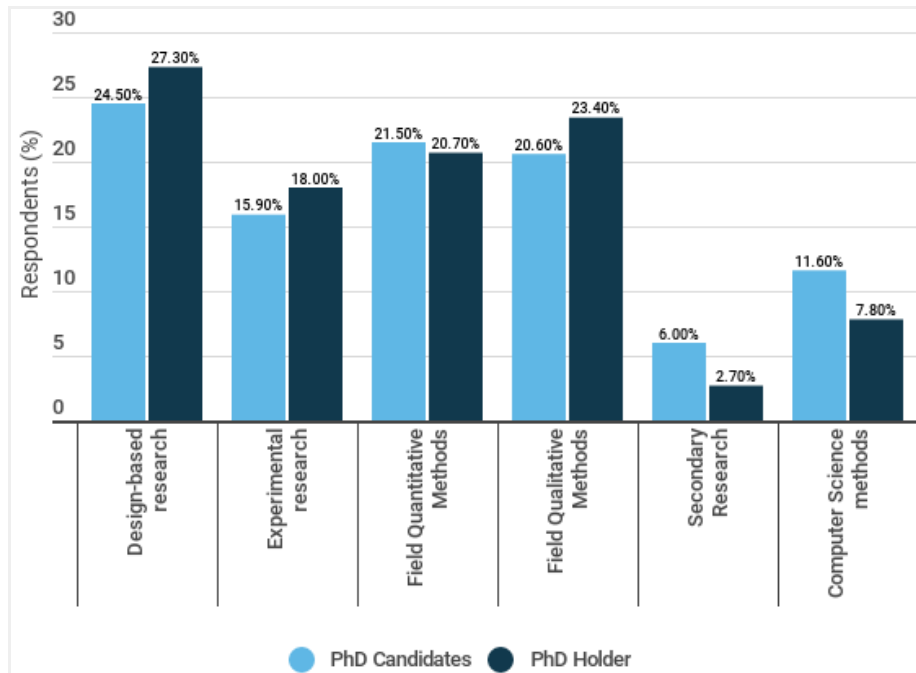
<sup>1</sup> Norwegian University of Science and Technology (Norway), Open University of the Netherlands (Netherlands), RWTH Aachen University (Germany), Tallinn University (Estonia), Pompeu Fabra University Technology (Austria), and University of Aveiro (Portugal).

methods (19.4%), experimental research (18.4%), computer science methods (9.2%), and secondary research (4.6%), as can be seen in Figure 1. Similarly, the most used research method by PhD holders was design-based research (27.4%) as well. On the other hand, quantitative (22.6%) and qualitative methods (22.2%) were the second and third most used research methods by PhD holders. They also selected experimental research (17.1%), computer science methods (7.9%), and secondary research (2.8%) as the least used research methods (Albó et al., 2022).



**Figure 1. Research methods used (source: Albó et al., 2022, p. 34)**

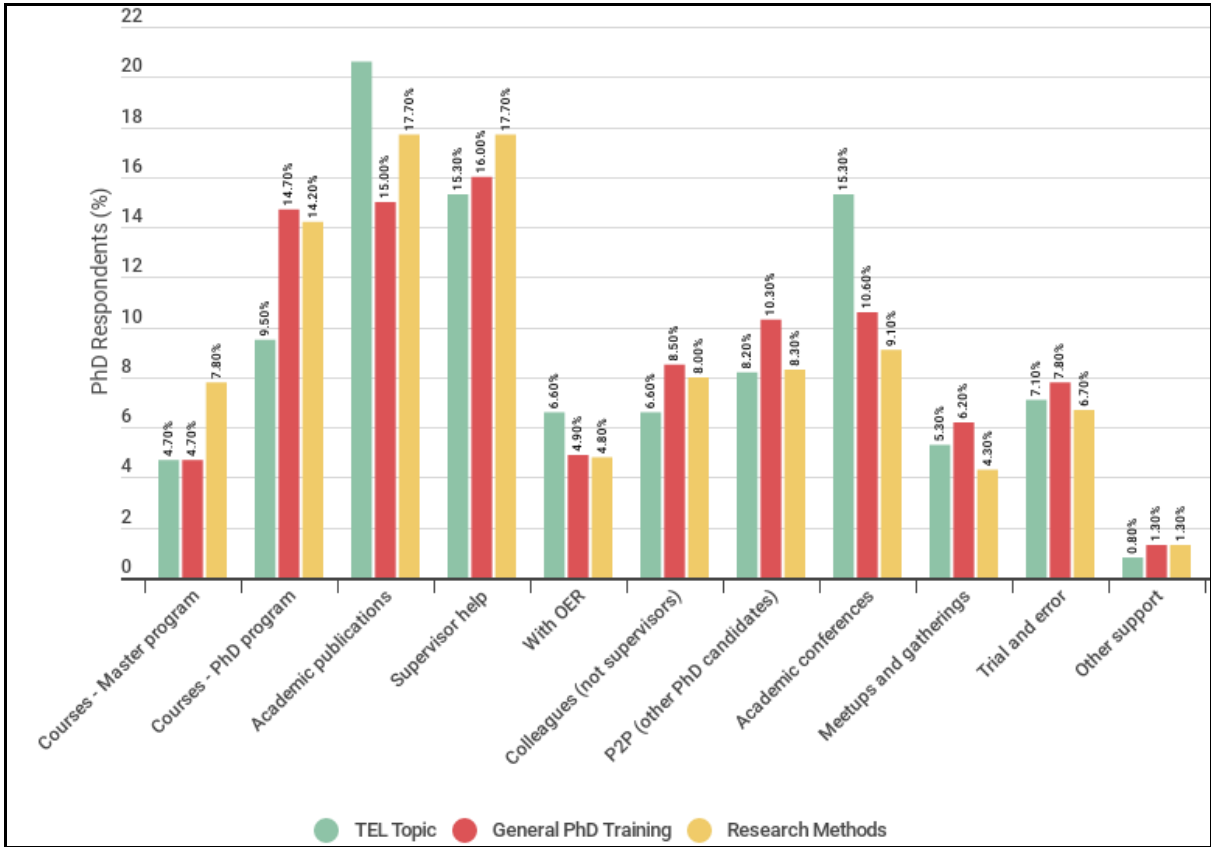
Regarding the research methods that they needed more training on, the results were similar to the ones related to the most used research methods. Design-based research was the most selected research method by PhD candidates (24.5%) and PhD holders (27.3%). Although qualitative and quantitative methods were the second and third most used research methods by PhD candidates, respectively, they selected quantitative (21.5%) and qualitative methods (20.6%) as those in which they need more training. The same happened to PhD holders. While quantitative and qualitative methods were the second and third most used research methods, qualitative (23.4%) and quantitative (20.7%) were the most selected in terms of training needs. Experimental research was the fourth research method selected by PhD candidates (15.9%) and PhD holders (18%), followed by computer science methods and secondary research (Figure 2) (Albó et al., 2022).



**Figure 2. Research methods training needs (source: Albó et al., 2022, p. 35)**

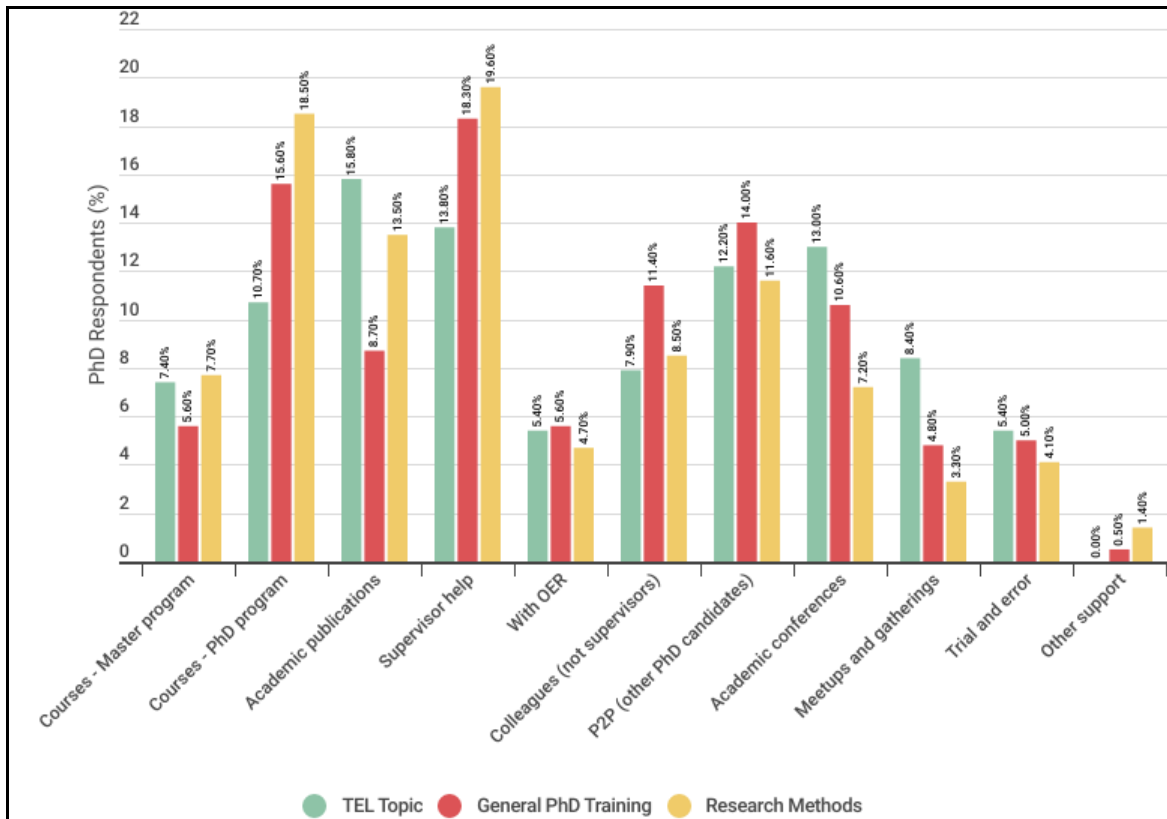
To sum up, the results reported that the most commonly used research method by PhD candidates and PhD holders and the one they need more training in was design-based research. In other words, regardless of their level of training, the participants mentioned they needed more training in the research methods they work with (Albó et al., 2022; EA-TEL, 2021).

These results have also revealed that OER are not popular among PhD candidates and PhD holders. When asked which learning sources they used to deepen their knowledge on TEL topics, doctoral training topics, and research methods, PhD candidates mentioned academic publications and supervisor help, being OER one of the least referenced sources (6.6% TEL topics, 4.9% PhD training, 4.8% research methods), as can be seen in Figure 3.



**Figure 3. Learning sources used by PhD candidates (source: Albó et al., 2022, p. 41)**

Similarly, PhD holders mentioned supervisor help and courses in PhD programs, being OER one of the least referenced sources (5.4% TEL topics, 5.6% PhD training, 4.7% research methods), as can be seen in Figure 4.



**Figure 4. Learning sources used by PhD holders (source: Albó et al., 2022, p. 42)**

With these results, a new program was designed and educational resources were developed for the DE-TEL context. This new program encompassed topics divided into four main categories: General PhD, TEL Core, TEL Introductions, and TEL ‘deep dive’. The topics varied from more generic themes, relevant to most PhD candidates, to narrower subjects, relevant to a smaller number of PhD candidates. The *General PhD* category is relevant to any PhD candidate regardless of their research field. As the name suggests, the *TEL Core* category includes topics that are relevant to all PhD candidates working in the field of TEL. *TEL Introductions* covers topics on TEL, such as Learning Analytics and Artificial Intelligence in Education, and research methods that are most used in TEL, such as design-based research and quantitative and qualitative methods. Lastly, TEL ‘deep dive’ topics are more specific and can be highly relevant to a few PhD candidates (EA-TEL, 2021).

Several events were organized by the DE-TEL project to pilot this new program and to evaluate the resources built. A webinar series was organized in the Spring of 2021 covering the main topics as, for example, design-based research in TEL, doctoral well-being, learning analytics, artificial intelligence, qualitative research, and so on. These webinars were held as workshops in other multiplier events in Portugal, Greece, and Spain, and also in two important events by the EA-TEL, the Summer School on TEL

(jTELSS) 2022 which happened in Greece, and the European Conference on TEL (EC-TEL) 2022 which took place in France. The materials used in the webinars and workshops resulted in OER, more specifically an open book<sup>2</sup> and videos<sup>3</sup>, openly and freely available for the TEL community, especially for those involved in the doctoral education level in TEL (EA-TEL, 2021).

## 2.2 Open Educational Resources

With the advent of the internet and information technologies, a vast number of educational resources have been created and made available at little or no cost. However, not all these resources available on the internet are open and can be reused, modified, and re-shared. Most of them are released without clear license terms and are, automatically, protected by copyright, not being allowed to be copied without the author's permission. On the other hand, resources that are made available under open licenses or in the public domain and enable legal use, adaptation, and redistribution are called Open Educational Resources (OER).

This section presents an overview of the OER, with a brief history and some definitions. It also discusses the open licenses and Creative Commons, technical issues affecting openness, and OER drivers and benefits as well as its barriers and challenges.

### 2.2.1 A brief history of OER

The history of OER started in 1994 when Wayne Hodgins conceived the terminology *learning object* to define any digital reusable resource that is adopted in a pedagogical context. Learning objects play an important role in the history of OER since they popularized the idea that digital material can be designed and produced to grant its reuse in a variety of teaching and learning situations (Wiley, 2006; 2008). However, repurposing, adapting, or modifying learning objects requires the acquisition of copyright permission from the rights holder, which can lead to costs related to the transaction of finding and contacting the owner and costs associated with the license for reusing the material. Because of this, learning objects are not open to being revised in order to fit specific contexts or meet the needs of specific learners (Wiley, 2008).

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<sup>2</sup> The open book was created on GitHub and is available in the following link: <https://ea-tel.eu/detel-book/>

<sup>3</sup> The videos are available in the EA-TEL channel on YouTube. Link: <https://www.youtube.com/@EATELeu>

In 1998, David Wiley coined the term *open content* to designate any original work, not necessarily with an educational purpose, that could be copied and adapted by other users. This concept was introduced as a comparison with *open source*, to promote the idea that the principles of free and open-source software (FOSS) movement could also be applied to content, making open content an important milestone in the history of OER (Wiley, 2006).

In the same year, as part of the Open Content Project, Wiley (2007) published the Open Content License (OCL), which is considered the first license to bring the model of open-source software to content. In 1999, the OCL was replaced by the Open Publication License (OPL). OPL was an improved version of the OCL with two license options - the restriction of creating derivative works and the restriction of using the material for commercial purposes.

In 2001, Lawrence Lessig, Hal Abelson, and Eric Eldred founded the Creative Commons (CC) and in 2002 they released the first set of CC licenses that superseded the OPL. According to Wiley (2007), "Creative Commons created a better legal instrument" and, because of this, he shut down the Open Content Project and joined the CC. The foundation of this non-profit organization was fundamental to OER establishment because it increased credibility and facilitated the use of licenses in the open content community (Wiley, 2006).

In 2001, the Massachusetts Institute of Technology (MIT) announced its OpenCourseWare (OCW) initiative, which is considered a landmark in the history of the OER movement, and in 2002 the first courses were released to the public via the internet (Wiley, 2006). MIT's objective was to make its learning materials available so that the resources could be utilized and redesigned to be used in other contexts, free of charge (Weller, 2020).

In 2002, due to the importance and growth of this initiative, the term *Open Educational Resource* (OER) was first coined by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in a forum on the Impact of Open Courseware for Higher Education in Developing Countries sponsored by the William and Flora Hewlett Foundation (Wiley, 2006; 2008). The group defined OER as "the open provision of educational resources, enabled by information and communication technologies, for consultation, use, and adaptation by a community of users for non-commercial purposes" (UNESCO, 2002, p.24), reiterating that OER is "a universal educational resource available for the whole of humanity" (UNESCO, 2002, p.28).



Nevertheless, this definition limits the use of OER for non-commercial purposes, which makes it incongruous with real practices since open should mean without restrictions (Downes, 2007). In 2012, Paris OER Declaration (UNESCO, 2012) updated this definition by saying that OER are:

Teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. (p. 1)

This new definition emphasizes that besides being free, that is, costing nothing, OER must be under an open license, which “refers to a license that respects the intellectual property rights of the copyright owner and provides permissions granting the public the rights to access, re-use, repurpose, adapt and redistribute educational materials” (UNESCO, 2019, p.5).

The next subsection discusses some other OER definitions and the nuances presented in the concept of ‘open’.

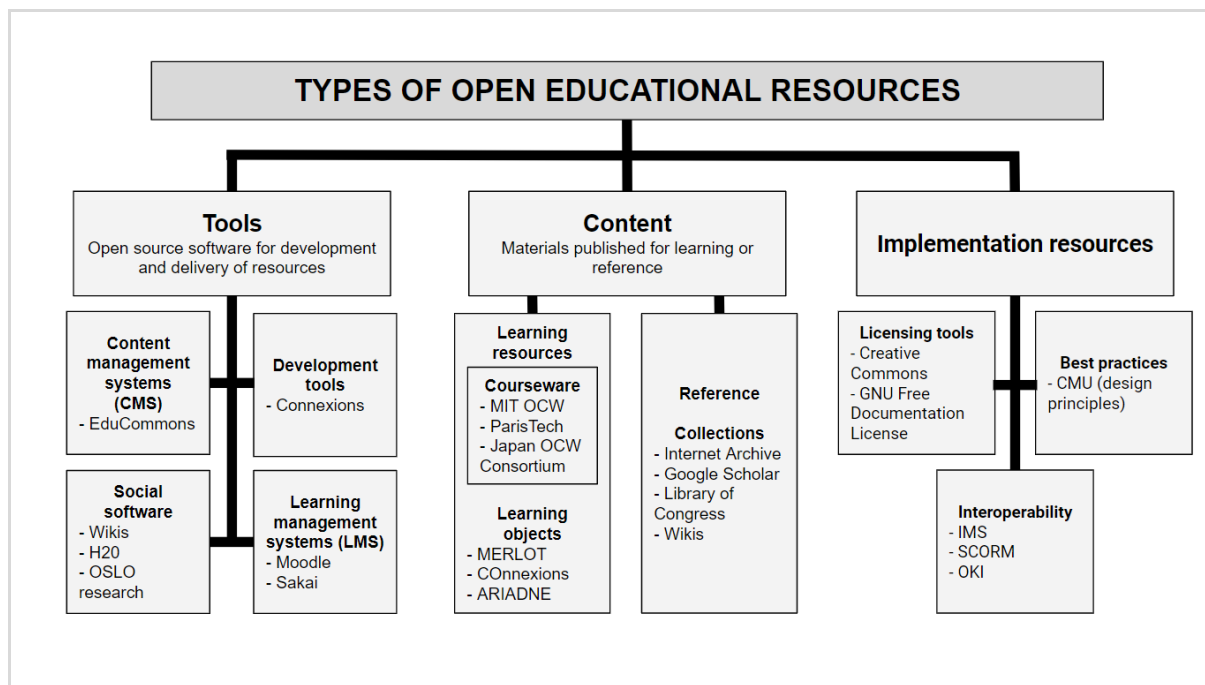
### **2.2.2 OER definitions**

In 2007, the Organisation for Economic Co-operation and Development (OECD) defined OER as “digitized materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research” (OECD, 2007, p.10). This definition includes:

- *Tools*: software to support the development, usage, and distribution of the content as, for example, content and learning management systems and online learning communities;
- *Content*: courses, courseware, modules, journals, and learning objects;
- *Implementation resources*: “intellectual property licenses used to promote open publishing of materials, design principles of best practice and localize content” (OECD, 2007, p.31).

Although this definition does not restrict OER to non-commercial purposes as UNESCO 2002’s definition did, it limits to *digitized materials* and excludes all printed resources. Besides, according to OECD (2007), this definition shows that the concept of OER is “both broad and vague” and “needs further refinement” (p.31) because the term has come to

cover a wide variety of objects and materials. It covers not only content but also tools for the development and delivery of resources as well as implementation resources, such as licensing tools. Figure 5 illustrates the different elements of this OER definition:



**Figure 5. Types of OER (Source: Margulies, 2005 as cited in OECD, 2007, p.31)**

In 2017, UNESCO said that:

OER are teaching, learning and research materials in any medium – digital or otherwise – that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. (UNESCO, 2007, p. 1)

This definition means that the materials can be digitized or printed. Basically, the only difference between OER and any other educational resources is the license that gives legal permission to reuse the material in several ways. Thus, OER are educational resources that incorporate a license to facilitate their reuse and adaptation without having to request permission from the copyright holder (COL/UNESCO, 2011).

All the definitions presented above lie in the openness concept. Downes (2007) mentions that there is a long debate concerning the definition of ‘open’ in OER. Some authors start by distinguishing ‘open’ and ‘commercial’ resources, but this differentiation is not sufficient. While resources provided by noncommercial enterprises, such as academic papers published by learned societies, require the payment of a subscription fee for

access, many resources provided by commercial enterprises, such as Google, are freely available without any restriction.

Besides, Downes (2007) argues that, although some authors define 'open' as 'affordable', there is a substantial distinction between 'affordable' and 'free', saying that "everyone would agree that gumballs (which sell for one cent) are for almost everyone 'affordable', not nobody would suggest that the gumball market is therefore 'open' (p.32)". Therefore, he claims that, as the payment can represent an exchange rather than sharing, it is not evident that these resources which demand some kind of payment by the user could be called 'open'.

From another perspective, Wiley (2021) defends that content is open not only when it is available to be used in other contexts. In order to be open, it must give everyone permission to reuse the material in different ways, originally known as the 4R:

- **Reuse** - the right to use the content in a wide range of ways (e.g., in a class, in a study group, on a website, in a video).
- **Revise** - the right to adapt, adjust, modify, or alter the content itself (e.g., translate the content into another language).
- **Remix** - the right to combine the original or revised content with other material to create something new (e.g., incorporate the content into a mashup).
- **Redistribute** - the right to share copies of the original content, your revisions, or your remixes with others (e.g., give a copy of the content to a friend).

In 2014, Wiley (2014) added the 5<sup>th</sup> R, **retain**, which means the right to make, own, and control copies of the content (e.g., download, duplicate, store, and manage). In other words, the right to keep access to useful material that you have acquired during a course after this course has finished and you have left the institution. Wiley (2014) added the 5<sup>th</sup> R in response to what he calls "disappearing ink", a phenomenon in which the institution negotiates with publishers to allow students to have access to materials at a reduced cost but only during the course, in contrast to purchasing the full price materials that a student would retain in perpetuity.

Similarly, Creative Commons<sup>4</sup> defines OER as "teaching, learning, and research materials that are either (a) in the public domain or (b) licensed in a manner that provides everyone

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<sup>4</sup> <https://creativecommons.org/>

with free and perpetual permission to engage in the 5R activities”<sup>5</sup>. If the authors want their content to be as open as possible and permit people to legally engage with it, they must license their resources. It does not need to grant permission to all 5R activities, but the degree will depend on the license used, making the resource less or more open.

In short, an OER is any educational material that uses an open license or resides in the public domain, free of copyright restrictions (Wiley et al., 2014). While *copyright* refers to a law that grants the author of a creative work the exclusive right of ownership and protection against unauthorized use, copy, modification, and distribution of it, for a limited period of time, the *public domain* consists of creative works which are not copyrighted. That is, works whose intellectual property rights have expired or are inapplicable, making them available for use by the public (COL/UNESCO 2019; WIPO, 2016).

While traditional “all rights reserved” copyright is automatic and restricts access, open licenses lie under a scale of concessions, allowing authors to concede specific permissions on how they want their property to be used. Although there are other open licenses, for instance, the Open Publication License and GNU Free Documentation License, the most frequently used licenses for OER are Creative Commons (CC) (Hilton III et al., 2010; Wiley et al., 2014).

### 2.2.3 Creative Commons

CC licenses are free and public, and grant the creators permission to share their work more flexibly, under a spectrum of concessions of how people can utilize their content - an approach called “some rights reserved” (Bissel, 2009). These licenses consist of four components that can be mixed in several ways. The components are Attribution (BY), ShareAlike (SA), Noncommercial (NC), and No Derivatives (ND), and Creative Commons defines them in the following way (Table 1):



#### **Attribution (BY)**

You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. In short, credit must be given to the creator.



#### **NonCommercial (NC)**

You may not use the material for commercial purposes. In other words, only noncommercial uses of the work are permitted.

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<sup>5</sup> Source: Creative Commons. Available at: [https://wiki.creativecommons.org/wiki/What\\_is\\_OER%3F](https://wiki.creativecommons.org/wiki/What_is_OER%3F); accessed on: October 9, 2023.

**NoDerivative (ND)**

If you remix, transform or build upon the material, you may not distribute the modified material. In other words, no derivatives or adaptations of the work are permitted.

**ShareAlike (SA)**

If you remix, transform or build upon the material, you must distribute your contributions under the same license as the original. In other words, adaptations must be shared under the same terms.

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**Table 1. Creative Commons components<sup>6</sup>**

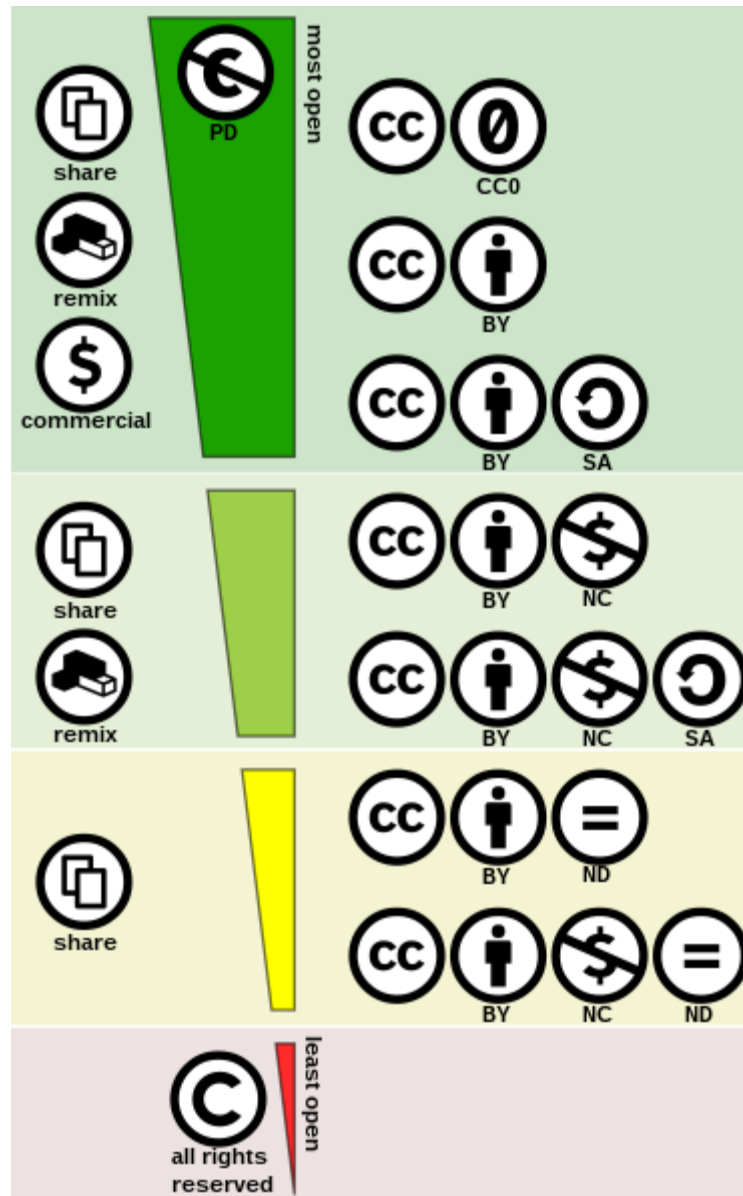
When combined, these components can generate six different license types, which are listed below from most to least permissive:

- Attribution (CC BY)
- Attribution-ShareAlike (CC BY-SA)
- Attribution-NonCommercial (CC BY-NC)
- Attribution-NonCommercial-ShareAlike (CC BY-NC-SA)
- Attribution-NoDerivatives (CC BY-ND)
- Attribution-NonCommercial-NoDerivatives (CC BY-NC-ND)

Figure 6 below shows the spectrum between public domain “no rights reserved” (top) and copyright “all rights reserved” (bottom). The symbols on the left side indicate the use cases allowed (share, remix, and commercial), and the ones on the right side are the different license types, from most to least open.

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<sup>6</sup> Source: Creative Commons. Available at: [https://en.wikipedia.org/wiki/Creative\\_Commons\\_license](https://en.wikipedia.org/wiki/Creative_Commons_license); accessed on: October 9, 2023.



**Figure 6. Spectrum of Creative Commons licenses<sup>7</sup>**

The “no rights reserved” option in the CC components, known as CC0, “allows creators to give up their copyright and put their works into the worldwide public domain”<sup>8</sup>. However, the most popular licenses for OER encompass the BY, BY-SA, and BY-NC-SA (Wiley et al., 2014). The less restrictive is the license, the better it can benefit both the creators and the users (Bissel, 2009). Wiley (2021) says that the inclusion of requirements and restrictions makes “OER less open than they would be without these requirements and restrictions.”

<sup>7</sup> Source: Wikipedia. Available at: [https://en.wikipedia.org/wiki/Creative\\_Commons\\_license](https://en.wikipedia.org/wiki/Creative_Commons_license); accessed on: October 9, 2023.

<sup>8</sup> Source: Creative Commons. Available at: <https://creativecommons.org/licenses/?lang=en>; accessed on: October 9, 2023.

As the *NoDerivative* component does not permit individuals to make changes or adaptations to the resources, and revising and remixing are activities that belong to the core of the OER definition, the licenses containing the *NoDerivative* element are not included in the discussion of OER (Wiley et al., 2014).

There are also some concerns about the *ShareAlike* component. Wikipedia, one of the most famous free online encyclopedias written and maintained by a community of volunteers, requires all derivative works to adopt the license CC BY-SA. Similarly, MIT OpenCourseWare, a web-based publication of MIT course materials, requires all derivative works to adopt the license CC BY-NC-SA (Wiley, 2021). According to Hilton III et al. (2010), sharing adaptations under the same license as the original is a challenging and problematic situation for those who want to remix OER. For instance, if a work with the license CC BY is remixed with a work with the license CC BY-SA, the new material produced must be licensed under CC BY-SA.

Furthermore, there is a disagreement in the community about the use of the *NonCommercial* component, which prohibits commercial use. Since it is not clear if a material licensed under this component can be used in a course where students are charged a fee, some in the community believe that there are situations where the noncommercial restriction is acceptable and many strongly criticize this restriction (Wiley, 2021).

Generally speaking, while the choice by open content publishers to use licenses that include requirements and restrictions can optimize their ability to accomplish their own local goals, the choice typically harms the global goals of the broader open content community. (Wiley, 2021)

Downes (2007) also discusses the CC BY-NC-SA license, saying that “while ‘open’ on the one hand may mean ‘without cost’, it does not, on the other hand, mean ‘without conditions’” (p.32). In addition to legal considerations related to licensing, some technical issues affect openness and are going to be discussed in the next subsection.

#### **2.2.4 Technical issues affecting openness**

While open licenses give users legal permission to engage in the 5R activities, many authors and publishers choose technical aspects that prevent the users from engaging in those same activities. If people are given legal permission to interact with OER through

the 5R activities, they should also be given technical tools to unlock the material so that they can revise and remix it according to their needs. The ALMS analysis is a framework that helps us to think about these technical choices. ALMS is an acronym for (Hilton III et al., 2010; Wiley, 2021):

- **A**ccess to editing tools: people must have access to software that enables them to edit the resource, not only open and visualize it.
- **L**evel of expertise required to revise or remix: the tools used to develop the OER must be simple and easy to use.
- **M**eaningfully editable: the OER produced must be shared in such a format that enables people to edit it.
- **S**ource-file access: a source file is accessible when the file that the web developer edits and works with is the same one that the web browser displays and the user interacts with (e.g., an HTML file). Consequently, modifying it must be uncomplicated.

Applying open licenses which permit users to engage with materials in the 5R activities as well as applying the ALMS analysis framework enable OER creators to maximize the openness of the materials they produce. The William and Flora Hewlett Foundation (2018) has already recognized that there is a demand for a better technical infrastructure to support OER and has highlighted recurring themes suggested by the OER community, which include the desire for:

- (a) better OER authoring and markup tools and metadata standards, including for assessments of learners, (b) automated feedback and analytics tools designed to save faculty time and work, (c) tools to manage the provenance and revision/adaptation of OER, (d) adaptation tools focused on localization (e.g., language translation), and (e) tools and standards to better manage the import/export of OER across file formats and platforms. (Levin, 2017, p. 4)

The OER movement deals with hurdles and obstacles that delay and hinder the movement to achieve its full potential. The next subsections discuss the barriers and challenges as well as the drivers and benefits when adopting OER.



### **2.2.5 OER barriers and challenges**

Even though there are several projects and initiatives in the area of open education, educators from higher education institutions are still resistant to embracing the use of OER and open educational practices (García-Holgado et al., 2020). Luo et al. (2020) conducted a systematic literature review of 51 studies and found that discoverability, sustainability, and remixing are the main obstacles that prevent OER adoption at this level of education. Similarly, Wong and Li (2019) reviewed 59 case studies on the use of OER in higher education and the results indicated that lack of policy support, limited technological infrastructure and digital literacy, and intellectual property issues were the main limitations in the use of OER.

The barriers to using, developing, and sharing OER can be categorized into legal, technical, economic, and social aspects (Hylén, 2006; Hodgkinson-Williams, 2010; OECD, 2007; Yuan et al., 2008). Internet and digital media have changed the way educators use, publish, and distribute their materials, but while they are willing to share their materials with others, “they are often hesitant as how to do this without losing all their rights” (Hylén, 2006, p.7). This lack of awareness regarding copyright issues is one of the biggest legal inhibitors when adopting OER. Before remixing or publishing remixed materials, authors need to ensure that they have the right to reuse the content available on the internet. Additionally, there is difficulty in finding materials that are licensed in a way that permits derivative works, and, although remixing is one of the most relevant practices in the area of OER (Amiel, 2013), there is also uncertainty about copyrights laws, open licenses and the procedures for sharing and licensing remixed materials (Coughlan et al., 2013; Hew & Cheung, 2013).

In spite of the success in the creation and publication of a great amount of OER, this success also brings some technical challenges. For instance, finding useful and suitable content on the internet is a recognized problem. Besides being time-consuming, there is a lack of a supportive environment that fosters discoverability and sharing of content combined with tools that enable its adaptation and redistribution (Dichev et al., 2011). This lack of adequate technology infrastructure and the difficulty in finding an appropriate OER were also mentioned by the staff of a public university in South Africa as the most important barriers to OER engagement (Hart et al., 2015). Searching and choosing suitable OER were the two major obstacles mentioned by Chinese teachers as well (Chen & Panda, 2013).

Educators in the context of higher education teaching highlighted that OER use could be

enhanced if they had easy access to a variety of resources (Hassal & Lewis, 2017). Furthermore, the integration of repurposed OER into other courses is still a challenge. Reusing and adapting materials created by others is a key concept in OER definition and, thus, the resources need to be easily searchable, found, downloaded, adapted, and integrated into other platforms. However, many resources are not exported and imported into other systems in an accessible manner, failing in the idea of interoperability. Although there are tools that facilitate the reuse of content, there is still a lack of specifications that enables its adaptation and reintegration (Yuan et al., 2008).

The technical and economic aspects are often intertwined. The lack of broadband and other technological innovations are the biggest barriers to developing countries where there is also the economic barrier and lack of resources to make investments in hardware and software necessary to develop and share OER (Hodgkinson-Williams, 2010; OECD, 2007). The problem regarding consistent access to technology is also mentioned by Chiorescu (2017), that found that fewer students dropped the course after the implementation of OER, not only because they could have constant access to materials, which helped them improve their grades, but also because of the reduction of costs.

Another economic barrier is the difficulty of covering the costs not only to start an OER project but to continue it in the long run after initial funding runs out (Hodgkinson-Williams, 2010; OECD, 2007). According to Downes (2007, p. 33), "calculations of sustainability need to consider much more than merely the cost of the resource." In addition to the cost of the resource itself, there are other costs related to funding and services to produce and share the content. Downes (2007) cites that the budget of Stanford Encyclopedia of Philosophy, a resource openly and freely available on the internet, encompasses staffing, travel and office expenses, and computer services, for example. According to Wiley et al. (2017, p. 61), "the topic of development models that can sustainability [*sic*] support the creation of OER has been discussed at length for over 10 years." Although there are a variety of potential models to financially support OER projects, such as donations, sponsorship, and governmental models (Downes, 2007), most of the projects searching for funding did not succeed in their task (Wiley et al., 2017).

Besides the technical difficulties in finding and selecting appropriate resources, these technical difficulties can be intensified and can also become a social challenge for those who do not have digital literacy skills (Hodgkinson-Williams, 2010; OECD, 2007). Educators also emphasized that the time necessary to find, adapt and include appropriate OER into practice can be a deterrent to the use of OER (Hassal & Lewis, 2017). Due to

the rapidly growing number of educational resources and repositories, finding the most suitable open-content materials and assuring their quality can demand extra time and specific skills (Hylén, 2006; Yuan et al., 2008). There are also cultural obstacles connected with the resistance to share or give away intellectual property, and the reluctance to use resources produced by other professors or institutions (Hodgkinson-Williams, 2010; OECD, 2007).

Therefore, in terms of social barriers, OECD (2007) cites the lack of a reward system for educators to invest time and energy in developing OER, the lack of skills and time to reuse or produce content, and, finally, the lack of awareness about the benefits and advantages of OER as the biggest challenges around OER adoption (OECD, 2007).

### **2.2.6 OER drivers and benefits**

There are some motivations for governments, institutions, and individuals to be involved with the development and sharing of OER. There are three reasons why governments should support OER projects (OECD, 2007; D'Antoni, 2009). First, OER projects make learning more accessible to society, particularly to nontraditional groups of learners, "widening participation in higher education" (D'Antoni, 2009, p.5). According to MIT's OCW, 43% of its users are self-learners (Hodgkinson-Williams, 2010). Secondly, OER projects efficiently promote lifelong learning; and, thirdly, they "can bridge the gap between non-formal, informal and formal learning" (OECD, 2007, p.11). For example, of 42% of students who use MIT's OCW, 46% use it to enhance personal knowledge and 34% to complement a course (Hodgkinson-Williams, 2010).

From an institutional perspective, there seem to be some reasons to be involved in OER projects (Hylén, 2006; OECD, 2007; D'Antoni, 2009). The first argument is related to the altruistic attitude of sharing knowledge, which is an academic tradition, as it is for educators. "Openness is the breath of life for education and research" (Hylén, 2006, p.5) and resources designed in these contexts should be always open to being used, remixed, and redistributed (OECD, 2007). For example, 90% of MIT faculty have published on OCW, and 86% of students and 73% of faculty use the OCW website (Hodgkinson-Williams, 2010).

Another reason to be involved with OER projects is that resources produced by educational institutions, especially those which are publicly funded, should also be open because it can avoid duplicate work and facilitate the reuse and sharing. Consequently, by reusing and sharing these resources, there might be an improvement in the quality of

teaching and learning materials when they are made available as OER, and the costs of content development can be reduced (Hylén, 2006; OECD, 2007; D'Antoni, 2009).

The respectful reputation that an institution earns is also a relevant motivation. An example is the positive recognition that MIT received when it announced its OpenCourseWare (OCW) initiative to release its courses publicly (Hylén, 2006). OER projects are advantageous to the public image of the institutions and can help attract new students (OECD, 2007). According to 82% of the faculty, MIT's OCW initiative is a significant aspect of MIT's international success, and more than one-third of the freshmen are aware of OCW before attending MIT. Because of this growing competition, institutions need to innovate in order to stand out. Hylén (2006, p.6) says that "(...) there is a need to look for new business models, new ways of making revenue" and being engaged with OER projects, developing new educational resources, and improving and innovating them through reusing, is a benefit for institutions (OECD, 2007).

From an individual perspective, researchers, teachers, and instructors are able to share materials as well as reuse and adapt them according to their context. This fact can optimize their time in creating materials from scratch and connect them with other colleagues around the world. Furthermore, there is the traditional academic value of sharing knowledge, which can reduce the costs for students and assist developing countries, for example. Free sharing can also increase the reputation of educators and provide personal gain and acceptance within the open community. Consequently, getting publicity and reaching the market may generate an economic advantage for them (Hylén, 2006; OECD, 2007; D'Antoni, 2009).

From the learner's point of view, OER may provide access to materials from some of the best institutions in the world, promote informal learning, and present the university to prospective students by showing them its materials which are publicly available (Hodgkinson-Williams, 2010). According to Hodgkinson-Williams (2010), 54% of MIT OCW traffic comes from outside the United States and 43% are self-learners. In addition to it, as it was said before, 35% of MIT's freshmen are aware of the OCW initiative before making the decision to attend it.

One of the objectives of Wong and Li's (2019) work was to analyse the effectiveness of OER adoption in higher education. The results have revealed that the use of OER can help improve students' performance in terms of academic results, facilitate the use and access of learning resources, reduce financial costs, and increase collaboration between professors in the development of educational materials. Harsasi (2015) investigated

students' opinions about the integration of OER in a distance course in higher education. Students used a variety of OER, such as videos, articles, presentations in PowerPoint, and pictures, and said that one of the advantages of using OER was to have access to other resources in addition to the textbook. By watching a video, they said they could see the examples in real life, and it was more attractive and easy to understand when compared to reading a text.

Petrides et al. (2011) examined the adoption of open textbooks by faculty and students, finding that the main factor influencing this was cost reduction, accessibility, and flexibility. Open textbooks are often more expensive than tuition fees and can be a critical obstacle to students' college attendance. According to faculty, another driver was the easy access and portability offered by an online open book, compared to physical ones. As OER are usually published and shared in digital formats, they can be easily adapted and remixed with existing resources.

Hilton III et al. (2013) analysed students' success and completion rates when OER were adopted in higher education in the USA. Although there were no significant differences when using printed textbooks, the results indicated a significant cost saving. As Hilton III et al. (2013, p.46) reported, "if all 2,043 students would have purchased a \$125.00 textbook, and instead used the openly licensed, free online materials, the total savings would have been \$255,375.00." Wiley et al. (2012) compared the internet to the printing press and writing books by hand:

Today the cost of having a 250-page book transcribed by hand is about \$250. The cost of printing that same book with a print-on-demand service is about \$5. The cost of copying an online version of that same book is about \$0.0008. The cost of shipping either the handwritten or printed book is about \$5. The cost of distributing an electronic copy of the book over the Internet, however, is approximately \$0.0007. (p. 2)

Mtebe and Raisamo (2014) analysed faculty's motivations when adopting OER in their teaching practice in higher education in Tanzania. The results revealed that instructors believe that locating, adapting, and using OER is easy and, therefore, effort expectancy has a positive influence on their intention to adopt OER in their practice. Similarly, Ozdemir and Hendricks (2017) investigated students' experiences with open textbooks and the most common motivations faculty from American colleges reported for adopting OER. Results revealed that the four most common factors were cost-saving, accessibility,

content, and repurposing. Besides being free and consequently financially accessible, digital open textbooks in different formats and flexibility in accessing them satisfy different students' preferences. Regarding the content, the faculty mentioned that open textbooks are more up-to-date when compared to standard textbooks. While the limited flexibility in traditional textbooks makes students spend money for a new edition, open textbooks are more accessible at no cost. Another motivation was the possibility of repurposing and customizing the content according to students' learning needs.

## **2.3 The use of OER in doctoral education**

This section describes a systematic review conducted with the goal of analysing the use of OER in doctoral education. First, the methodology is presented followed by the main results.

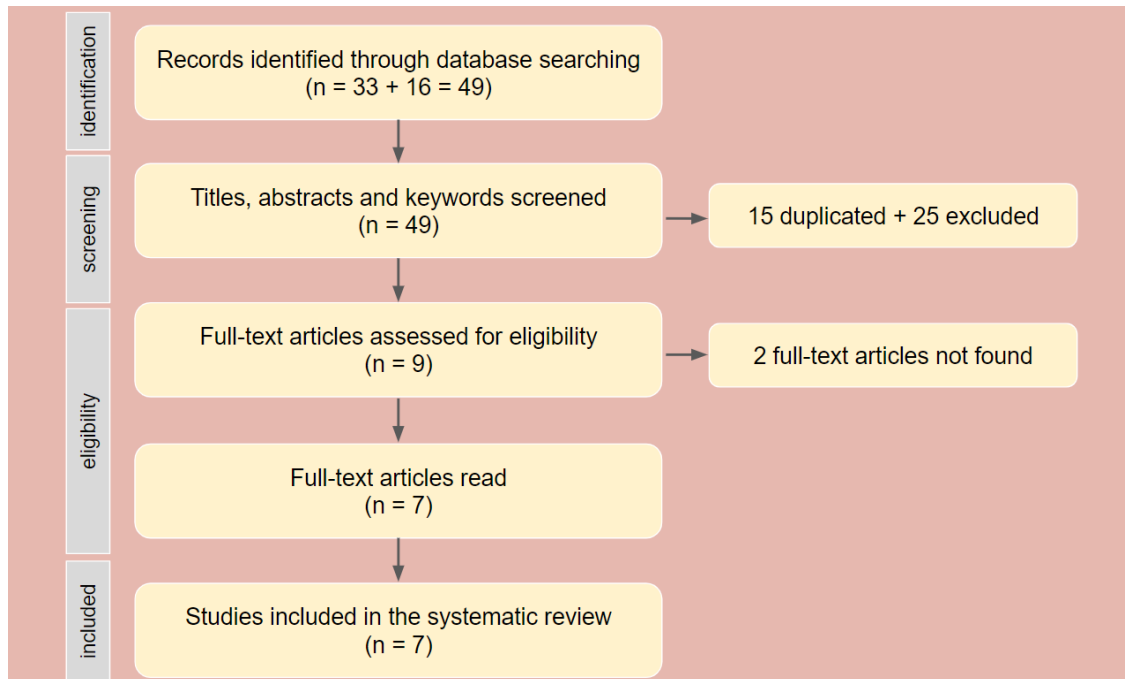
### **2.3.1 Methodology**

This systematic review was conducted by following the reporting checklist of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Liberati et al., 2009) which is structured into four phases: identification, screening, eligibility, and inclusion. In phase one (identification) eligible studies were identified by searching pre-selected terms in the Scopus database. We utilized Scopus, one of the largest abstract and citation databases of peer-reviewed literature in this field, and the search was conducted based on the title, abstract, and keywords of articles, using the following search term: *("open educational resource\*" OR OER\*) AND (doctor\* OR phd)*.

The last update in the data collection was conducted on 9th December 2022 and this round of search generated 33 document results. As this number was not sufficient, a second search using the same term was conducted on the Web of Science, since it is also a relevant researchable database to the area, resulting in 16 documents. The title, abstract, keywords, year, and authors of the identified records were exported to an MS Excel spreadsheet to be screened by an individual reviewer.

In the second phase (screening), the titles of the 49 articles were carefully screened in order to identify those which were duplicated, excluding 15 duplicated articles. Then, 34 abstracts were read to determine their eligibility but 11 were not about OER, eight were not about the use of OER in doctoral education, and six were PhD theses about OER, but not about the use of OER in doctoral education, resulting in nine articles left.

In the third phase (eligibility), nine full-text articles were assessed to check if they were about the use of OER in doctoral education, but two articles were not available online. In the fourth phase (inclusion), a total of seven articles had their full-text read, three of them authored by this PhD candidate and her supervisors. The data collection procedures have been summarized in Figure 7:



**Figure 7. PRISMA diagram of the data collection procedures**

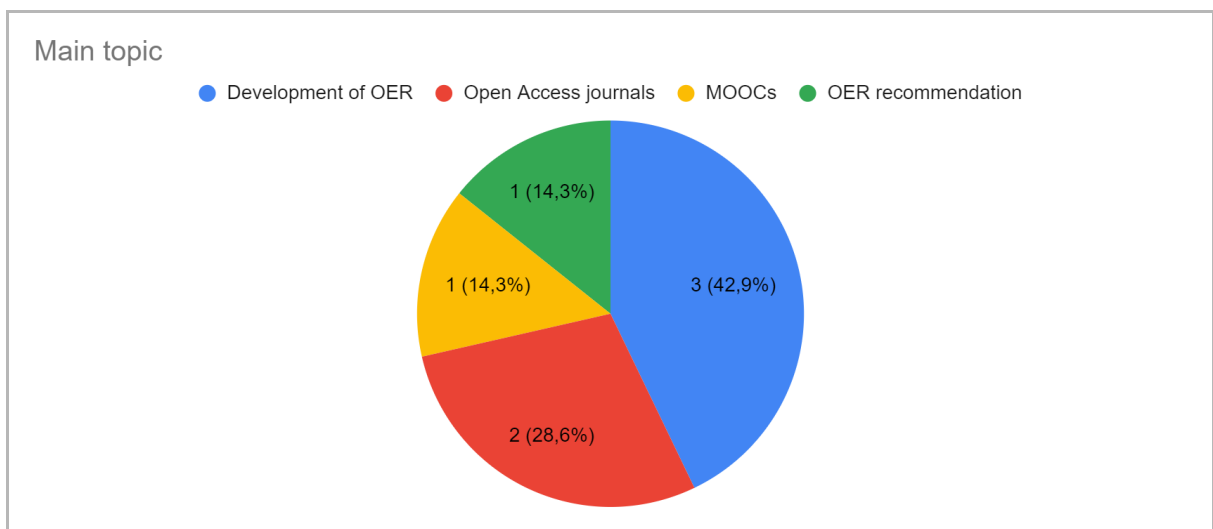
All selected papers are shown in Table 2:

#	Title of the paper	Year
1	An Educational Design Research approach for developing Open Educational Resources to doctoral education training (Sousa et al., 2022)	2022
2	Developing open educational resources to doctoral education training: an educational design research approach (Sousa, 2021)	2021
3	Developing a Prototype of an Open Educational Resource on Research Methods for PhD Candidates in Technology-Enhanced Learning (Sousa et al., 2021)	2021
4	Digital publishing platform as a pedagogical tool to teach and learn scholarly publishing: The helsinki university library experience (Koskinen et al., 2021)	2021
5	Mathematics content understanding for cyberlearning via formula evolution map (Jiang et al., 2018)	2018
6	Research analysis on mooc course dropout and retention rates (Gomez-Zermeno & Aleman De La Garza, 2016)	2016
7	Open access scholarly publications as OER (Anderson, 2013)	2013

**Table 2. Papers selected for this review**

### 2.3.2 Results

Sousa (2021) and Sousa et al. (2021, 2022) emphasize the development of OER in the context of doctoral education; Koskinen et al. (2021) and Anderson (2013) focus more on the topic about Open Access journals; Jiang et al. (2018) highlight the proposal of a solution to recommend OER and facilitate students' math-content reading; and Gomez-Zermeno and Aleman De La Garza (2016) concentrate on analysing the terminal efficiency of a MOOC. Figure 8 summarizes the main topic of the papers.



**Figure 8. Main topic of the selected papers**

Sousa (2021) and Sousa et al. (2021, 2022) present a study about the development of OER for the doctoral education context. Sousa (2021) introduces the methodological aspects and the main three phases of the investigation under Educational Design Research. In the first phase, a systematic review to analyse the use of OER in doctoral education training was carried out and a survey was conducted to identify which characteristics can contribute to making OER an engaging solution to doctoral education training. In the second phase, the OER prototype was developed and went through a formative evaluation. In the third phase, it was expected to evaluate the final version of the prototype to disseminate it. Preliminary results present the development of the prototype, justifying why design-based research was the methodology chosen for the content and why the H5P was the tool used for developing the prototype. Sousa et al. (2021) present a brief theoretical background and focus on the development of the OER prototype as well.



Sousa et al. (2002) also introduce the methodological aspects and the activities planned for the main three phases of the investigation under Educational Design Research. Preliminary results from the survey that was conducted among PhD candidates, researchers, and practitioners show that the characteristics they consider relevant when searching for resources are the content having scientific rigor and being properly referenced with the identification of authors and their sources. Regarding the formats, the participants answered infographics, tutorials, e-books, videos, lectures, and open textbooks as the most relevant.

Koskinen et al. (2021) present a new open-access journal publishing service named Editori, which was created by the Helsinki University Library. The article emphasizes a pilot project that was initiated by the library together with the Working Seminar of Doctoral Programme in Philosophy, Arts and Society of the Arts Faculty, and aimed at teaching open-access publishing practices. Fourteen PhD students from philosophy, art history, music, literature, and social sciences participated in the working seminar of the doctoral school. The pilot project learning outcomes were to discuss different roles in scholarly publishing, such as author, editor, and reviewer; experience the peer review process; describe and evaluate the influence of giving and receiving feedback; and experiment with the platform for submitting papers and reviews. According to the results, faculty members showed a clear interest and demand for further information about the Editori open journal service, which can indicate the educational potential of the platform for enhancing scholarly publishing and communication skills with doctoral students, besides promoting open educational practices.

Similarly, Anderson (2013) reflects on the principles, common practices, and challenges of the use and reuse of peer-reviewed scholarly articles as OER. The author argued that although the discussion around OER frequently encompassed learning objects, courseware, and textbooks, articles published in scholarly journals were the major component in graduate education, and, therefore, more attention should be given to open-access publications. He said that since he had graduated with a doctorate degree, the acceptance of open-access publishing had almost reversed itself. At that time, his PhD supervisor argued that publishing online was not a viable option and did not have the same scholarly recognition and prestige as a paper publication. His judgement expressed the confusion between online resources and open-access publications. Anderson concluded by saying that the evolution from paper to online production and consumption

had fostered citizen science and increased and facilitated access to scholars all around the world, especially those in developing countries.

In their paper, Jiang et al. (2018) propose a novel solution to assist readers, especially junior scholars and graduate students, to better understand and consume complex math content in academic publications. By using the PDF Reader with Math-Assistant (PRMA) system, scholars and students can easily highlight a target formula in a PDF file and the algorithm can recommend a number of OER, i.e. video lectures, presentation slides, source codes, and Wikipedia pages, that may help readers to better understand the content. Students reported that the system was easy to use and the recommended OER can be very useful for their understanding of the math content.

Gomez-Zermeno and Aleman De La Garza (2016) aim at identifying the terminal efficiency of the Massive Online Open Course "Educational Innovation with Open Resources" offered by a Mexican private university, analysing the levels of retention, completion, and desertion, and the characteristics of the students who completed the course. Although it was not directed to PhD students, the results revealed that 14% of the students who remained and 11.7% of those who completed the course had some common characteristics, such as having a graduate (master's or doctorate). In other words, the study showed that the students who possessed a master's degree or higher were more likely to stay and complete the course when compared to those who only have a professional degree or lower educational level.

Due to the small number of articles found related to the use of OER in doctoral education training, a new systematic review of systematics review on OER was conducted. This second systematic review is presented in the next section.

## **2.4 A systematic review of systematic reviews on Open Educational Resources**

Applying open licenses which give users permission to engage with resources through the 5R activities as well as applying the ALMS analysis framework enable OER creators to maximize the openness of the materials they produce (Hilton et al., 2010). However, it seems that studies have highlighted more the legal openness and open licenses, neglecting the technical aspects, such as the tools and skills necessary to modify and share resources.

Considering the key concepts of OER which encompass the 5R activities, the open licenses, and the legal and technical openness, this systematic review of OER systematic reviews aims to analyse how the 5R principles and the technical aspects are addressed in the systematic reviews and identify tools and practical examples that foster the 5R activities beyond the simple access to OER. The research questions that guide this systematic review are:

- a) How are the 5R activities addressed in the systematic reviews on OER?
- b) How often are the licenses or intellectual property issues mentioned?
- c) How often are the technical aspects discussed?
- d) Which open tools are pointed out in the reviews?
- e) How relevant is the topic of sustainability in these systematic reviews?

#### **2.4.1 Methodology**

This systematic review was also conducted by following the reporting checklist of PRISMA (Liberati et al., 2009). The search was conducted in the Scopus database based on the title, abstract, and keywords of articles, using the following search terms: *open educational resource*, *open educational resources*, *OER*, *OERs*, *review*, and *reviews*. We searched for “review” and not for “systematic review” to avoid missing systematic literature reviews that did not use the term “systematic” in their titles, abstracts, or keywords. The data collection was conducted on 5th November 2021 and this round of search resulted in 1023 documents.

In order to maintain the quality and feasibility of this analysis, a filtering process was conducted, such as the year of publication (2012-2021), language (English), and publication state (final), and 784 articles were retained. Many titles mentioned OER as *oxygen evolution reaction* and not *open educational resources*, and because of this the keywords were filtered, limiting them to those related to learning, teaching, and education, culminating in the selection of 343 articles. The title, abstract, keywords, year, and authors of the identified records were exported to a Microsoft Excel spreadsheet to be screened by an individual reviewer.

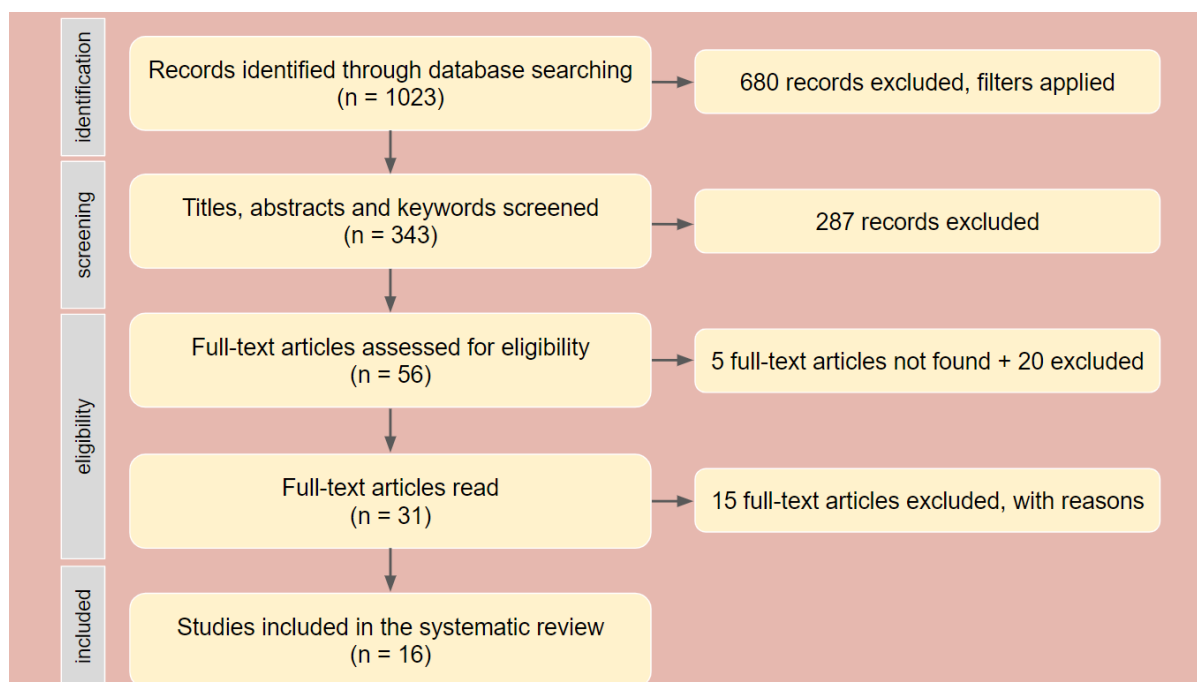
In the second phase (screening), the titles of all articles were checked to identify those still related to *oxygen evolution reaction*, and 179 articles were eliminated (out of 343). Then,

164 abstracts were screened to determine their eligibility and 56 articles that referred somehow to open educational resources and systematic reviews were maintained.

In the third phase (eligibility), 56 full-text articles were assessed to verify if they were systematic reviews on open educational resources. Five articles were not available online, one was not written in English, and 19 were not systematic reviews.

In the fourth phase (inclusion), 31 full-text articles were read and 15 were excluded because they were not systematic reviews on open educational resources. Since open educational resource is a broad term and encompasses other open terms, such as open educational practice, open pedagogy, and open education, many texts cited OER in their titles and abstracts but did not refer to open educational resources exactly.

Therefore, 16 articles were included in this systematic review. The data collection procedures have been summarized in Figure 9:



**Figure 9. PRISMA diagram of the data collection procedures**

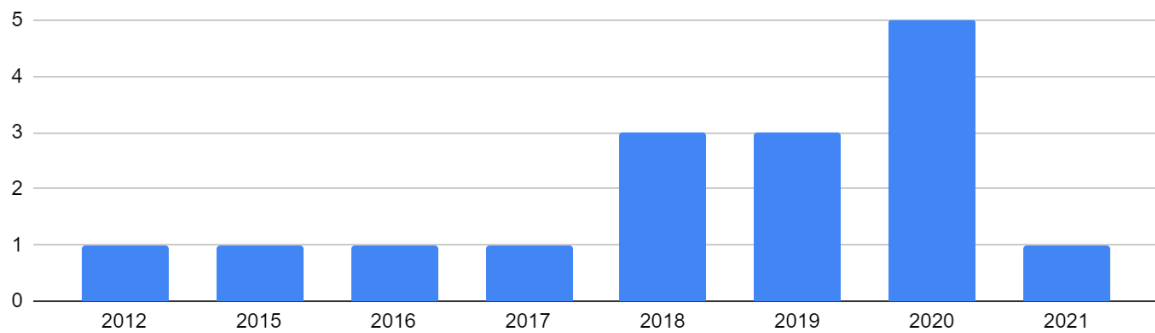
Each study was then reviewed and examined considering the following items: if they mentioned the 5R, the licenses or intellectual property issues, technical aspects, open tools, and sustainability. These topics provided information to answer the research questions and to conduct the analysis that is going to be reported in the next section. All selected papers are shown in Table 3:

#	Title of the paper	Year
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1	A Scoping Review on Open Educational Resources to Support Interactions of Learners with Disabilities (Moon & Park, 2021)	2021
2	Looking Back before We Move Forward: A Systematic Review of Research on Open Educational Resources (Meng et al., 2020)	2020
3	Accessibility within open educational resources and practices for disabled learners: a systematic literature review (Zhang et al., 2020)	2020
4	The power of open: benefits, barriers, and strategies for integration of open educational resources (Luo et al., 2020)	2020
5	2020 Pandemic: Resilient Canadian higher education institutions will integrate OER (Craig, 2020)	2020
6	Analysis and modeling the domain of open educational resources from learning analytics perspective (Ivanova et al., 2020)	2020
7	Open Educational Resources and practices in China: A systematic literature review (Tlili et al., 2019)	2019
8	Using open educational resources for teaching in higher education: A review of case studies (Wong & Li, 2019)	2019
9	Cost, Outcomes, Use, and Perceptions of Open Educational Resources in Psychology: A Narrative Review of the Literature (Clinton, 2019)	2019
10	Systematic Review: OER and Disability (Moreno et al., 2018)	2018
11	Open educational resources: A brief vision from IEEE topics (Paragarino et al., 2018)	2018
12	MOOCs and OER in the Global South: Problems and potential (King et al., 2018)	2018
13	A bibliometric analysis of 15 years of research on open educational resources (Wang et al., 2017)	2017
14	Open educational resources and college textbook choices: a review of research on efficacy and perceptions (Hilton, 2016)	2016
15	Not all rubrics are equal: A review of rubrics for evaluating the quality of open educational resources (Yuan & Recker, 2015)	2015
16	A systematic review of methods for developing open educational resources (Arimoto & Barbosa, 2012)	2012

**Table 3. Papers selected for this review**

As shown in Figure 10, 11 studies out of 16 were published in 2018 ( $n = 3$ ), 2019 ( $n = 3$ ), and 2020 ( $n = 5$ ), suggesting a rising interest in systematic reviews on open educational resources, probably because of the coronavirus pandemic and the transition to online education. However, this tendency can not be noticed in 2021 ( $n = 1$ ) maybe due to the data collection that was conducted in November 2021 and there were still some articles to be published in that year.



**Figure 10. Time distribution of sampled papers through the years (n=16)**

The articles selected had 71 keywords in total and Figure 11 presents these keywords. The bigger the font size, the more frequently they appeared in the texts. The most frequently used keyword was *Open Educational Resources*, mentioned 14 times, followed by *OER*, which appeared seven times. *Open Educational Practices*, *Systematic Review*, *Higher Education*, *Textbooks*, *Disability*, and *Accessibility* appeared twice and the others appeared only once each.



**Figure 11. Keywords used in the systematic reviews**

Furthermore, the systematic reviews cited 10 other open terms in their titles, abstracts, and keywords besides the term *open educational resources*, which appeared 24 times and, since it is the centre of this review, it was not introduced in the word cloud below. *Open Educational Practices* appeared five times, *Massive Open Online Courses* and *OpenCourse Ware* were mentioned three times, and *Open Textbooks* appeared twice.

The other terms, as can be seen in Figure 12, were mentioned only once.

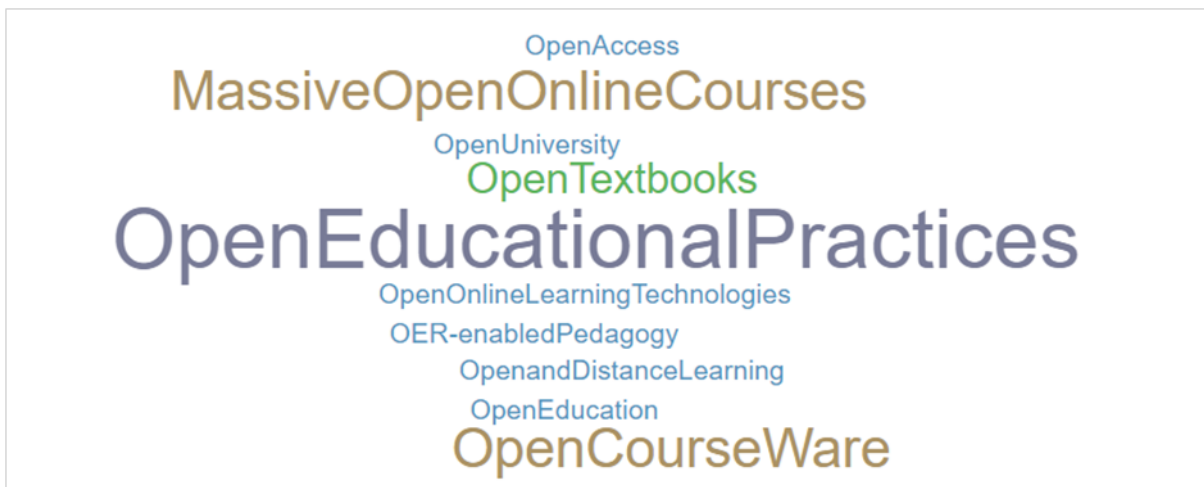


Figure 12. Other open terms cited in the titles, abstracts and keywords

## 2.4.2 Results

The following subsections are going to provide answers to the five research questions that guided this systematic review.

### 2.4.2.1 How are the 5R activities addressed in the systematic reviews on OER?

As can be seen in Figure 13, only four texts mentioned Wiley’s 5R principles. Three texts mentioned the 5R before the results, that is, in the introduction and/or theoretical background (Craig, 2020; Moon & Park, 2021; Tlili et al., 2019), and two texts cited it in the results (Craig, 2020; Wong & Li, 2019). From these texts, only one mentioned the 5R both before and in the results (Craig, 2020).

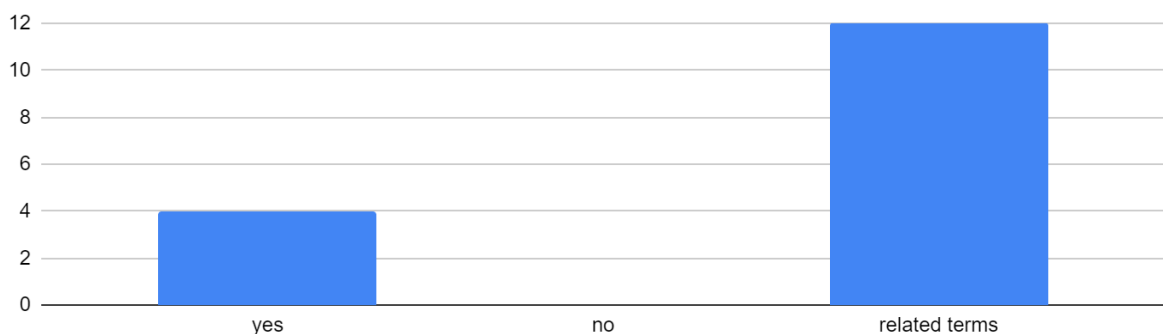


Figure 13. Studies mentioning the 5R

Moon and Park (2021), for instance, said that while most studies have highlighted the 5R, they hardly ever discuss approaches to enhance learners’ engagement and interactions with the resource. They also mentioned that OER-enabled pedagogy expands learners’

interactions with the OER beyond the simple use for information retrieval. Through this pedagogy, learners can create, adapt and share these resources.

In addition to this, Craig (2020) reported that learners could benefit more from the 5R if they had at least a basic knowledge about editing tools. The access to editing tools and the level of expertise required to customize or remix materials are two elements discussed in the ALMS framework (Hilton et al., 2010; Wiley, 2021) and essential to the technical openness prerequisites.

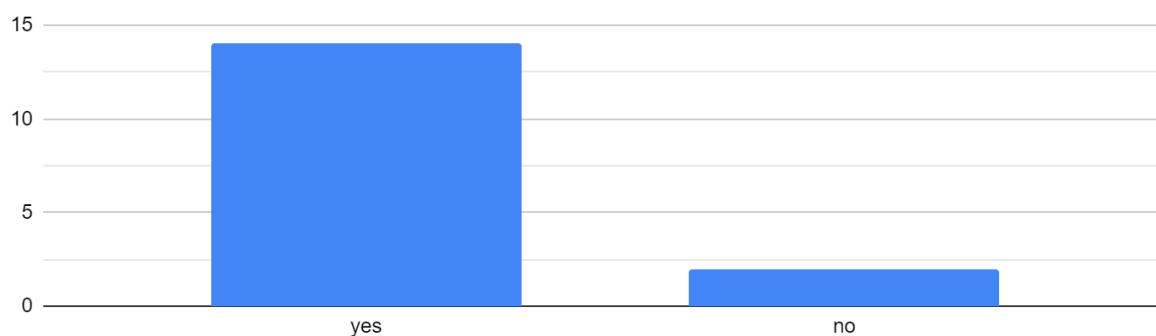
Most texts (n = 12) did not mention Wiley's "5R" exactly, but utilized some synonyms to refer to it, such as *share*, *dissemination*, *adaptation*, *copy*, and *combine* (Arimoto & Barbosa, 2012; Hilton, 2016; Ivanova et al., 2020; King et al., 2018; Luo et al., 2020; Meng et al., 2020; Moreno et al., 2018; Paragarino et al., 2018; Wang et al., 2017; Yuan & Recker, 2015; Zhang et al., 2020). From these 12 texts, seven mentioned the related terms both before and in the results. In conclusion, all the texts referred to the 5R, directly or indirectly.

#### **2.4.2.2 How often are the licenses or intellectual property issues mentioned?**

In total, 14 out of 16 studies referred to the licenses, such as Creative Commons, copyright, or intellectual property issues in their texts (Figure 14). Eleven mentioned them in the introduction and/or background theory (Arimoto & Barbosa, 2012; Clinton, 2019; Hilton, 2016; Ivanova et al., 2020; Meng et al., 2020; Moreno et al., 2018; Paragarino et al., 2018; Tlili et al., 2019; Wang et al., 2017; Wong & Li, 2019; Zhang et al., 2020), 11 mentioned them in the results (Arimoto & Barbosa, 2012; Clinton, 2019; Hilton, 2016; Ivanova et al., 2020; King et al., 2018; Luo et al., 2020; Meng et al., 2020; Moon & Park, 2021; Tlili et al., 2019; Wang et al., 2017; Wong & Li, 2019), and eight mentioned copyright issues both before and in the results (Arimoto & Barbosa, 2012; Clinton, 2019; Hilton, 2016; Ivanova et al., 2020; Meng et al., 2020; Tlili et al., 2019; Wang et al., 2017; Wong & Li, 2019).

Only two of 16 texts selected for this review (Craig, 2020; Yuan & Recker, 2015) did not mention the licenses in their studies, which may suggest the high relevance given to the legal aspects of OER, one of the key elements in the OER concept (Figure 14).



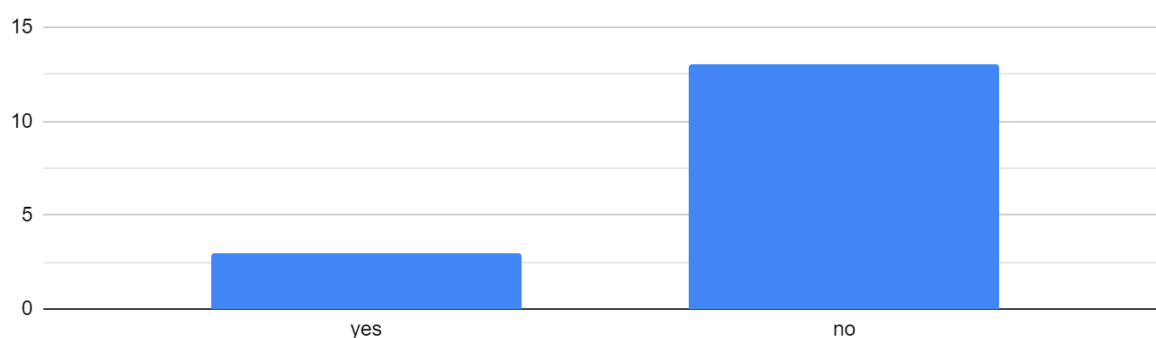


**Figure 14. Studies mentioning the licenses**

One of the texts that did not mention the licenses is about the implementation of OER in Canadian higher education during the pandemic (Craig, 2020). Although it discusses Wiley’s 5R principles, it does not refer to any aspect regarding intellectual property and technical issues related to the reuse, sharing, and modification of resources. The other text that did not comment on licenses is about the use of rubrics to evaluate the quality of OER (Yuan & Recker, 2015). It used related terms to describe the 5R activities and also did not discuss technical aspects (that is going to be discussed in the next subsection).

#### 2.4.2.3 How often are the technical aspects discussed?

Only three texts addressed the concerns about the technical aspects of OER as, for example, tools that can support the creation and reuse of learning content, as displayed in Figure 15. Three mentioned the technical aspects in the introduction and/or background theory (Arimoto & Barbosa, 2012; Ivanova et al., 2020; Wong & Li, 2019) and only one cited the technical aspects in the results (Arimoto & Barbosa, 2012), being also the only one that mentioned them before and in the results.



**Figure 15. Studies mentioning the technical aspects**

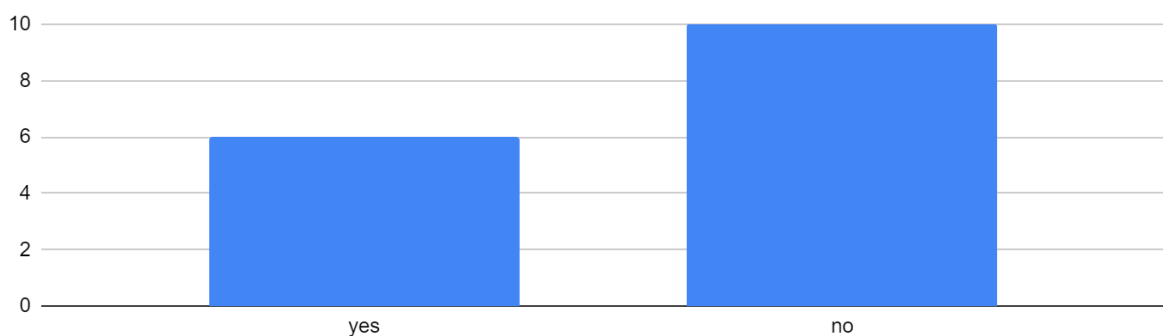
When comparing these numbers of the technical aspects to the numbers of the legal openness discussed in the previous subsection, it can be noticed that they are almost opposites. While 14 texts discussed the legal openness and two did not mention it, 13

texts did not mention the technical aspects and only three did.

As these results indicate, few studies have emphasized the importance of technical infrastructure and knowledge that enables technical openness in OER. The William and Flora Hewlett Foundation, for instance, has recognized the need for “tools for authoring and automated feedback, tools for metadata management, analytical tools, tools for import/export in different platforms and formats” (Ivanova et al., 2020, p.67). Arimoto and Barbosa (2012) argued that “The integration of social tools encourages the active participation of developers and users in the construction of OERs, being also important in distributed and collaborative development of such resources” (p.6). These tools can also facilitate the development of OER, besides contributing to the quality of the final resource.

#### 2.4.2.4 Which open tools are pointed out in the reviews?

Six out of 16 articles pointed out open tools through their texts (Arimoto & Barbosa, 2012; Hilton, 2016; King et al., 2018; Moon & Park, 2021; Tlili et al., 2019; Wong & Li, 2019), as displayed in Figure 16. Some examples of open tools mentioned in the texts are Moodle, edX, Sina Weibo, XuetangX, CNMOOC, iCourse163, P2PU, Canvas Network, Coursera, EdX, Khan Academy, OpenCourseWare (OCW), Openstax, The Saylor Foundation, Washington State’s Open CourseLibrary, and The Minnesota Open Textbook Library.



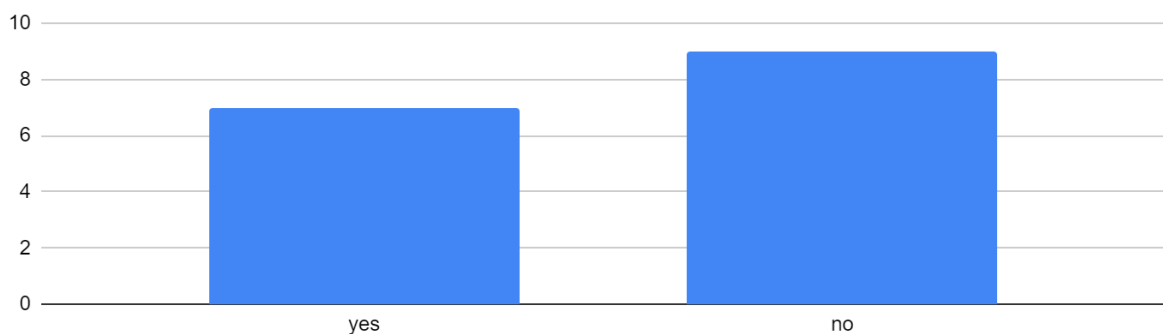
**Figure 16. Studies mentioning the open tools**

Curiously, almost all these tools are platforms to have access to materials and content, not tools that facilitate the practice of the 5R activities, fostering the construction and modification of existing resources. Only three texts out of six mentioned tools intrinsically linked to the development of OER, such as blogs and wikis. These results are in close relation to the demand that exists in the OER field discussed by Ivanova et al. (2020). According to them, the William and Flora Hewlett Foundation has already recognized the need for a better infrastructure to support these resources.

As it was also discussed in the previous subsection, Arimoto and Barbosa (2012) mentioned the integration of social tools in the OER to encourage the active participation of users in the collaborative development of these resources. They pointed out that the use of these tools tends to make the development of resources easy, contributing to the quality of the final resource.

#### 2.4.2.5 How relevant is the topic of sustainability in these systematic reviews?

Only seven texts out of 16 (Craig, 2020; Luo et al., 2020; Meng et al., 2020; Paragarino et al., 2018; Tlili et al., 2019; Wang et al., 2017; Wong & Li, 2019) discussed the topic of sustainability regarding the OER (Figure 17). Considering the definition of sustainability as the ability of an OER to continue or be continued for the long term, Wang et al. (2017, p.303) argues that “Sustainability is a core issue and major challenge faced by not only end-users but also OER developers, foundations and policymakers”.



**Figure 17. Studies mentioning the sustainability**

According to Paragarino et al. (2018), very few OER projects are continued after the end of funding. Few successful examples have impacted the general financial model of OER development, and designing new business models for OER sustainability is one of the central challenges faced by this area. In 2019, UNESCO released a recommendation on OER, and one of the fields of action is “nurturing the creation of sustainability models for OER” (Tlili et al., 2019, p.11). Wong and Li (2019) also defended that developing policies to support OER is vital for the sustainability of their practices.

In Meng et al. (2020), the topic of sustainability is highlighted in the keyword analysis, highly cited publications, and OER practice. Similarly, it also revealed that many projects could not survive beyond the duration of their initial funding and argued that self-finance models should be explored to sustain OER projects. Meng et al. (2020) suggested two approaches to maintain an OER project: to advertise or offer other services to collect extra income, and to extend the traditional mode of donation.

However, although sustainability is frequently considered from an economic perspective, it is not restricted to financial issues. According to Downes (2007), sustainable OER models can be classified into four aspects: funding, technical, content, and staffing (Wang et al., 2017). Luo et al. (2020) found that sustainability is the most frequently mentioned obstacle that stands in the way of OER, and recommended that partnerships among designers, e-learning staff, academic librarians, and teachers, for example, could contribute to the sustainability of OER.

### **2.4.3 Conclusions**

To sum up, the main findings revealed that all the 16 texts mentioned the 5R or related terms, such as *access*, *share*, *copy*, and *adaptation*, almost all the selected texts discussed the legal issues (n = 14), and 13 did not mention the technical aspects. The studies that talked about tools did not point out tools that facilitate the creation and adaptation of resources. Most of them were platforms used to have access to OER. About the topic of sustainability, seven out of 16 studies highlight the relevance of developing sustainable OER models, but few suggest approaches to sustain an OER project.

Therefore, if users are given legal permission to engage with OER through the 5R activities, they should also be given technical tools to unlock these resources so that they can interact with them as producers and contributors, and not only as passive consumers, maximizing the openness of content.

This chapter provided a review of the theoretical foundations which support the present study. Drawing from the studies presented in this chapter, this investigation employed a tool called H5P to facilitate engagement with the 5R activities. The next chapter provides a complete description of the research design, as well as the implementation of the research.

## CHAPTER 3: METHODOLOGY

This study was developed under the Educational Design Research methodological approach. Its planning consisted of three phases: (1) context analysis, (2) development and formative evaluation, and (3) semi-summative evaluation. This chapter describes the methodological implementation of the study and explains the activities developed in each phase, describing the instruments and procedures adopted in the process of data collection and data analysis.

### 3.1 Educational Design Research

This present study was developed under the Educational Design Research (EDR) methodological approach, whose main commitment is to develop theoretical knowledge and practical interventions for educational problems, together with the interested parties and in a real context (McKenney & Reeves, 2012; Plomp, 2013; Reeves, 2000). There are other terms related to EDR and while some of them are used as synonyms, others may vary according to their goals and characteristics (Plomp, 2013; Reeves, 2006; van den Akker, 1999; van den Akker et al., 2006). EDR is also known as *Design-Based Research*, for example, but as this study is contextualized in the educational field, we decided to use the term *Educational Design Research* to avoid confusion with *Design-Based Research* applied to other fields.

Plomp (2013, p.11) affirms that EDR “(...) encompasses the systematic study of designing, developing and evaluating educational interventions”. These interventions can be teaching-learning materials, programs, learning processes, learning environments, products, or systems. Van den Akker (1999) claims that traditional research approaches in the education area usually provide a description of the context and rarely emphasize a plan or suggestion that is useful to tackle real problems in education. Similarly, Bakker (2018) says that most interventions in the field of education describe, evaluate, or analyse education as it *is* or as it *was*, while the focus of EDR is to investigate education as it *could* or *should* be. According to Reeves (2006), instead of undertaking comparison studies, analysing if method A is better than method B, educational technologists should conduct research aimed at developing optimal solutions to practical problems in learning environments.

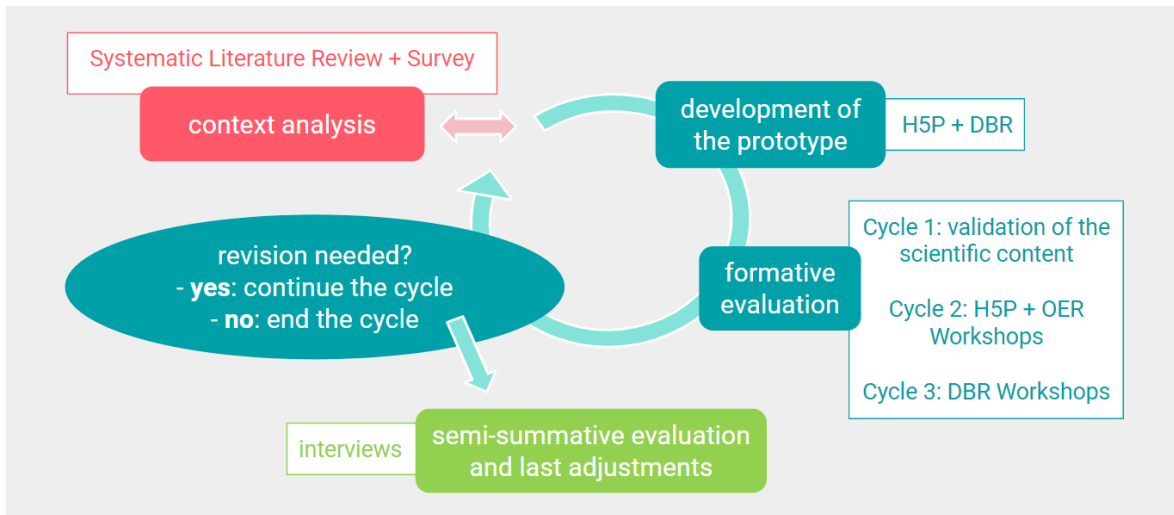
Several authors also agree on various characteristics represented in this type of research (Plomp, 2013; McKenney & Reeves, 2012; van den Akker et al., 2006). According to

them, EDR is *interventionist* because it aims at designing an intervention in a real-world setting in order to positively impact practice; it is *iterative*, that is, the research process incorporates cycles of analysis, design, development, evaluation, and revision; *collaborative*, involving active participation and collaboration among researchers and practitioners in the various stages and activities of the research; it is *process-oriented*, focusing on understanding and improving interventions; it is *utility-oriented* because the quality of the design is measured by its practical use in real contexts to check if the intervention is really useful; and it is *theory-oriented* since scientific understanding is used to frame not only the research but also to shape the design of the solution to the real problem.

The process of interventions is illustrated in different ways by different authors. Reeves (2006), for example, describes his approach in four main phases: analysis of practical problems, development of solutions, evaluation, and refinement of solutions in practice, and documentation and reflection. McKenney (2001) divides the process into three phases: needs and context analysis; design, development, and formative evaluation; and semi-summative evaluation. It features an iterative and flexible structure, with eight cycles that vary in terms of the number of participants involved and the time invested. Based on their survey and analysis of existing models and frameworks for EDR, McKenney and Reeves (2012) created the generic model for conducting design research in education which consists of three phases, analysis/exploration, design/construction, and evaluation/reflection.

Similarly, Plomp (2013) also incorporates three phases: (1) preliminary investigation, which includes analysis of context and needs, research and literature review, and development of the theoretical framework; (2) prototyping or development phase, which refers to the iterative design phase, with formative assessment as the main research activity in search of improvement and refinement of the intervention; and (3) evaluation phase, which encompasses semi-summative evaluation to conclude whether the solution or intervention has met predetermined specifications and to recommend the latest possible improvements.

Based on these models presented previously, this investigation consists of three main phases: (1) context analysis, (2) development and formative evaluation, and (3) semi-summative evaluation. Figure 18 presents the methodological design of this investigation.



**Figure 18. Methodological design**

Table 4 summarizes the activities developed in each phase and cycle of this investigation.

		Data collection	Data analysis	Participants
<b>1<sup>st</sup> phase: context analysis</b>	systematic review	-	-	-
	survey	survey	descriptive statistics (means, standard deviations, correlations, frequencies, and percentages)	92 participants
<b>2<sup>nd</sup> phase: development and formative evaluation</b>	development of the prototype	-	-	-
	formative evaluation	Cycle 1: - validation of the scientific content - form	descriptive statistics (frequencies)	4 professors experts in Methodologies and/or DBR
		Cycle 2: - H5P + OER workshops - UEQ + self-design survey	descriptive statistics (frequencies and percentages) and UEQ	8 participants
		Cycle 3: - DBR workshops - UEQ + self-design survey	descriptive statistics (frequencies and percentages) and UEQ	48 participants
<b>3<sup>rd</sup> phase: semi-summative</b>	semi-summative evaluation	interviews	thematic analysis	4 professors experts in Methodologies

**Table 4. Summary of the activities developed in each phase**

Abdallah and Wegerif (2014, p.2) claim that EDR is “(...) a new approach for educational enquiry which can stand alone as an independent paradigm”. They emphasize that this methodological approach “(...) is neither purely positivist nor purely interpretivist in orientation”, and Coutinho (2015) presents the sociocritical paradigm as an alternative, which has the purpose of improving a problem in a real context, providing changes in educational practices. This paradigm is based on pragmatic assumptions and the research problem and the research questions and/or objectives are the central aspects that lead the investigation process (Abdallah & Wegerif, 2014). In this way, this research is of an applied nature, as it aims to seek practical solutions for solving problems, having as a starting point the understanding of the real context. Besides being interventionist and problem-oriented, and due to the variety of methods that could be applied in the research process using EDR, the information collected was quantitative and qualitative data, characterizing this research as a mixed methods research approach (Abdallah & Wegerif, 2014; Amado, 2014; Coutinho, 2015).

The next sections describe the activities developed in each of the three phases of this investigation.

### **3.2 First phase: context analysis**

In the first phase of this investigation, named *context analysis*, a systematic review was carried out and a survey was conducted. The details are presented in the next sections.

#### **3.2.1 Systematic Literature Review**

At first, a systematic review was carried out to analyse the use of OER in doctoral education. The main goals of this systematic review were to analyse what kinds of OER were used in doctoral education and identify the main challenges and barriers when adopting OER at this level of education. However, as presented in section 2.3, only seven articles related to this theme were found, and not all of them discussed the practical use of OER as well as its challenges and barriers. Because of this, as presented in section 2.4, a second systematic review was conducted with the aim of analysing how the 5R activities, the open licenses and intellectual property, technical aspects, tools, and the topic of sustainability were addressed in other systematic reviews on OER.



### 3.2.2 Survey presentation

In addition to the systematic reviews, a survey was conducted among PhD candidates, practitioners, and researchers to identify which OER characteristics, factors, and formats they consider relevant or more likely to select when searching for resources within the scope of doctoral training, and also to analyse their knowledge about the concept of OER.

The survey consisted of five sections. The first section encompassed questions related to personal background, such as age, gender, country of residence, academic background, and main field of research, work, or study.

In the second section, the participants were asked how relevant some characteristics were to them when they searched for resources within the scope of doctoral training. They should choose an option on a 5-point Likert scale, from 1 (not relevant) to 5 (highly relevant). Although it was not specified in the survey that these characteristics were related to OER, this section was adapted from Henriques (2016), whose objective was to identify the characteristics that a resource should have to be considered an OER. With this omission, there was no need of having previous knowledge about OER to answer this question.

The second section aimed at identifying how relevant these OER characteristics were to PhD candidates, practitioners, and researchers and taking them into consideration when developing OER for the context of doctoral training. The 28 characteristics were distributed over five categories named identification, layout and design, didactic and pedagogical organization, copyright, and technological aspects. Some examples of these characteristics were whether the resource had an open license, could be copied, shared, adapted, or modified, and was completely free and downloadable from the internet.

In the third and fourth sections, the participants were asked which factors and formats would make them more likely to select a particular resource when searching for resources within the scope of doctoral training. In this case, they should choose an option on a 5-point Likert scale, from 1 (not likely) to 5 (very likely). These two sections were adapted from a survey developed by the OER Research Hub<sup>9</sup>, a three-year project funded by The William and Flora Hewlett Foundation and based in the Institute of Educational Technology at The Open University in the United Kingdom. Their survey aimed at gathering data about the use of OER by educators, and formal and informal learners

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<sup>9</sup> Website of the project (2012-2014): <https://iet.open.ac.uk/projects/oer-hub>

around the world (Farrow et al., 2015). Again, it was not specified in our survey that these factors and formats were related to OER.

The third section of our survey included 17 factors, such as the resource being recently created, uploaded, or updated, having interactive or multimedia content, and being created or uploaded by a reputable institution or person. The fourth section covered 15 formats such as e-books, courses, videos, podcasts, infographics, interactive games, and quizzes. At the end of the second, third, and fourth sections there was an open-ended question in case the participants needed to add any further comments.

In the fifth and last section of the survey, the participants were asked which attributes they would include in their concept of OER if they were going to describe it to someone. They should choose between the alternatives “may include”, “may or may not include”, and “not include”. This section was adapted from Spilovoy and Seaman (2015) and some examples of these attributes were: being available for free, being easy to be edited, adapted, or modified, and including some license. Then, they should classify their level of confidence regarding their answers to this question as none, low, medium, high, and expert.

### **3.2.2.1 Survey data collection**

These questions were added to formsUA<sup>10</sup>, the platform by the University of Aveiro that enables the implementation of an online form, using the LimeSurvey software. The survey was piloted with six PhD candidates to verify if the questions and alternatives were clear, and some minor changes were made before its dissemination. Then, the survey (see Appendix A) was disseminated online between December 2021 and March 2022 among PhD candidates, practitioners, and researchers mainly in Europe and Brazil.

The participants were aware of the purposes of the investigation, and the data confidentiality and anonymity were respected in accordance with the data protection law of the European General Data Protection Regulation (GDPR) and Portuguese Legislation. Besides, all the answers were stored in the formsUA platform, respecting all these rules (Assembleia da República, 2019; European Union, 2016). See the confirmation letter from the Data Protection Officer of the University of Aveiro in Appendix B.

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<sup>10</sup> <https://forms.ua.pt/>

### **3.2.2.2 Survey data analysis**

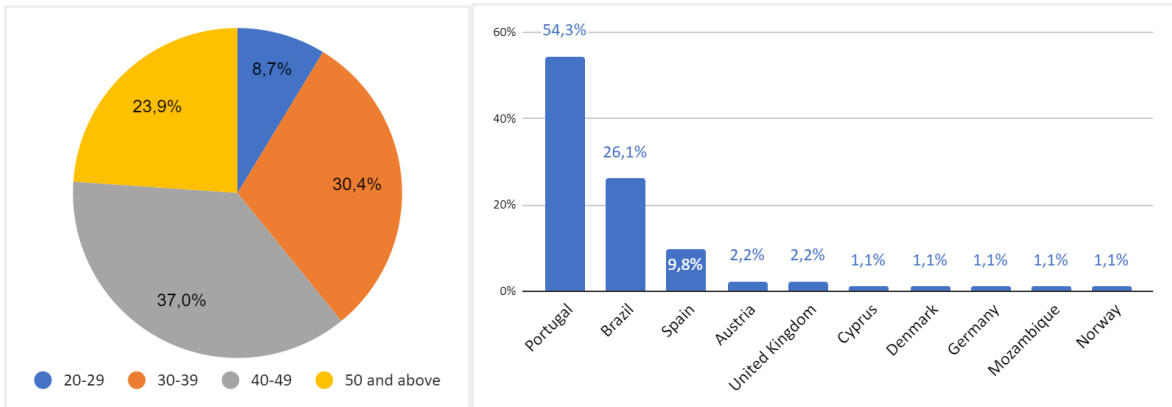
The data collected with the survey were analysed through descriptive and inferential statistics on IBM SPSS software. The data from the first section, regarding the respondents' personal background, were represented by frequencies and percentages.

The second, third, and fourth sections, regarding the characteristics, factors, and formats, respectively, were interpreted by means and standard deviations. Since means and standard deviations are inappropriate for ordinal data and thus have unclear meanings when applied to Likert scale responses, experts have argued that the median or mode should be used as the measure of central tendency (Jamieson, 2004; Sullivan & Artino, 2013). However, Norman (2010) affirms that, when summing the data from the multiple Likert scale questions, they can be treated as interval data and, therefore, the mean and standard deviation can be calculated.

The fifth section about the concept of OER was described by frequencies and percentages. Furthermore, Pearson correlations were used to analyse if there was any relation between the participants' answers and their level of confidence about the concept of OER. Norman (2010) also argues that although parametric statistics cannot be used to analyse Likert scale data, which are ordinal, many studies have consistently shown that parametric statistics "are robust with respect to violations of these assumptions" (Norman, 2010, p. 1).

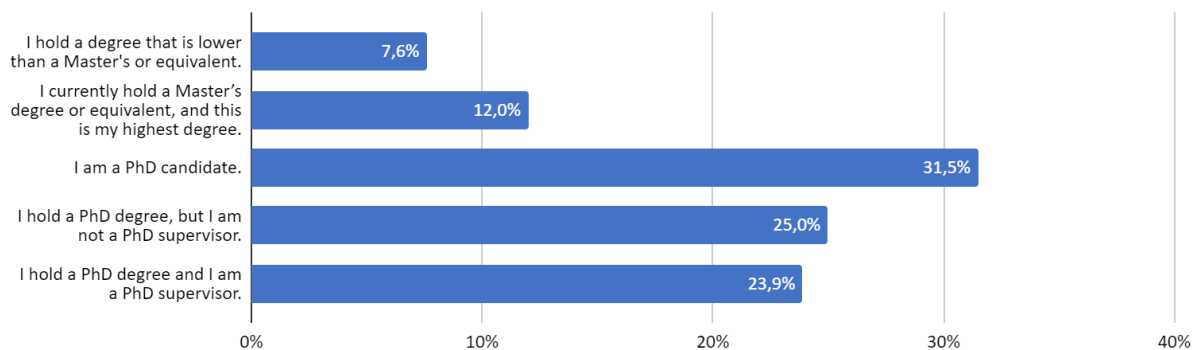
### **3.2.2.3 Survey participants**

A total of 92 participants answered the survey, 57% female, 42% male, and 1% preferred not to specify. Almost one-fourth of the respondents were 50 years old or above (24%), 37% were between 40-49 years old, 30% were between 30-39, and 9% were between 20-29. The respondents were from ten different countries, more than half from Portugal (54.3%), followed by Brazil (26.1%) and Spain (9.8%) (see Figure 19).



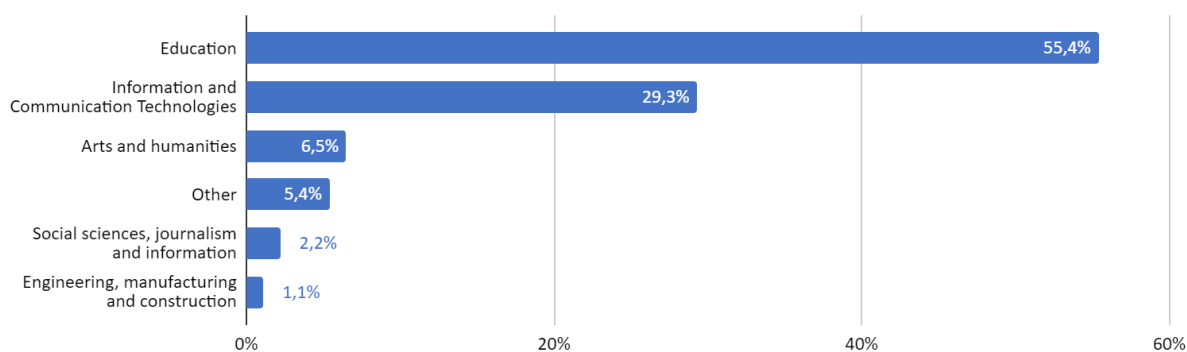
**Figure 19. Respondents' age and country of residence (survey)**

Regarding their academic background, 7.6% held a degree that was lower than a Master's or equivalent, 12% held a Master's degree or equivalent and this was their highest degree, 31.5% were PhD candidates, 25% held a PhD, but were not a PhD supervisor, and 23.9% held a PhD and were a PhD supervisor, as can be seen in Figure 20. Although the target of the survey was PhD candidates, practitioners, and researchers, we decided to keep the data from other researchers with a Master's degree or a lower degree because we believe that these researchers are relevant to the context of this study.



**Figure 20. Respondents' academic background (survey)**

As can be visualized in Figure 21, their main field of research, work, or study was Education (55.4%), followed by Information and Communication Technologies (29.3%), and Arts and humanities (6.5%). When asked if their research, work, or study was related to TEL, 80% said yes while 20% said no.



**Figure 21. Respondents' main field of research, work, or study (survey)**

### 3.3 Second phase: development and formative evaluation

In the second phase, called *development and formative evaluation*, the OER prototype was conceptualized, designed, and developed and it went through three cycles of formative evaluation.

#### 3.3.1 Development of the prototype

The tool used to develop this prototype was H5P and the content was about Design-based Research (DBR).

##### 3.3.1.1 Why develop a prototype about Design-based Research?

As this research aims at developing OER for doctoral education in TEL and preliminary results from Albó et al. (2022) showed that DBR is the most used research method and also the one which PhD candidates and PhD holders need more training, an OER prototype about DBR was designed and developed using H5P.

Before adding the content to H5P, two webinars about DBR were held in order to organize and select which information should be introduced in the resource, although no data had been collected in these webinars. The first webinar happened on 7 May 2021 as part of the Spring Webinars offered by the DE-TEL project to PhD students in TEL around the world, especially in Europe, and had about 30 participants. The title of this webinar was “Design Based Research in Technology Enhanced Learning”<sup>11</sup> and the slide presentation is available in Appendix C. The second one happened on 27 May 2021 to a group of students from the Master’s in Education - E-learning and Distance Education, from the

<sup>11</sup> See the program and recording of the webinar on the EA-TEL website: <https://ea-tel.eu/events/design-based-research-in-technology-enhanced-learning>

Education Institute of the University of Lisbon and the content was the same as the one from the DE-TEL Spring Webinars.

The content of the workshop was organized into three main parts. In the first part, the definitions and other terminologies were presented. Then, still in the first part, some research functions and approaches were discussed to explain DBR and the structure of the research question. In the second part, the different models for conducting DBR and their characteristics were described, emphasizing the three main phases - analysis, development, and evaluation. And finally, in the third part, a repertoire of activities that can be conducted in each phase was provided. To conclude, the participants should think about how these concepts could be applied to their research. With the structure of the resource planned, the content was introduced into H5P.

### **3.3.1.2 Why H5P?**

H5P<sup>12</sup>, an abbreviation for HTML5 Package, is a completely free and open technology, which enables anyone to create, share, reuse, and modify interactive HTML5 content efficiently, without the need for any technical knowledge.

H5P makes it easy to create rich interactive content by providing several content types for various needs. It is possible to create videos enriched with interactions, presentations with interactive slides, drag-and-drop tasks with images and text, images with multiple information hotspots, single or multiple-choice questions, interactive books integrating several content types, and many others.

Figure 22 shows an example of the content type named *drag the words*, where it is possible to create text-based drag-and-drop tasks. In this activity, learners are asked to drag the characteristics of DBR and drop them into the correct explanation. Then, they can check their answers to see how many responses they got right and to generate a score. They can also choose between retrying the task or visualizing its solution. Figure 22, for instance, presents the solution with the correct responses.

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<sup>12</sup> Although [h5p.org](http://h5p.org) says that “H5P is a completely free and open technology”, there are some exclusive features available at [h5p.com](http://h5p.com), a paid version of the tool, where it is possible to get a free 30-day trial.

**Characteristics** 7 / 10

**Design-Based Research**

- Introduction
- Definitions and oth...
- Research functions...
- Research question
- Cycles and phases
- Main activities in ea...
- Characteristics**
  - Characteristics
  - Further readings
  - References

**Drag the characteristics into the correct explanation:**

- iterative** ✓ the research process incorporates cycles of analysis, design, development, evaluation, and revision, as demonstrated in the models presented before.
- interventionist** ✓ the research aims at designing an intervention in a real world setting in order to positively impact practice. These interventions include educational products, processes, programs or policies, for example. Its intention is to make a real change on the ground.
- collaborative** ✓ the research involves active participation and collaboration among researchers and practitioners in the various stages and activities of the research. The intervention needs to be relevant and practical for the educational context, and this collaboration increases the probability for a successful implementation.
- process oriented** ✓ the focus is on understanding and improving interventions. The products of DBR are shaped by the participants, literature, and especially field testing. The interventions are adjusted based on the empirical data, which are collected in real world settings during the process.
- theory oriented** ✗ the quality of a design is measured by its practical use in real contexts to check if the intervention is really useful.
- utility oriented** ✗ scientific understanding is used to frame not only the research, but also to shape the design of the intervention / the solution to the real problem. The results also contribute to theoretical understanding and theory building.

4 / 6 Show solution Retry

References: van den Akker (1999), Van den Akker et al. (2006), Kelly (2006), Nieveen (1999), Plomp & Nieveen (2013)

**Figure 22. Example of the content type called drag the words**

The content type that was adopted in the creation of this OER prototype on DBR was the *interactive book*. The H5P interactive book content type allows authors to create courses, books, or tests, combining various interactive content types inside of it, such as interactive videos, course presentations, questions, and much more, through multiple pages. Figure 22 above illustrates a part of the page about the characteristics of DBR. On the left-hand side of the image, it is possible to visualize the contents of this interactive book. The numbers in the top right-hand corner of the image indicate the actual page and the total pages of the book, respectively.

At the end of the interactive book, there is a report displaying the learner's progress throughout the book (Figure 23). There is the *total score*, which is the number of points scored by the learner from his/her correct answers to the interactive questions; the *book progress*, which is the percentage of the visualized pages and the performed interactions with the content (it is not possible to get 100% of *book progress* only visualizing the pages); and the *interactions progress*, which is the percentage of the content that the learner interacted with. On the last page of the interactive book, there is also a summary that shows the details of the interactions from each page.

**Total score**  
0 / 29  
2 of 4 interactions

**Book progress**  
78%  
7 of 9 pages

**Interactions progress**  
50%  
2 of 4 interactions

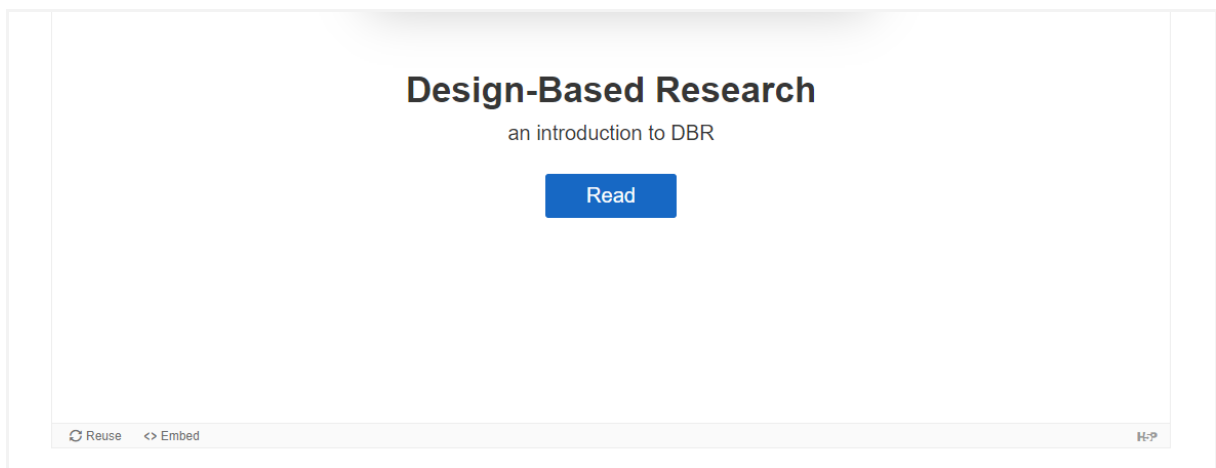
Submit Report Restart

**Figure 23. Report of an interactive book**

There are three kinds of H5P integrations. Creating and storing content on H5P.com, it is possible to embed the content into any page or platform that supports embedded content, or access it through a direct link. H5p.com also provides Learning Tools Interoperability (LTI) integrations with Learning Management Systems (LMS), such as Canvas, Blackboard, Moodle and other existing systems. And it is also possible to self-host H5P through free plugins. The H5P team has developed plugins for Drupal, WordPress, and Moodle, for instance.

The advantage of integrating the H5P plugin into an LMS is that gamification strategies can be added, such as generating a badge for content visualization and another one according to the score and interactions performed by the user. In addition, discussion forums can also be created so that PhD candidates, practitioners, and researchers can communicate with one another, and share references and other relevant resources related to the content.

H5P was chosen because besides being a simple-to-use tool to create interactive content it also enables anyone to get involved with key concepts of OER such as the 5R (retain, revise, remix, reuse, redistribute). For instance, when creating content, it is possible to publish it publicly so that anyone can access it through a link and reuse the material. There are two buttons in the bottom left-hand corner of the content - *reuse* and *embed* - which enable anyone to download the H5P file or embed it into other platforms (see Figure 24). In addition to retaining, reusing, and redistributing the content, it can be also uploaded into H5P to be revised or remixed with other materials.



**Figure 24. reuse and embed buttons**

In each content type that is created in H5P, metadata can be added to display more details about copyright information such as the license and the author's name, as can be seen in Figure 25 below.



**Metadata (sharing and licensing info)**  
Fill in the fields below Save metadata

Title \* ⓧ Show label for AT

License \* License Version

Years (from) Years (to) Source

Author's name Author's role \*  
  Save author

License Extras  
 Any additional information about the license

**Figure 25. Metadata and copyright information**

### 3.3.1.3 Which Creative Commons license?

As it was discussed in section 2.2.3 *Creative Commons*, the most frequently used licenses for OER are the BY, BY-SA, and BY-NC-SA. While we believe that OER should not be used for commercial purposes and, thus, the CC BY-NC-SA license could be the most appropriate, we also believe that OER should not have any restrictions or conditions. Because of this, the OER developed for this investigation is under the CC BY license, allowing everyone to retain, reuse, revise, remix, and redistribute the resource, as long as credit is given to the original author (Downes, 2007; Wiley, 2021).

### 3.3.2 Formative evaluation: data collection, data analysis, and participants

This prototype went through three cycles of formative evaluation with PhD candidates, practitioners, and researchers in the field of TEL, the context of this study, and as feedback was being received from each cycle, adjustments and improvements were carried out before starting the next cycle. Table 5 summarizes each cycle of this formative evaluation.

	What?	When?	Where?	How many?
<b>Cycle 1</b>	Validation of the scientific content	May 2022	Survey via e-mail	4 experts in research methods
<b>Cycle 2</b>	H5P + OER Workshop	26 May 2022	EA-TEL Summer School (Greece)	6 participants
		23 September 2022	EC-TEL (France)	2 participants
<b>Cycle 3</b>	DBR Workshop	17 November 2022	Master's program in Audio-visual Communication for New Media (Portugal)	15 participants
		22 November 2022	Master's program in Communication and Web Technologies (Portugal)	14 participants
		23 November 2022	Master's program in Digital Game Development (Portugal)	7 participants
		23 November 2022	By Students for Students Program (Portugal)	4 participants
		9 December 2022	PhD course in New Media (Portugal)	2 participants
		12 December 2022	PhD course in Multimedia in Education (Portugal)	6 participants

**Table 5. The three cycles of formative evaluation**

All the participants were aware of the purposes of the investigation, and the data confidentiality and anonymity were respected in accordance with the data protection law of the European General Data Protection Regulation (GDPR) and Portuguese Legislation (Assembleia da República, 2019; European Union, 2016).

### 3.3.2.1 Cycle 1: validation of the scientific content

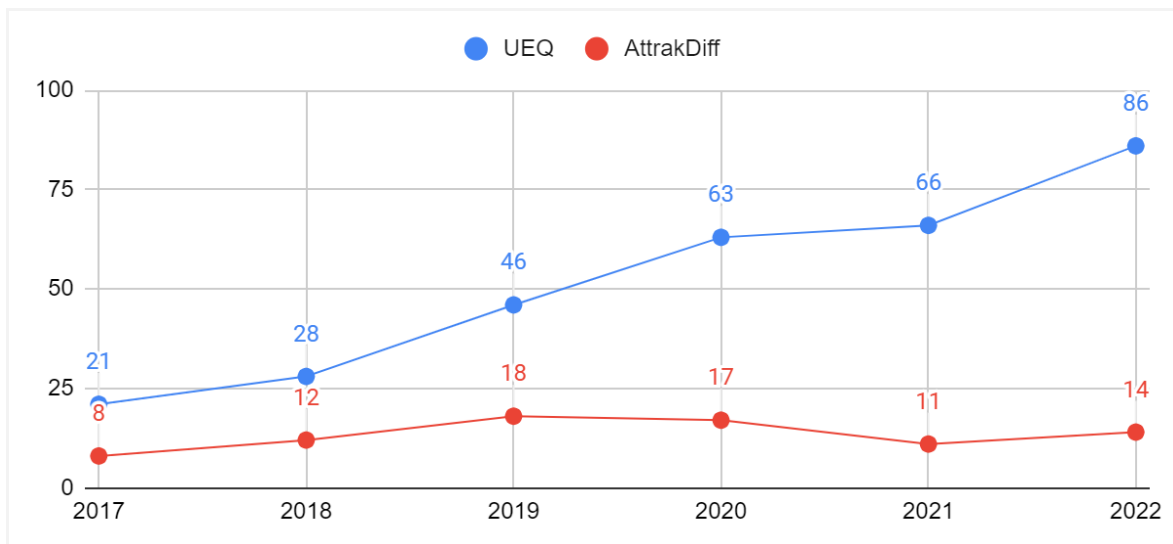
In Cycle 1, the validation of the scientific content of the prototype was carried out by experts in the area of research methods. The main goal of this cycle was to verify if the content was appropriate to the learning of research methods in doctoral programs in TEL, more specifically to the learning of DBR, the content of this prototype.

Six experts were contacted via email in May 2022 to validate the content and four answered the questions that were added to formsUA and were used to better guide their validation. The form was divided into five sections to facilitate the evaluation of each section of the prototype and asked if the content was useful, relevant, accurate, reliable,

sufficient, and if it met learners' needs. There was also an open-ended question in each section for additional comments. See Appendix D to visualize the questions. The data were analysed using descriptive analysis (frequencies) and graphs were generated through Microsoft Excel.

### 3.3.2.2 Cycle 2: H5P + OER workshop

In Cycle 2, the general aspects of the prototype were evaluated through the workshop *Creating Open Educational Resources with H5P*, which was offered twice. The survey conducted at the end of the workshops consisted of the User Experience Questionnaire (UEQ) (Laugwitz et al., 2008) complemented by a self-design questionnaire and a section related to participants' personal background. According to Díaz-Oreiro et al. (2021), although the AttrakDiff questionnaire has appeared five years earlier than the UEQ and it is the questionnaire that counts the most uses since 2006, UEQ has surpassed AttrakDiff in uses per year in 2017 and 2018. Conducting a quick search on Scopus using the terms "user experience questionnaire" and "attrakdiff", it is possible to visualize in Figure 26 that this tendency was kept in 2019, 2020, 2021, and has also continued in 2022 (data from February 2023).



**Figure 26. UEQ versus AttrakDiff**

Díaz-Oreiro et al. (2021) also report that standardized user experience questionnaires were used in combination with other evaluation instruments, such as self-design questionnaires. As we intended to complement the standardized questionnaire with a self-design questionnaire, we chose to use UEQ over AttrakDiff because AttrakDiff is implemented on its own website ([attrakdiff.de](http://attrakdiff.de)), without the possibility of adding other

groups of questions. Using UEQ, we could add it on formsUA together with other questions from our self-design questionnaire. On the website ueq-online.org, it is possible to download the UEQ in more than 30 languages and also the tool available on a Microsoft Excel file, completely free of charge, to facilitate the data analysis.

The scales of the UEQ cover both classical usability aspects (efficiency, perspicuity, dependability) and user experience aspects (novelty and stimulation), besides the attractiveness of the resource. *Attractiveness* measures the overall impression of the resource, if users like it or not; *efficiency* assesses if users can solve their tasks without unnecessary effort, if the resource reacts fast; *perspicuity* calculates if it is easy to get familiar with the resource and learn how to use it; *dependability* evaluates if users feel in control of the interaction, if it is secure and predictable; *novelty* calculates if the design of the product is creative and catch the interest of users; and *stimulation* measures if the resource is exciting, motivating, and fun to use (Laugwitz et al., 2008).

According to the UEQ data analysis tool from the website (ueq-online.org), values between -0.8 and 0.8 represent a more or less *neutral evaluation* of the corresponding scale, values  $> 0,8$  represent a *positive evaluation*, and values  $< -0,8$  represent a *negative evaluation*. The range of the scales is between -3 (horribly bad) and +3 (extremely good) and it is extremely unlikely to observe values above +2 or below -2. On a scale range of -3 to +3, a quite good value of +1.5 does not look so positive. For this reason, we choose to use figures with the reduced scale -2 to +2 to communicate the results.

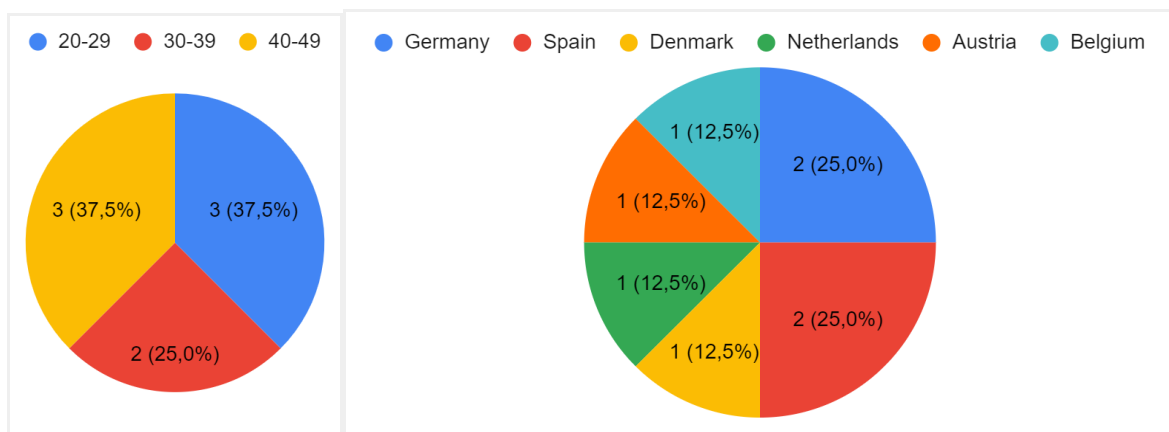
As a complement to the UEQ, the self-design questionnaire encompassed questions related to participants' personal background, the 5R activities - if it was possible to retain, revise, remix, reuse and redistribute the content -, and some open-ended questions regarding the most positive and negative aspects of the prototype in their opinion, and suggestions for improvement (see Appendix E to visualize the complete survey). These data were analysed using descriptive statistics (frequencies and percentages) and graphs were generated through Microsoft Excel.

The first workshop was held during the *16th EATEL Summer School on Technology Enhanced Learning 2022*<sup>13</sup> and lasted one hour and 30 minutes. It was structured into three main parts: (1) a brief introduction to OER and H5P, (2) a hands-on activity in which the participants created a resource with H5P and applied some OER concepts, (3) and the evaluation of the OER prototype about DBR, the focus of this thesis. To visualize the planning details, see Appendix F. It had sixteen participants working individually, in pairs

or trios, however only six could answer the survey because most of them were without their computers and it was complicated to open the prototype and the survey on their mobile phones.

The second workshop was held on the first day of the *17th European Conference on Technology Enhanced Learning - Addressing Global Challenges and Quality Education*<sup>14</sup>. Due to flight cancellation, this workshop had to be rescheduled to an online format one week after the conference. Its structure was very similar to the first one offered in the Summer School except that it was online and lasted 3 hours instead of one hour and 30 minutes. Thus, in the second part, besides creating a resource, the participants had the chance to learn how to reuse the resource created by the other participants and add more content to it. The workshop had two participants working individually and all of them evaluated the material and answered the survey.

In total, eight participants from six different countries answered the survey, as can be seen in Figure 27, being 50% female and 50% male, 37.5% at the age of 20-29, 25% at the age of 30-39, and 37.5% at the age of 40-49.

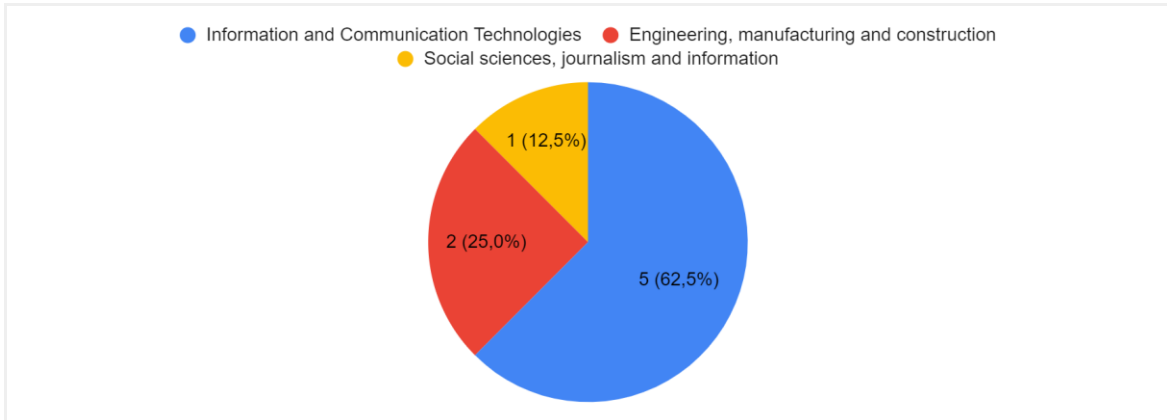


**Figure 27. Respondents' age and country of residence (Cycle 2)**

Regarding their educational level, 75% were PhD candidates and 25% held a PhD degree and were a PhD supervisor. Their main field of research, work, or study was Information and Communication Technologies (62.5%), Engineering, manufacturing, and construction (25%), and Social sciences, journalism, and information (12.5%), as can be visualized in Figure 28. When asked if their research, work, or study was related to TEL, all of them said yes.

<sup>13</sup> <https://ea-tel.eu/jtelss22>

<sup>14</sup> <https://ea-tel.eu/ectel2022>



**Figure 28. Respondents' main field of research, work, or study (Cycle 2)**

### 3.3.2.3 Cycle 3: DBR workshop

In Cycle 3, the content of the prototype about DBR was evaluated through the workshop *Design-based Research: an Introduction*. The workshop lasted between 1 hour and 30 minutes and 2 hours and was structured into three main parts: (1) an introduction to DBR, with some definitions and other terminologies, (2) DBR models, their phases and characteristics, (3) and the main activities that can be developed in each phase. To conclude, the participants were asked to evaluate the OER prototype about DBR through a survey. To visualize the planning details of this workshop, see Appendix G.

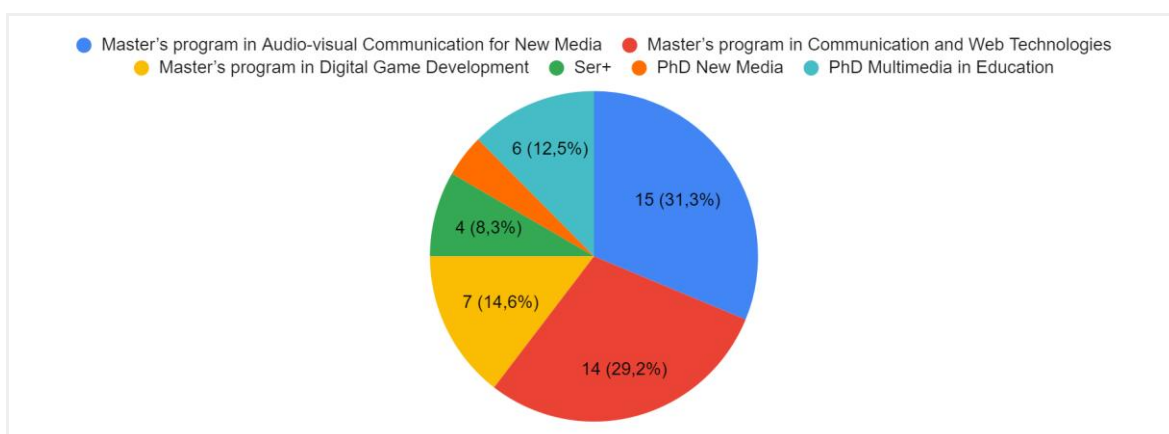
The survey conducted in Cycle 3 was the same as the one conducted in Cycle 2 except for the questions related to the 5R activities. Since the 5R activities had been already evaluated in the H5P workshops, it did not make sense to include this section of the survey in a workshop related to DBR. Therefore, the survey included the UEQ, open-ended questions regarding the most positive and negative aspects of the prototype in their opinion, suggestions for improvement, and their personal background (see Appendix E to see the complete survey). Again, these data were analysed using descriptive statistics (frequencies and percentages) and graphs were generated through Microsoft Excel.

Six workshops were offered in Cycle 3 and had 48 participants in total. The first workshop was held on 17 November 2022 for the Master's program in *Audio-visual Communication for New Media* and had 15 participants; the second was held on 22 November 2022 for the Master's program in *Communication and Web Technologies* and had 14 participants; the third was held on 23 November 2022 to the Master's program in *Digital Game Development* and had seven participants; the fourth was held in the *By Student for*

*Student Program*<sup>15</sup> on 23 November 2022 and had four participants; the fifth was held on 9 December 2022 to the PhD course in *New Media* and had two participants; and the sixth was held on 12 December 2022 to the PhD course in *Multimedia in Education* and had six participants<sup>16</sup> (See Figure 29).

We decided to include Master's students in this phase of the investigation because of the lower adhesion of PhD candidates. Besides, Master's students are also considered researchers and can highly benefit from the OER about DBR that has been developed. We carefully chose Master's courses in the TEL area, where DBR is widely used as a methodological approach and, for this reason, the students were familiar with it and needed credible sources to design their research plans.

Although the target of the survey was PhD candidates, practitioners, and researchers, we decided to keep the data from other researchers with a Master's degree or a lower degree because we believe that these researchers are relevant to the context of this study

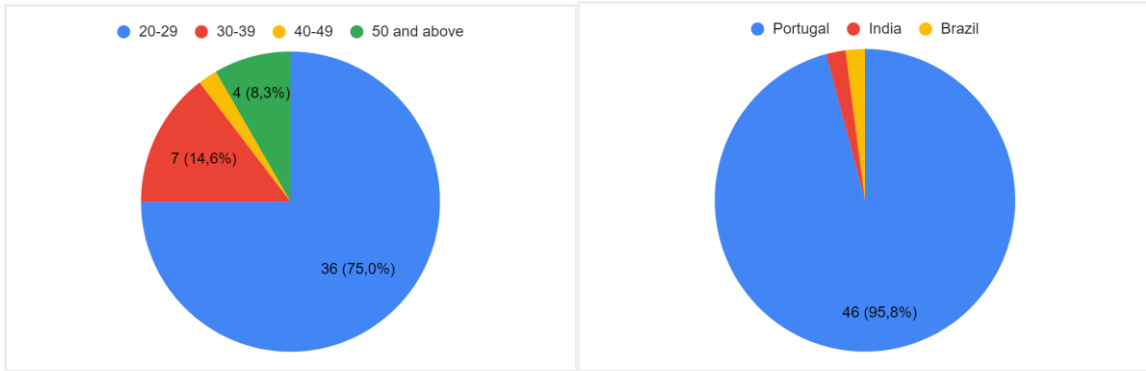


**Figure 29. Participants of the workshops according to their courses**

Regarding the gender of the 48 students who participated in the workshops and answered the survey, 37.5% were female and 62,5% were male. Three-fourths (75%) of the participants were between 20-29 years old, seven (14.6%) were between 30-39 years old, one (2.1%) was between 40-49, and four (8.3%) were 50 or above 50. Almost all the participants reside in Portugal (95.8%), one (2.1%) resides in India, and one (2.1%) in Brazil (see Figure 30).

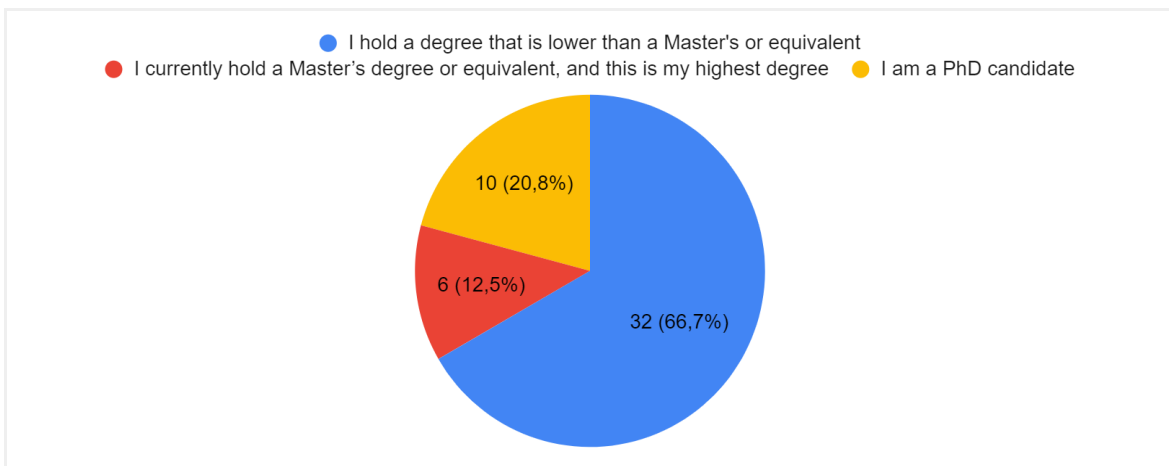
<sup>15</sup> As the name suggests, the program is built by students for students: "sometimes you can help by organizing a training course, and sometimes you can be helped by participating in one." More information in the following link: <https://www.ua.pt/en/sermais/programa-de-estudantes-para-estudantes>

<sup>16</sup> Only this workshop was held in an online format



**Figure 30. Respondents' age and country of residence (Cycle 3)**

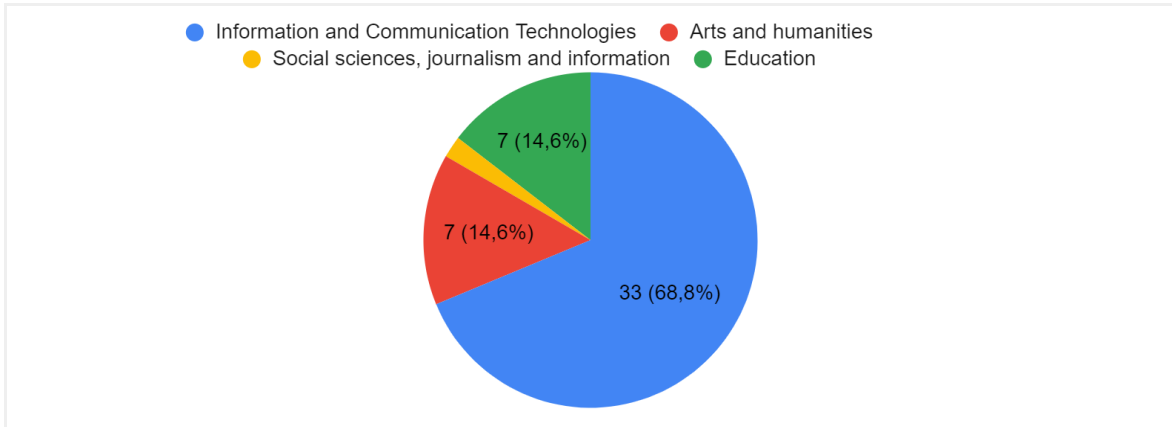
About their educational level, 66.7% held a degree that was lower than a Master's or equivalent, 12.5% held a Master's degree or equivalent and this was their highest degree, and 20.8% were PhD candidates, as can be seen in Figure 31.



**Figure 31. Respondents' academic background (Cycle 3)**

Their main field of research, work, or study was Information and Communication Technologies (68.8%), Arts and humanities (14.6%), Education (14.6%), and Social sciences, journalism, and information (2.1%), as can be visualized in Figure 32. When asked if their research, work, or study was related to TEL, 60.4% said yes while 39.6% said no.





**Figure 32. Respondents' main field of research, work, or study (Cycle 3)**

### **3.4 Third phase: semi-summative evaluation**

In the third phase, four professors who teach and/or are experts in research methods and/or DBR were interviewed individually with the purpose of validating the scientific content of the final version of the prototype; verifying how some key concepts of OER, such as the 5R (retain, revise, remix, reuse, and redistribute), can be applied to the resource considering the experts' needs and practice; evaluating the positive and negative aspects of the resource; and analysing experts' knowledge about OER and the application of OER in their practice.

#### **3.4.1 Data collection: interviews**

The four experts were all professors at Portuguese universities and therefore the interview was conducted in Portuguese. These four experts were among the six experts who were contacted to validate the content in the second phase, Cycle 1. As the validation of the content was anonymous, we do not know if those experts were the same as the experts from the interviews.

The interviews were held online via Zoom, between February and March 2023, and lasted about 30 minutes each. They were recorded and transcribed to be analysed through thematic analysis with the support of qualitative data analysis software NVivo.

The experts were aware of the purposes of this investigation, and the data confidentiality and anonymity were respected in accordance with the data protection law of the European General Data Protection Regulation (GDPR) and Portuguese Legislation (Assembleia da República, 2019; European Union, 2016). The free and informed consent form can be visualized in Appendix H.

According to Saldaña (2011), interview formats can range from highly structured to unstructured. As the name suggests, semi-structured interviews are between structured and unstructured, which means that although the interviewer has predetermined questions organized in a certain order, they can be rephrased or changed during the interview. The interview guide for this semi-structured interview was composed of four sections (available in Appendix I).

At first, there was an introduction to the study and a presentation of the interview objectives. Then, the participants were asked about their experience with research methods and DBR. About the prototype, they were asked if they were interested in retaining, revising, remixing, reusing, and redistributing the resource, what they liked the most and the least about the resource, and suggestions for improvements. Finally, there was a discussion about the OER concept and the application of OER in their practice, and the interview was concluded with additional comments and acknowledgment.

### **3.4.2 Data analysis: thematic analysis**

The qualitative data collected from these interviews were analysed through thematic analysis with the support of qualitative data analysis software NVivo. According to Clarke and Braun (2017, p. 297), “thematic analysis is a method for identifying, analyzing, and interpreting patterns of meaning (‘themes’) within qualitative data.” Braun and Clarke (2006) provide an outline guide for conducting a thematic analysis consisting of six phases. These phases are not a linear process but a more recursive process with movements back and forth when needed.

The first phase is familiarisation with the data, transcribing, reading, and re-reading it in an active way, searching for meanings and patterns, and taking notes that may be useful in the subsequent phases. As thematic analysis does not require the same level of detail in the transcription as conversation, narrative, or discourse analysis (Braun & Clarke, 2006), we opted for a denaturalized transcription (Bucholtz, 2000; Oliver et al., 2005) in which nonverbal language, such as stuttering, laughing, coughing, pauses, involuntary vocalizations, and other noises are removed, presenting a clearer transcription. The transcription of the four interviews can be consulted in Appendix J.

The second phase involves the generation of initial codes that appear interesting to be analysed. After identifying the codes, these codes must match with data extracts. It is important to guarantee that all the data extracts are coded. Then, the extracts, that may belong to different experts, for instance, must be collated within each code.

In the third phase, all data have been initially coded and the extracts collated, and the codes are going to be sorted into potential themes and the extracts collated within the identified themes. Themes can be considered units of analysis and are broader than codes. See an example of themes and codes in Table 6.

Themes	Codes	Data extracts
Experience with research methods and DBR	Teaching research methods	<i>Yes, research methodologies as part of both the doctorate in Science Didactics and the master's course in Innovation in Education.</i> <sup>17</sup> (Expert 1)
		<i>So, for a few years now, I've been teaching courses on research methodologies in education in the doctoral program in education and in the doctoral program in multimedia in education.</i> <sup>18</sup> (Expert 3)
	Supervising students using DBR	<i>I've supervised several projects. Several master's and doctorates studies. I'm now supervising two, three in fact, that use design-based research.</i> <sup>19</sup> (Expert 1)
		<i>[...] yes, some of my doctoral students used it to develop their doctoral projects.</i> <sup>20</sup> (Expert 3)

**Table 6. Example of theme, codes, and data extracts**

The fourth phase involves checking if the themes are appropriate to the codes and the data set. During this phase, the themes are refined and some of them might collapse into each other or break down into separate themes. The first level of this refinement is reading the collated data extracts for each theme and checking if they fit one another. If they do not fit, it is necessary to check whether the problem is with the extract or with the theme. The second level considers the whole data set and analyses if the initial thematic map reflects the whole data.

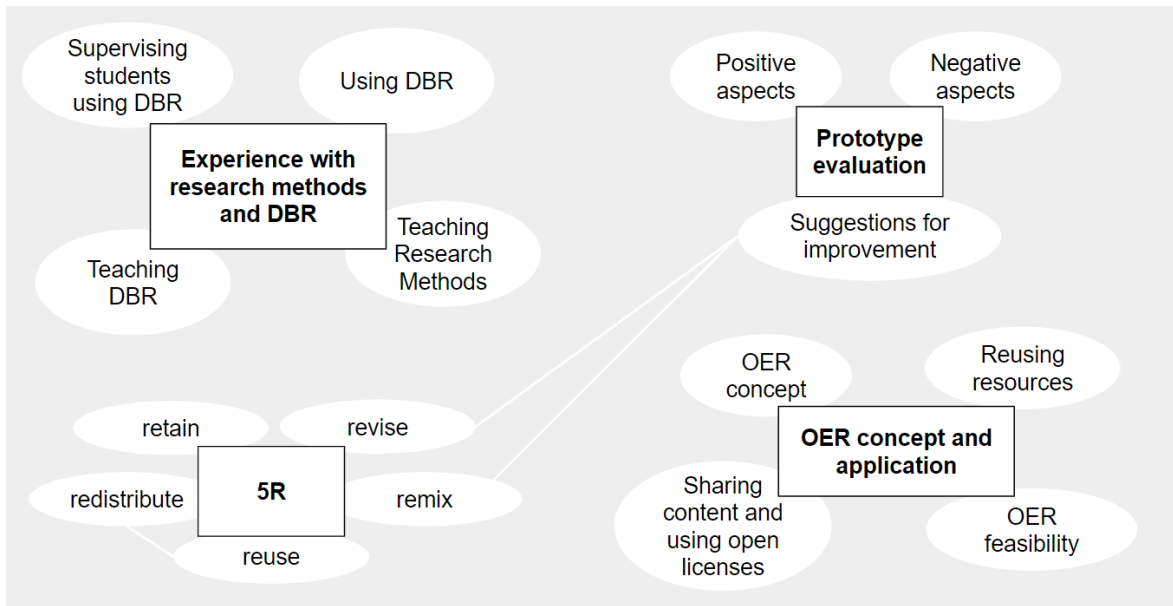
Figure 33 represents the initial thematic map of the analysis of the interviews. The codes *revise* and *remix* in the theme *5R* fit the theme *prototype evaluation*, more specifically the *suggestions for improvement*, and, therefore, they were collapsed. Besides, the codes *redistribute* and *reuse* were used by the interviewees almost as synonyms during the evaluation of the prototype. Because of this, we decided to collapse the themes *prototype evaluation* and *5R*.

<sup>17</sup> Translated from Portuguese: *Sim, metodologias de investigação também no âmbito tanto do doutorado em Didática das Ciências como também no mestrado em Inovação em Educação.* (Expert 1)

<sup>18</sup> Translated from Portuguese: *E, portanto, de alguns anos para cá eu leciono, no programa doutoral em educação e no programa doutoral em multimédia em educação, as unidades curriculares de metodologias de investigação em educação.*

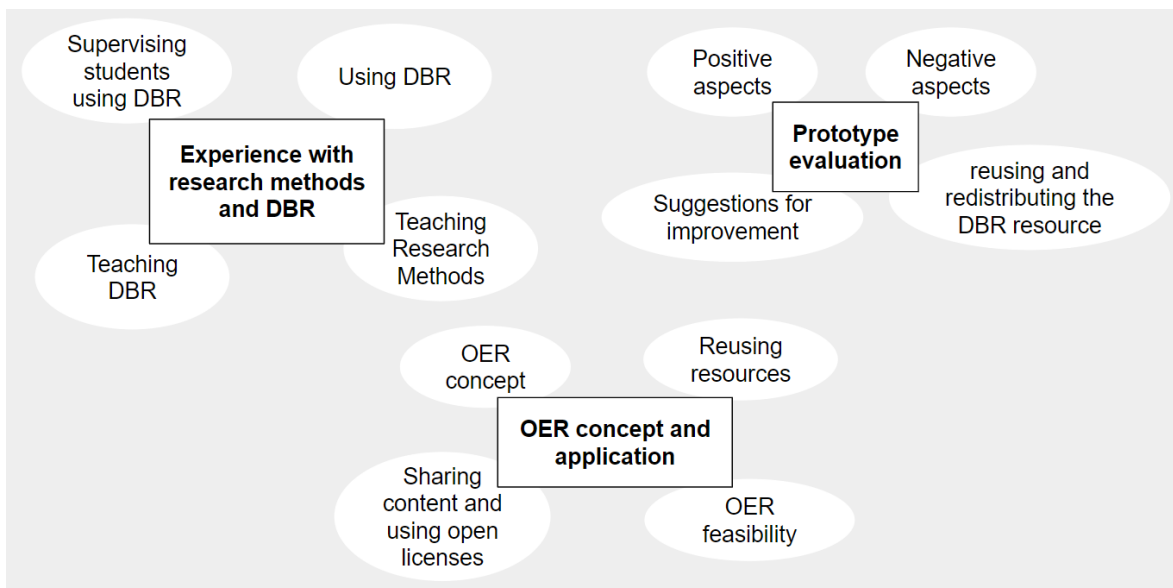
<sup>19</sup> Translated from Portuguese: *Orientei vários trabalhos. Vários trabalhos de mestrado e também de doutorados. Estou precisamente a orientar agora dois, aliás, três que recorrem ao design-based research.*

<sup>20</sup> Translated from Portuguese: *[...] sim, alguns dos meus doutorandos utilizaram para desenvolver os seus projetos de doutoramento.*



**Figure 33. Initial thematic map**

After reaching a satisfactory thematic map of the data, phase five introduces the final refinement of the themes and the generation of definitions and names for analysis. In this phase, the themes are analysed to identify whether or not they contain any sub-themes. Figure 34 represents the final thematic map after all the refinements.



**Figure 34. Final thematic map**

Finally, phase six involves writing the final report with the final analysis. The results of this thematic analysis are presented in the next chapter.

## **CHAPTER 4: RESULTS AND DISCUSSION**

This chapter presents and discusses the results of the three phases of this investigation. The first section discusses the results of the survey conducted in the context analysis (first phase). The second section presents the results of the formative evaluation and the changes that were made in the prototype (second phase). Finally, the third section presents the results of the thematic analysis of the interviews, the semi-summative evaluation and the last phase of this investigation.

### **4.1 First phase: results from the survey**

This section presents and discusses the main results of the survey conducted in the first phase of this investigation, the context analysis. First, the preferable characteristics, factors, and formats by PhD candidates, practitioners, and researchers are described, followed by the attributes they would include in their OER concept and some correlations among the attributes they would include in their OER concept and their level of confidence when answering this question.

#### **4.1.1 Characteristics, factors, and formats**

PhD candidates, practitioners, and researchers were asked how relevant some characteristics were to them when they searched for resources within the scope of doctoral training. As can be seen in Table 8, the most relevant characteristics were the resources being properly referenced with the identification of authors and their sources (mean = 4.70; SD = 0.550), having scientific rigor (mean = 4.68; SD = 0.592), being easily accessible (mean = 4.49; SD = 0.749), and having identification data such as subject, author(s), co-author(s), developer(s), and institution (mean = 4.45; SD = 0.898).

In contrast, the least relevant characteristics were the content being in accordance with environmental legislation (mean = 3.60; SD = 1.166), allowing adaptation or modification (mean = 3.61; SD = 1.176), and allowing redistribution of copies of the original or remixed resource (mean = 3.67; SD = 1.053) (see Table 8).

The characteristics with the highest standard deviation rates, in other words, the characteristics that had the most divergent opinions regarding their relevance, were allowing adaptation or modification (mean = 3.61; SD = 1.176), being conformed to the legislation on gender, diversity, inclusion (mean = 3.70; SD = 1.172), being in accordance

to environmental legislation (mean = 3.60; SD = 1.166), and allowing to be translated or doubled into another language (mean = 3.71; SD = 1.120) (see Table 8).

	N	Mean	Std. Deviation
Scientific articles, texts taken from the internet, sections or chapters of books are properly referenced with the identification of authors and their sources.	92	4.70	.550
The content has scientific rigor.	92	4.68	.592
It is easily accessible.	92	4.49	.749
The resource has identification data: subject, author(s), co-author(s), developer(s), institution.	91	4.45	.898
In the images, tables and charts the reference sources are indicated.	91	4.38	.853
The images, tables and charts are referenced.	92	4.38	.823
It allows the user to download it from the internet.	92	4.36	.793
It is in accordance with the rules of ethical standards of research with human beings and animals.	89	4.31	.887
It is available in public portals and open databases.	92	4.28	.789
The didactic-methodological approach allows its recontextualization.	89	4.27	.876
It has an open license (e.g. Creative Commons).	92	4.26	.900
The didactic-methodological approach allows its retemporalization (to reuse at another time).	90	4.20	.939
The access is possible for any user.	91	4.20	.909
It has an open license that permits open access, reuse, redesign, sharing, etc.	92	4.20	.986
It presents the credits of the team that participated in the production.	91	4.18	.995
It allows the user to download immediately (without the need for registration).	92	4.16	.829
It allows to be shared.	92	4.12	.888
It is completely free.	91	4.07	.975
The new versions indicate the author(s) of previous ones.	91	3.93	1.083
It allows to be copied.	91	3.90	1.086
It complies with accessibility criteria.	90	3.89	.999
It allows to be combined with other resources to create something new.	91	3.86	1.081
It allows to be adapted to special education.	89	3.82	1.051

It allows to be translated / doubled into another language.	89	3.71	1.120
The content conforms to the legislation on gender, diversity, inclusion.	89	3.70	1.172
It allows the user to redistribute copies of the original or remixed resource.	89	3.67	1.053
It allows to be adapted or modified.	92	3.61	1.176
The content is according to environmental legislation.	87	3.60	1.166
Valid N (listwise)	77		

**Table 7. Characteristics: mean and standard deviation**

When asked which factors and formats would make them more likely to select a particular resource when searching for resources within the scope of doctoral training, the likeliest factors were the resource being relevant to their particular interests/needs (mean = 4.60; SD = 0.696), being created/uploaded by a reputable/trusted institution or person (mean = 4.42; SD = 0.759), and having been previously used successfully (mean = 4.20; SD = 0.753), as can be seen in Table 9.

On the other hand, the least likely factors were the resource featuring a catchy title or attractive image(s) (mean = 3.46; SD = 1.012), using interactive or multimedia content as, for example, video or quiz (mean = 3.63; SD = 1.022), and having an open license allowing adaptation (mean = 3.68; SD = 1.010) (see Table 9).

Regarding the standard deviation, the factors with the greatest divergent opinions were the resource being recently created, uploaded, or updated (mean = 3.81; SD = 1.032) and using interactive or multimedia content (mean = 3.63; SD = 1.022) (see Table 9).

	N	Mean	Std. Deviation
The resource being relevant to my particular interests/needs	92	4.60	.696
The resource being created/uploaded by a reputable/trusted institution or person	92	4.42	.759
Having previously used this resource successfully	90	4.20	.753
A detailed description of the resource content being provided	91	4.15	.906
A description of learning objectives or outcomes being provided	91	4.11	.960
Personal recommendation	91	4.00	.760
The resource having an open license (e.g. Creative Commons)	92	3.95	.906
The resource being easy to download	90	3.91	.956
Positive user ratings or comments about the resource	91	3.84	.981

The resource being recently created, uploaded or updated	91	3.81	1.032
Being required to use a resource for a project or study task	90	3.81	1.016
Evidence of interest in that resource (e.g. lots of downloads)	89	3.71	1.014
The length/complexity of the resource	91	3.70	.888
The resource having previously been used with others	91	3.69	.839
The resource having an open license allowing adaptation	91	3.68	1.010
Use of interactive or multimedia content (e.g. video or quiz) in the resource	90	3.63	1.022
The resource featuring a catchy title or attractive image(s)	89	3.46	1.012
Valid N (listwise)	87		

**Table 8. Factors: mean and standard deviation**

Regarding the formats, the most relevant were infographics (mean = 4.14; SD = 0.995), e-books (mean = 4.10; SD = 0.967), videos (mean = 4.08; SD = 0.957), and open textbooks (mean = 4.02; SD = 1.016). In contrast, the least relevant were quizzes (mean = 3.34; SD = 1.222), audio podcasts (mean = 3.38; SD = 1.157), interactive games (mean = 3.41; SD = 1.348), and lesson plans (mean = 3.52; SD = 1.233). These formats were also the ones with the most divergent opinions since they had the highest standard deviation rates, as can be seen in Table 10.

	N	Mean	Std. Deviation
Infographics	91	4.14	.995
E-books	91	4.10	.967
Videos	91	4.08	.957
Open Textbooks	90	4.02	1.016
Images	91	3.96	1.064
Learning tools, instruments and software plugins	89	3.96	1.010
Tutorials	91	3.95	1.004
Elements of a course (e.g. module/unit)	91	3.90	.943
Lectures	91	3.88	1.009
Data Sets	89	3.73	1.074
Whole courses	92	3.62	1.057
Lesson plans	91	3.52	1.233
Interactive games	90	3.41	1.348
Audio podcasts	90	3.38	1.157



Quizzes	91	3.34	1.222
Valid N (listwise)	86		

**Table 9. Formats: mean and standard deviation**

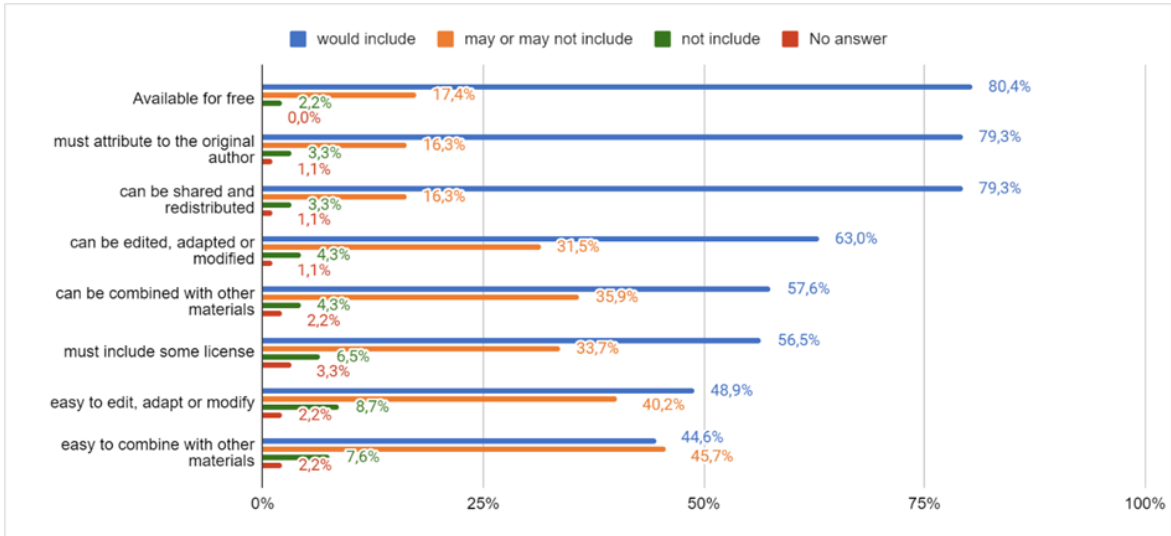
In short, these results may indicate that PhD candidates, practitioners, and researchers consider more relevant having access to resources that are properly referenced, have a scientific rigor, and were created by a reputable institution or person. The characteristics and factors of having an open license and allowing adaptation or redistribution, which are key activities in the OER concept, were not considered a priority to them. In other words, they are more interested in having access to reliable content and less interested in modifying and sharing resources.

#### **4.1.2 OER concept**

PhD candidates, practitioners, and researchers were also asked which attributes they would include in their concept of OER and their level of confidence when answering this question. They said they would include *being available for free* (80.4%), *attributing to the original author* (79.3%), and *being possible to share and redistribute* (79.3%) attributes, as can be seen in Figure 35.

Although more than one-half of the respondents would also include *being possible to edit, adapt or modify* (63%), *being possible to combine with other materials* (57.6%), and *including some licenses* (56.5%) in their concept, these three attributes reached a lower percentage when compared to the ones mentioned in the previous paragraph. Furthermore, *being possible to edit, adapt, or modify* may or may not be included by 31.5% of the respondents, *being possible to combine with other materials* may or may not be included by 35.9%, and *including some licenses* may or may not be included by 33.7% of them (see Figure 35).

These three attributes are central to the concept of OER because they go beyond the access and sharing of content. Thus, these results may indicate that the respondents relate their OER definition more to the free access and redistribution of content than to the possibility of modifying and combining this content with other materials, and the inclusion of licenses that enable users to remix or revise these resources.



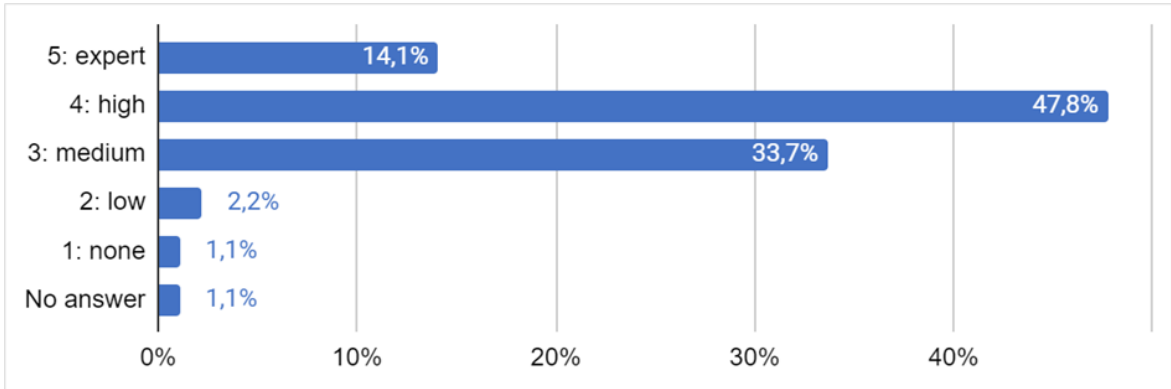
**Figure 35. OER attributes**

*Being easy to edit, adapt or modify* and *being easy to combine with other materials* were the attributes that had more divergent opinions, as can be seen in Figure 35. While *being easy to edit, adapt or modify* would be included by 48.9% of the respondents and may or may not be included by 40.2%, *being easy to combine with other materials* would be included by 48.9% and may or may not be included by 45.7% of them.

The attributes of *being easy to edit, adapt or modify* and *being easy to combine with other materials* are more related to the technical aspects of OER and the tools that may facilitate the engagement with the resource through the 5R. On the other hand, *being possible to edit, adapt, or modify*, *being possible to combine with other materials*, and *including some licenses* represent more the legal facet of OER as they are related to the possibility and permission of engaging with the content through the 5R. These results may suggest that OER attributes regarding the legal aspects, such as the possibility of being edited, adapted, modified, or combined with other materials, are more likely to be included in the respondents' OER concept than the technical aspects related to the facilitation of this edition, adaptation, modification, or combination.

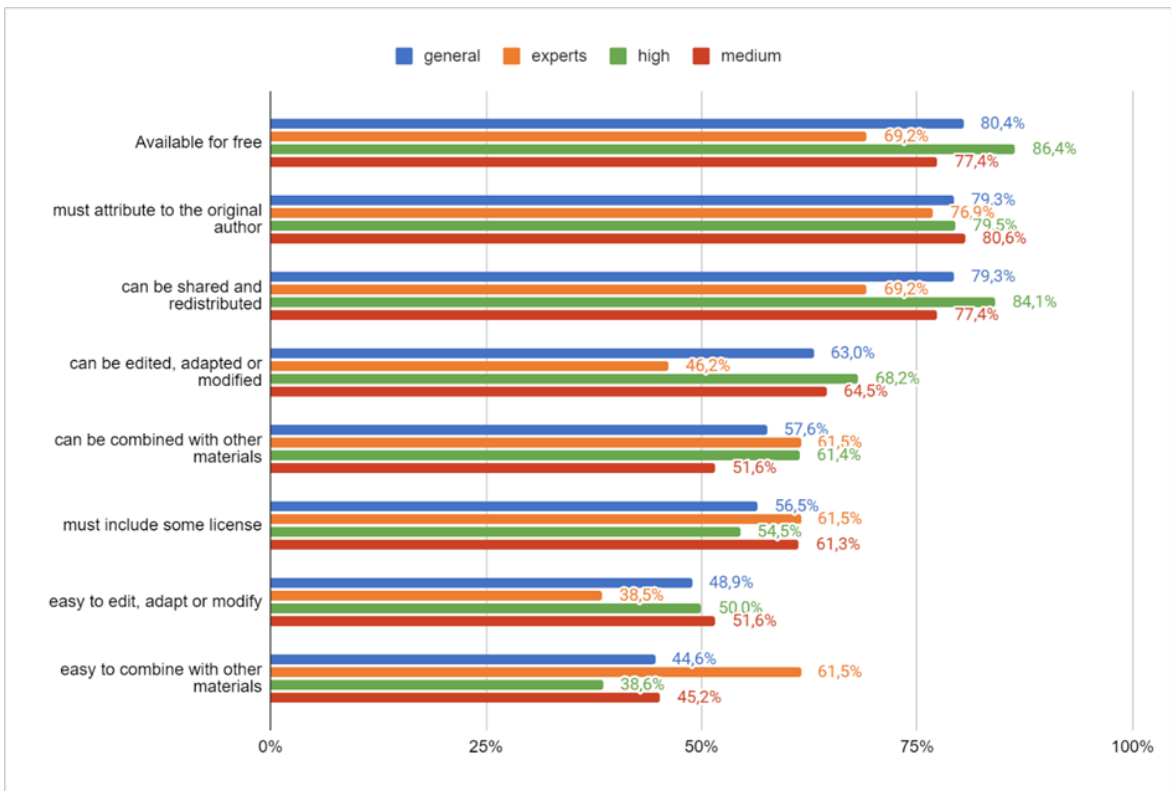
#### **4.1.2.1 Level of confidence regarding the OER concept**

When asked about their level of confidence regarding the attributes they would include in their OER concept, 14.1% of the respondents answered *expert*, almost half of the participants answered *high* (47.8%), followed by *medium* (33.7%), *low* (2.2%), and *none* (1.1%), as can be seen in Figure 36.



**Figure 36. Level of confidence about their OER concept**

Comparing the pattern of responses among all respondents to those who reported that their level of confidence about the OER concept was expert, high, and medium, the three groups presented slightly different views of what constitutes OER. As can be seen in Figure 37, those who reported having a higher level of confidence were not necessarily those more likely to include the attributes in their description.



**Figure 37. Comparison between the levels of confidence about the OER concept**

Those who reported their level of confidence as *expert* were more likely to include the attributes of *being possible to combine with other materials* (61.5%), *including some licenses* (61.5%), and *being easy to combine with other materials* (61.5%) in their concepts. Less than half of the *expert* respondents would include the attribute of *being*

easy to edit, adapt or modify (38.5%) and the attribute of *being possible to edit, adapt or modify* (46.2%), the two attributes related to the edition, adaptation and modification of materials, key characteristics of the OER (see Figure 37).

Those who reported a *high* level of confidence were more likely to include the attributes of *being available for free* (86.4%), *being possible to share and redistribute* (84.1%), and *being possible to edit, adapt or modify* (68.2%) in their OER concept. Less than half of the *high* respondents would include the attribute of *being easy to combine with other materials* (38.6%) and half would include the attribute of *being easy to edit, adapt or modify* (50%), the two attributes related to the technical aspects of OER (see Figure 37).

Those who reported a *medium* level of confidence were more likely to include the attributes of *attributing to the original author* (80.6%) and *being easy to edit, adapt or modify* (51.6%) in their OER concept. Less than half of the *high* respondents would include the attribute of *being easy to combine with other materials* (45.2%), 51.6% would include *being possible to combine with other materials*, and 51.6% would include *being easy to edit, adapt or modify* (see Figure 37).

Although there was no significant correlation between the inclusion of these attributes in their OER concept and the participants' level of confidence, all the correlation scores were negative, except for *being possible to edit, adapt or modify*, *being possible to combine with other materials*, and *including some license*, as can be seen in the first Pearson Correlation row of Table 11. The negative correlations mean that the higher the participants' level of confidence, the less the probability of including these attributes in their OER concept. We know that different authors present different and sometimes divergent concepts of OER. However, future research should investigate why these participants felt highly confident in their answers and did not include key attributes in their OER concept.

		Level of confidence	available for free	must attribute to the original author	can be shared and redistributed	can be edited, adapted or modified	can be combined with other materials	must include some license	easy to edit, adapt or modify	easy to combine with other materials
Level of confidence	Pearson Correlation	1	-.069	-.053	-.083	.015	.019	.013	-.004	-.034
	Sig. (2-tailed)		.515	.621	.439	.887	.857	.904	.968	.752
	N	91	91	90	90	90	89	88	89	89
available for free	Pearson Correlation	-.069	1	.176	.273**	.053	.181	.172	.015	.007
	Sig. (2-tailed)	.515		.095	.009	.615	.088	.108	.887	.949

	N	91	92	91	91	91	90	89	90	90
must attribute to the original author	Pearson Correlation	-.053	.176	1	-.038	-.060	.055	.160	-.047	.033
	Sig. (2-tailed)	.621	.095		.719	.574	.604	.135	.658	.754
	N	90	91	91	91	91	90	89	90	90
can be shared and redistributed	Pearson Correlation	-.083	.273**	-.038	1	.251*	.191	.197	.230*	.129
	Sig. (2-tailed)	.439	.009	.719		.016	.071	.065	.030	.225
	N	90	91	91	91	91	90	89	90	90
can be edited, adapted or modified	Pearson Correlation	.015	.053	-.060	.251*	1	.254*	.271*	.634**	.205
	Sig. (2-tailed)	.887	.615	.574	.016		.016	.010	<.001	.053
	N	90	91	91	91	91	90	89	90	90
can be combined with other materials	Pearson Correlation	.019	.181	.055	.191	.254*	1	.083	.316**	.536**
	Sig. (2-tailed)	.857	.088	.604	.071	.016		.437	.003	<.001
	N	89	90	90	90	90	90	89	89	90
must include some license	Pearson Correlation	.013	.172	.160	.197	.271*	.083	1	.174	.143
	Sig. (2-tailed)	.904	.108	.135	.065	.010	.437		.105	.180
	N	88	89	89	89	89	89	89	88	89
easy to edit, adapt or modify	Pearson Correlation	-.004	.015	-.047	.230*	.634**	.316**	.174	1	.465**
	Sig. (2-tailed)	.968	.887	.658	.030	<.001	.003	.105		<.001
	N	89	90	90	90	90	89	88	90	89
easy to combine with other materials	Pearson Correlation	-.034	.007	.033	.129	.205	.536**	.143	.465**	1
	Sig. (2-tailed)	.752	.949	.754	.225	.053	<.001	.180	<.001	
	N	89	90	90	90	90	90	89	89	90

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

**Table 10. Correlation between the level of confidence and the attributes**

There were also positive and significant correlations between the attributes, as can be visualized in Table 11. The participants who included the attribute of *being available for free* were also the ones who included *being possible to share and redistribute* ( $r(91) = .273$ ,  $p = .00$ ). The ones who included *being possible to edit, adapt or modify* were also the ones who included *being easy to edit, adapt or modify* ( $r(90) = .634$ ,  $p < .001$ ). The

participants who included *being possible to combine with other materials* were also the ones who included the attribute of *being easy to combine with other materials* ( $r(90) = .536, p < .001$ ) and *being easy to edit, adapt or modify* ( $r(89) = .316, p = .00$ ). Finally, the ones who included the attribute of *being easy to edit, adapt or modify* were also the ones who included the attribute of *being easy to combine with other materials* ( $r(89) = .465, p < .001$ ).

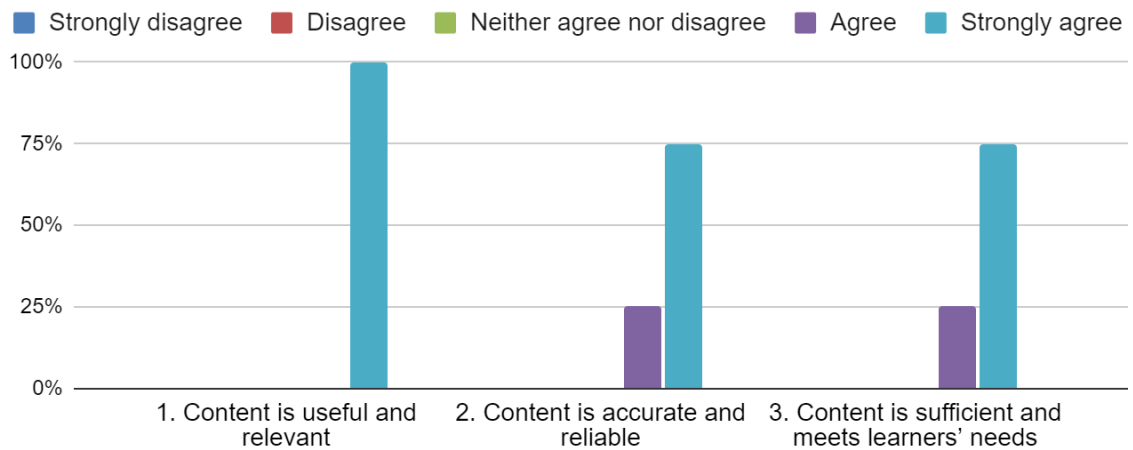
## **4.2 Second phase: formative evaluation**

The prototype about DBR went through three cycles of formative evaluation and this section presents the results of these iterations. Cycle 1 was the validation of the scientific content by experts in the area of research methods and/or DBR. Cycle 2 was the evaluation of the prototype through two workshops about the creation of OER with HP5. And Cycle 3 was the evaluation of the prototype through six workshops about DBR (see Table 5 in subsection 3.3.2 to review the details of these three cycles of formative evaluation).

### **4.2.1 Cycle 1: validation of the scientific content**

In Cycle 1 of the formative evaluation, the scientific content of the prototype was validated by four experts in research methods and/or DBR to verify if the content was appropriate to the learning of DBR in the context of doctoral education in TEL. The first version of the prototype can be visualized here: <https://h5p.org/node/1265482>.

The form was divided into five sections according to the pages of the prototype, which was an interactive book, to facilitate this evaluation. Results of the first section, which covered the two first pages - the introduction, definitions, and terminology, reveal that the four experts (100%) strongly agreed that the content was useful and relevant. Three of them (75%) strongly agreed and one (25%) agreed that the content was also accurate and reliable, sufficient and met learners' needs, as can be seen in Figure 38.

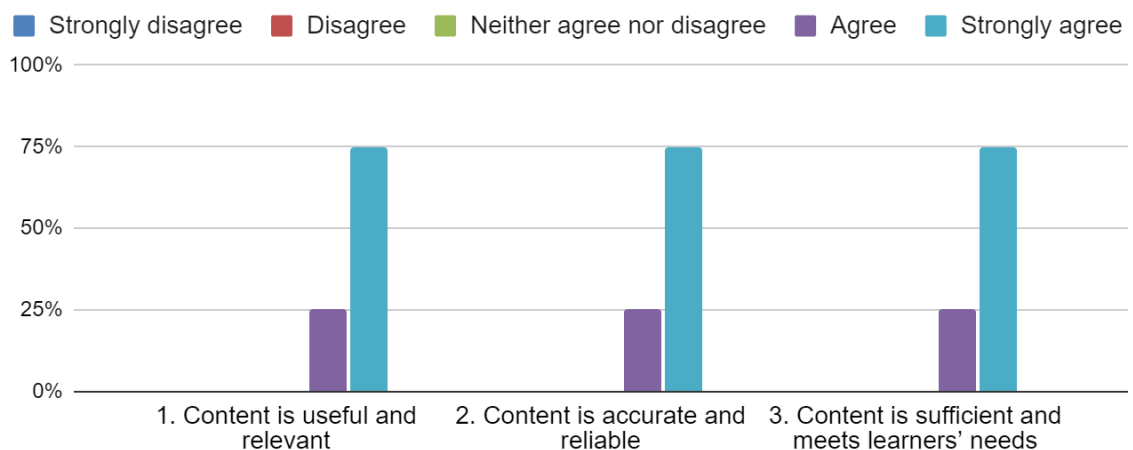


**Figure 38. Content validation of the first section (pages 1 and 2)**

One expert made a comment about the relevance of the information on DBR included in the prototype and praised the way the content was organized:

*“Extensive, pertinent, and current literature review (which allows users access to accurate, reliable and systematized information on DBR). The information is presented in a very clear and accessible way. I would like to emphasize the importance of presenting the various DBR terminologies found in the reference literature. This terminological diversity is always a source of confusion and recognizing it allows for a more in-depth knowledge on DBR but also a better understanding of the knowledge-construction in the field of research methodologies.” (Expert 3)*

Results of the second section of the form, which encompassed pages 3 and 4 - research functions, research designs, and research question, show that three experts (75%) strongly agreed and one (25%) agreed that the content was useful and relevant, accurate and reliable, sufficient and met learners’ needs, as can be seen in Figure 39.



**Figure 39. Content validation of the second section (pages 3 and 4)**

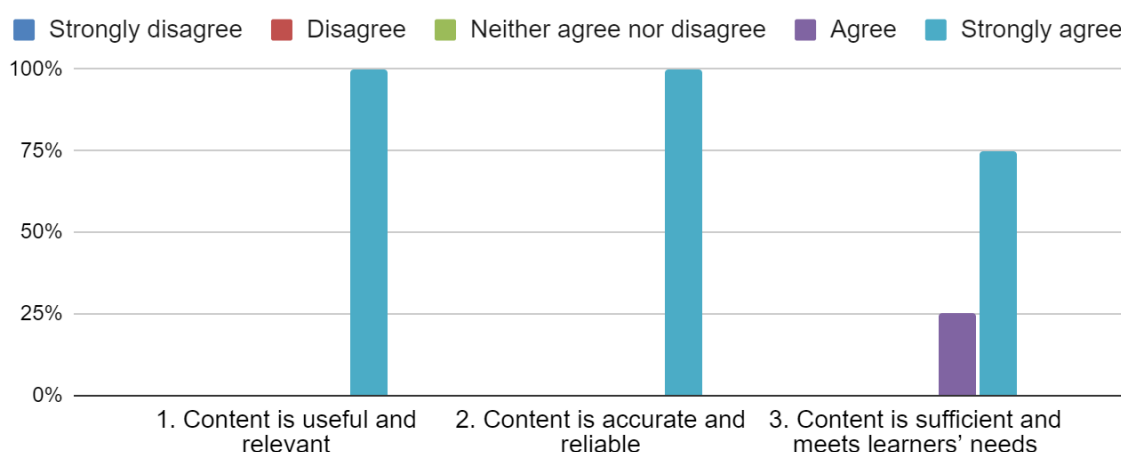
Although she/he had agreed that the content about research functions, research designs, and research question was useful and relevant, Expert 2 mentioned that the part about *research functions* was not very useful and could be confusing:

*“In my opinion, the item about "research functions" is not so useful for learning about DBR. It can be quite confusing.”* (Expert 2)

Another expert highlighted the challenge faced by researchers when constructing the research question:

*“I find the support offered to users in the construction of a research question very interesting. It is always a great challenge and a difficulty felt by most researchers. And, although the sequence problem - research question - choice of research design is presented, I am afraid that this guidance might tempt researchers to reverse the sequence (choice of research design - research question). It's a comment just for reflection...”* (Expert 3)

Regarding section 3 of the form and the validation of pages 5 and 6 - cycles, phases, and main activities in each phase, all the experts (100%) strongly agreed that the content was useful and relevant, accurate and reliable. Three of them (75%) strongly agreed and one (25%) agreed that the content was sufficient and met learners' needs (See Figure 40).



**Figure 40. Content validation of the third section (pages 5 and 6)**

One expert suggested including an activity related to qualitative, quantitative, and mixed methods, that can be used in the evaluation phase. This expert also recommended adding the page number of the images that were referenced as examples of models by different authors on page 5:

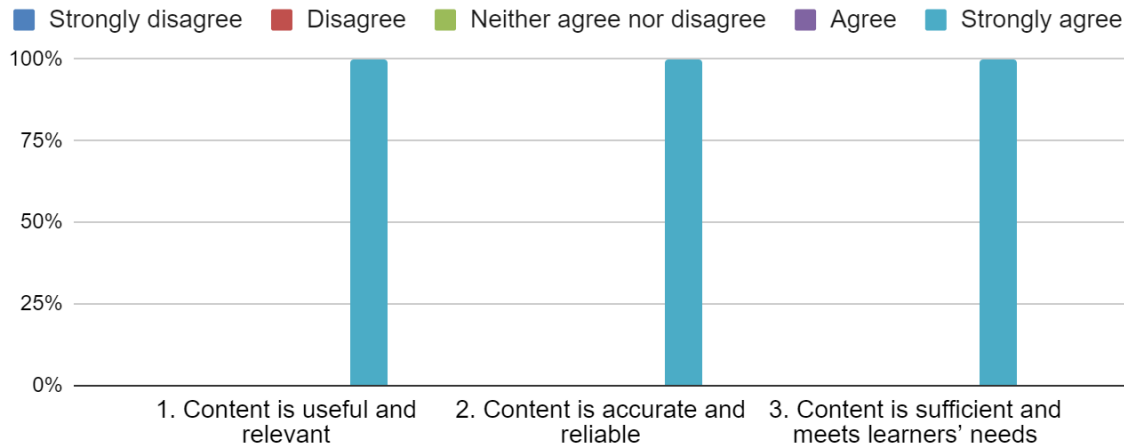
*“I feel the need of some activity (based on different DBR studies) that would show the students the kind of methodologies that are possible to use in the evaluation phase: qualitative, quantitative, and mixed. Please, introduce the page number in the references of the images.”* (Expert 2)

Another expert recommended using videos or infographics to present the cycles, phases, and main activities of each DBR phase:



*“Perhaps due to the limitation of the platform used, it would be advantageous to use a video or infographic in this part.” (Expert 4)*

All four experts (100%) strongly agreed that the content from page 7, about the characteristics of the DBR, was useful and relevant, accurate and reliable, sufficient and met learners’ needs (See Figure 41).



**Figure 41. Content validation of the fourth section (page 7)**

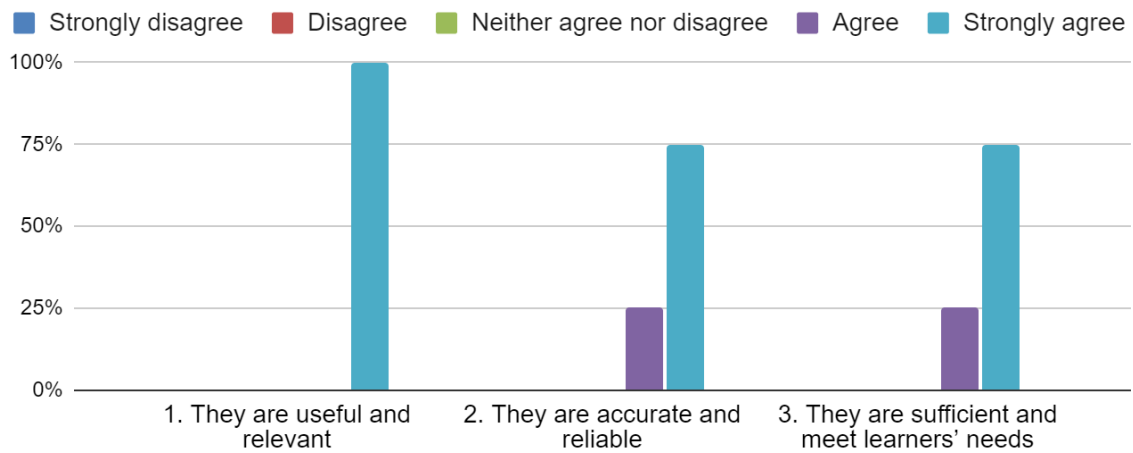
There were two comments on the Generic Design Research Model. One expert would like to see an activity that would instruct the students to explore this model:

*“I would like to have some kind of activity that would guide the students through the exploration of the Generic Design Research Model.” (Expert 2)*

Still about the Generic Design Research Model, another expert mentioned the interesting way in which the information is synthesized in this model:

*“The presentation of the Generic Design Research Model is particularly interesting as it allows relating research to practice in a synthesis scheme that can serve as an organizer for each user (for each research). I consider that the most interesting thing about this tool is its usefulness, not being just another theoretical presentation organized in an appealing way.” (Expert 3)*

Finally, regarding the reading recommendations and references on pages 8 and 9, and throughout the interactive book, all four experts (100%) strongly agreed that the content was useful and relevant. Three (75%) strongly agreed and one (25%) agreed that the content was accurate and reliable, sufficient and met learners’ needs, as can be seen in Figure 42.



**Figure 42. Content validation of the fifth section (all pages, pages 8 and 9)**

When asked if they had additional comments about the first version of the prototype, one said that this material was useful and well organized, and recommended doing the same systematization to other research methods:

*“Extremely well organized and useful tool. It’s very interesting the idea of “offering” the same type of systematization and guidance for various research methods. There is a lot of need for this kind of tools. Congratulations on the work developed so far.” (Expert 3)*

#### 4.2.1.1 Changes from Cycle 1

Since the scientific content was successfully validated with just some recommended minor corrections (Cycle 1), and the first workshop of Cycle 2 was happening in the same month as this scientific content validation, we decided not to change anything in the first version of the prototype between Cycle 1 and Cycle 2. We made some changes in the content after analysing the results of Cycle 1 together with the results of the first workshop of Cycle 2 (see Table 12).

	What?	When?	Where?	How many?
<b>Cycle 1</b>	Validation of the scientific content	May 2022	Survey via e-mail	4 experts in research methods / DBR
		26 May 2022	EA-TEL Summer School (Greece)	6 participants
<b>Cycle 2</b>	H5P + OER Workshop	June/July	changes from Cycle 1 and first workshop of Cycle 2	
		23 September 2022	EC-TEL (France)	2 participants
		October	changes from the second workshop of Cycle 2	

<b>Cycle 3</b>	DBR Workshop	17 November 2022	Master's program in Audio-visual Communication for New Media (Portugal)	15 participants
		22 November 2022	Master's program in Communication and Web Technologies (Portugal)	14 participants
		23 November 2022	Master's program in Digital Game Development (Portugal)	7 participants
		23 November 2022	By Students for Students Program (Portugal)	4 participants
		9 December 2022	PhD course in New Media (Portugal)	2 participants
		12 December 2022	PhD course in Multimedia in Education (Portugal)	6 participants
		January	changes from Cycle 3	

**Table 11. Cycles and changes in the prototype**

#### 4.2.2 Cycle 2: H5P + OER workshop (first workshop)

The first workshop of Cycle 2 was held in May, during EA-TEL Summer School 2022, in Greece. It had 16 participants but only six answered the survey about the first version of the prototype, which can be visualized in the following link: <https://h5p.org/node/1265482>. Only six could answer the survey because not all of them were in possession of their computers during the workshop.

According to the UEQ data analysis tool, mean values between -0.8 and 0.8 represent a more or less neutral evaluation, values higher than 0.8 represent a positive evaluation, and values lower than -0.8 represent a negative evaluation. As can be seen in Table 13, all the scales achieved a positive evaluation and the highest scales were attractiveness ( $m = 2.03$ ), efficiency (2.00), perspicuity ( $m = 1.91$ ), and stimulation ( $m = 1.91$ ). The scales with the lowest mean values, although still positive, were novelty ( $m = 1.54$ ) and dependability ( $m = 1.29$ ), which refers to the resource being creative and the participants feeling in control of the interactions in this resource, respectively.

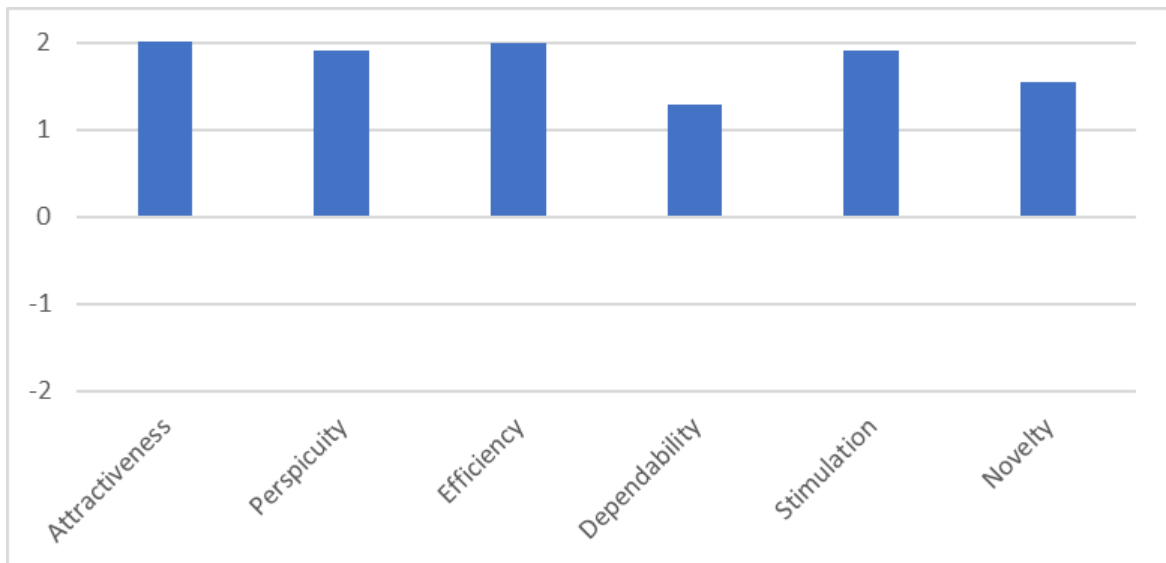
UEQ Scales	Mean	Variance
Attractiveness	2.03	0.63
Perspicuity	1.92	1.37

Efficiency	2.00	1.45
Dependability	1.29	0.74
Stimulation	1.92	0.67
Novelty	1.54	1.29

**Table 12. UEQ Scales and values (Cycle 2, first workshop)**

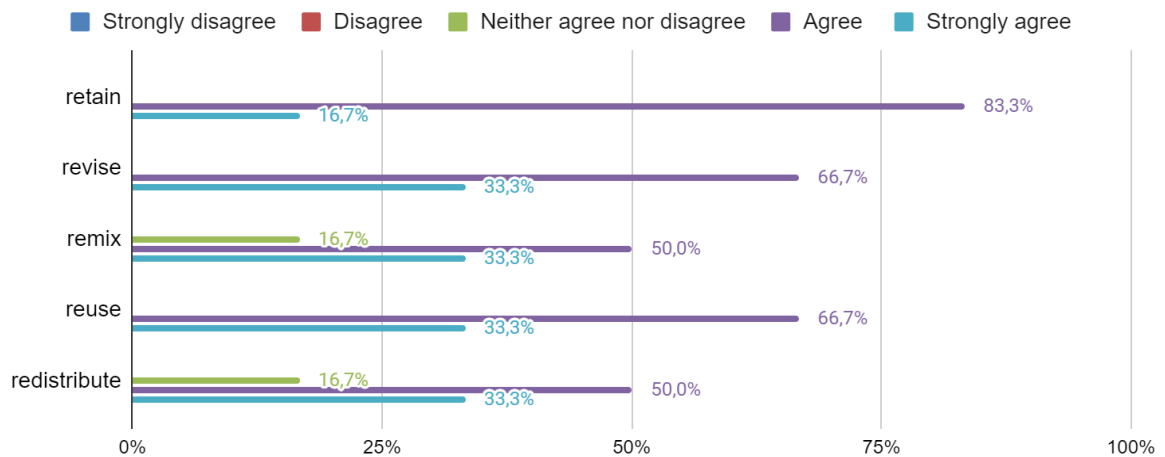
Attractiveness, stimulation, and dependability were the scales with the lowest variance values (var = 0.63; var = 0.67; var = 0.74, respectively), which means that the answers were nearer the mean value, that is, the participants had similar opinions. On the other hand, efficiency, perspicuity, and novelty had the highest variance values (var = 1.45; var = 1.37; var = 1.29, respectively) with the participants possessing more divergent opinions about these scales.

On a scale range of -3 to +3, a quite good value of +1.5 does not look so positive. For this reason, we chose to use a figure with the reduced scale -2 to +2 to communicate these results, as suggested in the UEQ data analysis tool (Figure 43).



**Figure 43. UEQ scales (Cycle 2, first workshop)**

When asked if it was possible to engage with the material through the 5R activities, five participants (83.3%) agreed and one (16.7%) strongly agreed that it was possible to retain the content; four participants (66.7%) agreed and two (33.3%) strongly agreed that it was possible to revise and reuse it; and three (50%) agreed, two (33.3%) strongly agreed, and one (16.7%) neither agreed nor disagreed that it was possible to remix or redistribute the content, as can be seen in Figure 44.



**Figure 44. The prototype and the 5R activities (Cycle 2, first workshop)**

This first workshop was about the creation of OER with H5P and these results may indicate that the tool used in the development of this first prototype, H5P, enables users to interact with the material and engage through the 5R activities.

When asked what they liked the most about the resource, two participants mentioned the structure and organization of the content:

*“Clear structure, clear objectives”* (Participant 1)

*“The contents are well organized and easy to navigate.”* (Participant 5)

Two other participants cited that the tool was easy to use and one of them considered it a very interesting way to apply information technology tools in the classroom:

*“It is something I didn't expected. So intuitive and easy to use and it allows me to apply IT tools in the classroom. For me it is a really interesting tool.”* (Participant 2)

*“Easy to use. Lots of possibilities. Easy to share (not sure yet if easy to integrate in other tools but it seems yes)”* (Participant 3)

When asked what they liked the least about the resource, one of the participants said that the content was very text-based and another one pointed out that the table, probably the one on page 6, was not displaying appropriately on the screen:

*“Very much text-based”* (Participant 1)

*“The table is not displayed properly on the small screen.”* (Participant 5)

Another mentioned a technical problem faced when requested to share the created content. This participant also mentioned a drawback of H5P, which was the difficulty in finding other resources created with this tool:

*"I didn't know how to share the link (at the end, it was just copy and paste). I couldn't find other sources easily because I always found the space to create but not the other resources published."* (Participant 3)

Finally, the participants were asked if they had any suggestions for improvements. One participant recommended that the material could have other kinds of multimedia content. This participant was the same one that thought that the material was very text-based.

*"Further additions of multimedia allowing different levels to perceive the DBR learning content"* (Participant 1)

Another participant said that it would be interesting to see the revisions of the material and visualize what was modified or included. This participant would also like to make comments on other resources and see all the answers submitted by the users. These suggestions are related to H5P itself, and therefore they are not about the content of the prototype about DBR.

*"I would like to see the versions other users create from mine version to see how they modified, what do they include, etc... I would like to add comments in other resources, Is it possible in the forum? I would like to see the summary of all the responses users submitted to my activities or information about the usage, etc...."* (Participant 3)

With this feedback and the feedback from Cycle 1, some modifications were carried out in the first version of the prototype (see Appendix K to visualize all the answers from the open-ended questions).

#### **4.2.2.1 Changes from Cycle 1 and Cycle 2 (first workshop)**

Considering the opinion of Expert 2, who said that the section about research functions was not useful for learning DBR and, thus, could be quite confusing, we decided to insert some introductory paragraphs on page 3 to facilitate understanding and avoid confusion.

We added the title "Research functions and research approaches" and a small introductory paragraph before the section "Research functions". After the matching exercise about research functions, we added a paragraph explaining more details about research functions, as can be seen in Figure 45.

## Research functions and research approaches

Before detailing the meaning and the process related to DBR, it is important to position this kind of research as a research approach next to other research approaches in order to provide a better understanding.

### Research functions

Plomp (2013) affirms that, in general, various research functions can be identified and distinguished from each other, with each reflecting certain types of research questions.

**Match the research function to the correct exemplary research question:**

what is the achievement of Chinese grade 8 pupils in mathematics?; what barriers to students' experience in the learning of mathematical modelling?

what are the differences and similarities between the Chinese and the Netherlands curriculum for primary education?; what is the achievement in mathematics of Chinese grade 8 pupils as compared to that in certain other countries?

how well does a program function in terms of competences of graduates?; what are the strengths and weaknesses of a certain approach?

what are the causes of poor performance in mathematics (i.e. in search of a 'theory' predicting a phenomenon when certain conditions or characteristics are met)?

what are the characteristics of an effective teaching and learning strategy aimed at acquiring certain learning outcomes?

to compare

to describe

to design and develop

to evaluate

to explain or to predict

Various research functions can be applied in a research project. For instance, if a research project wants to design and develop a certain strategy to improve a learning outcome, the researchers may first want to explain or to describe the main barriers faced by the students. Besides, after the intervention, it is important to evaluate the strategy to determine if it is effective or not. Usually, a research project has a primary research function and can have other research functions that can be applied to support the primary research function.

**Figure 45. Changes on page 3: introduction and research functions**

We changed the terminology from “research design” to “research approaches” to fit the terminology used in the bibliography and also added some sentences to introduce the research approaches. After the explanation of the research approaches and presentation of some examples, and before the reflective activity, a paragraph concluding this part was added (see Figure 46):

## Research approaches

In research methodology, there are a number of research approaches or strategies that can be used. Each research approach or strategy can be used for realizing more than one research function. Examples of research approaches and their possible research functions are:

- *Survey*: to describe, to compare, to evaluate
- *Case studies*: to describe, to compare, to explain
- *Experiments*: to explain, to compare
- *Action research*: to design/develop a solution to a practical problem
- *Ethnography*: to describe, to explain
- *Correlational research*: to describe, to compare
- *Evaluation research*: to determine the effectiveness of a program

Textbooks on research methodology usually do not present and discuss design research, probably due to its recently emerging status and the fact that relatively small groups across several disciplines have been responsible for its development.

- *Design research*: to design and develop an intervention (such as programs, teaching-learning strategies and materials, products and systems) as a solution to a complex educational problem as well as to advance our knowledge about the characteristics of these interventions and the processes to design and develop them, or alternatively to design and develop educational interventions (about for example, learning processes, learning environments and the like) with the purpose to develop or validate theories.

Similar to the research functions, more than one research approach may have to be applied in a research project 'serving' the main research approach.

### Figure 46. Changes on page 3: research approaches

Expert 2 also recommended adding the page number of the models displayed on page 5, so we did it:

- Interactions of systematic design cycles (Plomp, 2013, p. 17)
- Refinement of problems, solutions, methods, and design principles (Reeves, 2006, p. 59)
- Display of the cascade-sea study (McKenney, 2001, p. 55)
- Generic model for conducting design research in education (McKenney & Reeves, 2012, p. 77)

Expert 4 suggested using a video or infographic to explain the cycles, phases, and main activities in each phase. Participant 5 reported the table on page 6 representing the main activities in each phase was not displaying properly. Considering these observations, we replaced the table on page 6 for three images describing each phase, (1) analysis/exploration, (2) design/construction, and (3) evaluation/reflection. Figure 47 shows the image from the first phase, analysis/exploration, as an example:



## Main activities in each phase

There are no one-size-fits-all steps for tackling different challenges in the context of DBR. There are, however, processes and activities which are often useful. We are going to briefly present you a repertoire so that you can select and use the most fitting approaches for your study.

Considering McKenney & Reeves's generic model, take a look at the main activities that can be conducted in the three main phases:

### 1st phase: analysis / exploration

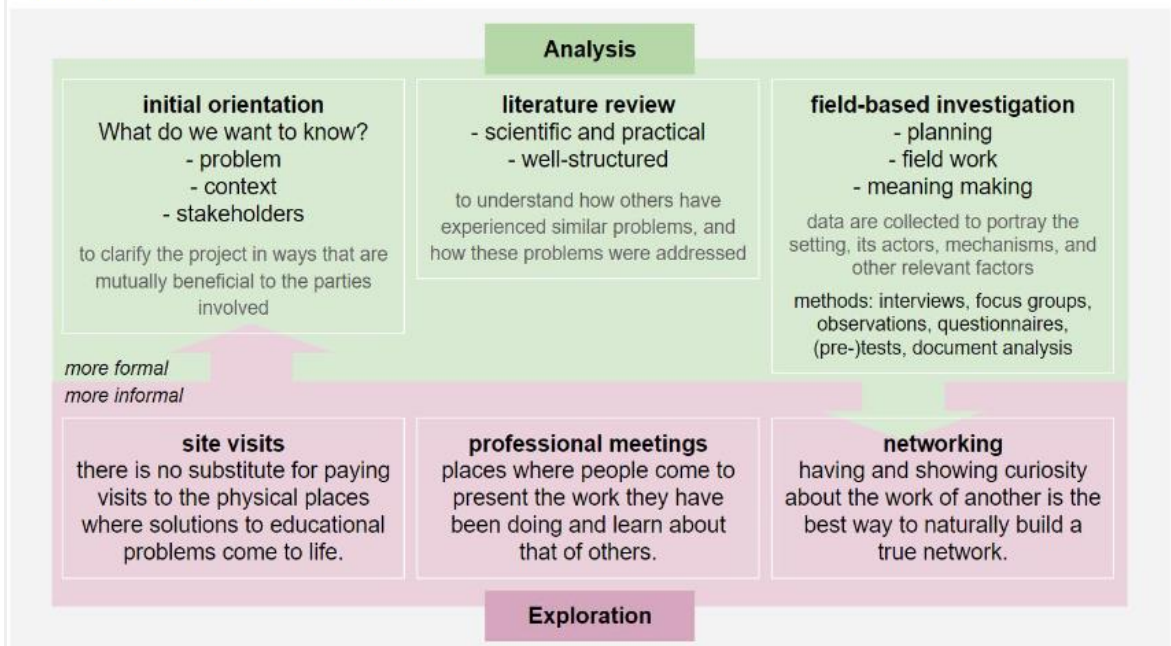


Figure 47. Changes on page 6: main activities in each phase

As the main activities in each phase were based on the generic model for conducting design research in education, by McKenney & Reeves (2012), an explanation about implementation and spread was added after the images explaining the three phases (Figure 48).

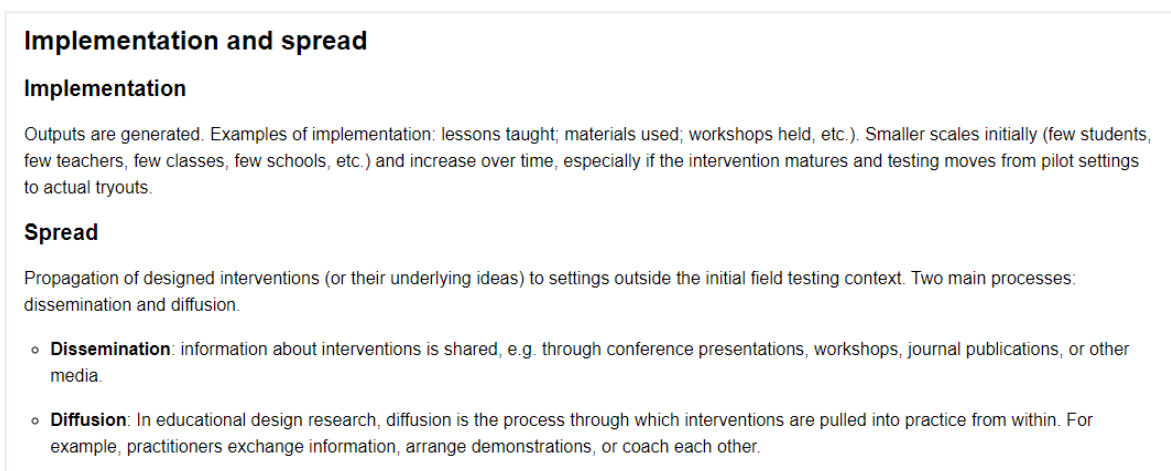


Figure 48. Changes on page 6: implementation and spread

Regarding the reflective activities, we numbered them and reformulated the text to make them more clear:

**REFLECTIVE ACTIVITY 1 (page 3)**

Think of some examples of problems from your context (or in the field of Education and Technology-enhanced Learning) and how you can design and develop an intervention as a solution. Remember, interventions can be programs, learning environments, teaching-learning materials, products, systems, etc.... Briefly, try to contextualize the problem and formulate a research question for this problem.

**REFLECTIVE ACTIVITY 2 (page 4)**

Option 1: Now, take a look at the research question that you formulated in the previous reflective activity (page 3) and try to revise it considering the structure presented above.

Option 2: If you are thinking of conducting Design-Based Research, think about the problem you want to address, the intervention you want to design and develop, and try to formulate your research question using the structure presented above.

**REFLECTIVE ACTIVITY 3 (page 6)**

Think about the activities you plan to develop in the main three phases:

1st phase: analysis / exploration

2nd phase: design / construction

3rd phase: evaluation / reflection

To compare the two versions of the prototype, visit <https://h5p.org/node/1265482> to see the first version, and visit <https://h5p.org/node/1294169> to see the second version.

**4.2.3 Cycle 2: Second H5P + OER workshop (second workshop)**

The second workshop of Cycle 2 was planned to be held in September, during EA-TEL Conference 2022 (EC-TEL), in France, but due to a flight cancellation of the workshop main organizer, it had to be held in an online format one week after the conference. It had four interested participants in the online format, but only two remained until the end of the workshop and answered the survey about the second version of the prototype, which can be visualized in the following link: <https://h5p.org/node/1294169>.

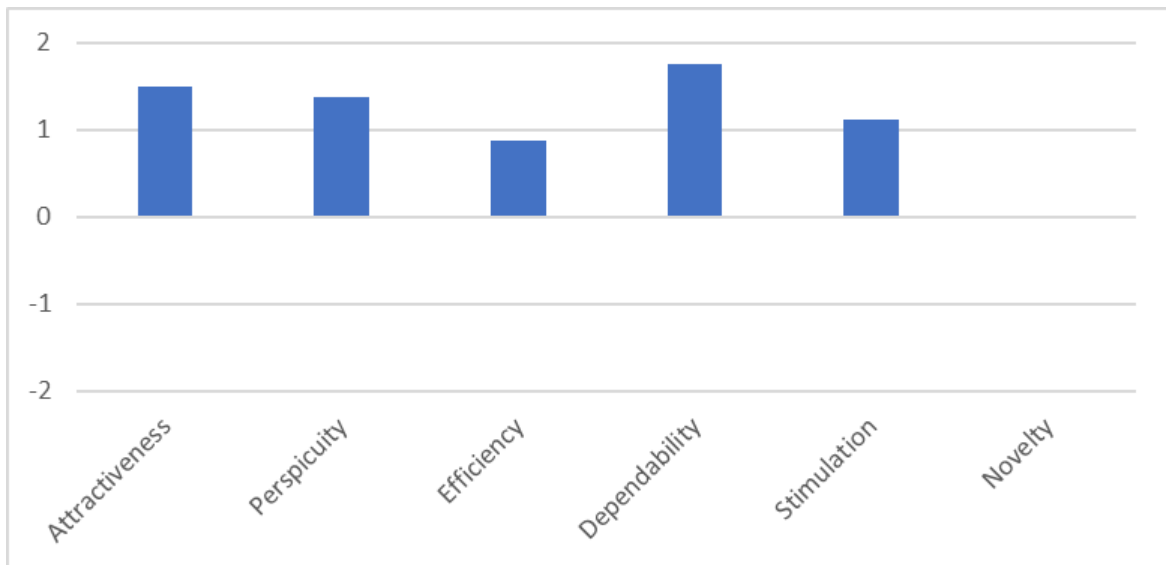
As can be seen in Table 14, all the scales had a positive evaluation, except novelty, which scored a neutral position ( $m = 0.00$ ). The scales from the highest to the lowest mean values were dependability ( $m = 1.75$ ), attractiveness ( $m = 1.50$ ), perspicuity ( $m = 1.37$ ), stimulation ( $m = 1.12$ ), and efficiency ( $m = 0.87$ ). These results reached lower mean values when compared to the first workshop, perhaps due to the number of participants which was only two. The variance value of all scales was almost 0, which means that the participants had similar answers (see Table 14).

UEQ Scales	Mean	Variance
------------	------	----------

Attractiveness	1.50	0.06
Perspicuity	1.37	0.28
Efficiency	0.87	0.03
Dependability	1.75	0.00
Stimulation	1.12	0.28
Novelty	0.00	0.50

**Table 13. UEQ Scales and values (Cycle 2, second workshop)**

As it was said before, we chose to use a figure with the reduced scale -2 to +2 to communicate these results (see Figure 49).



**Figure 49. UEQ scales (Cycle 2, second workshop)**

About the possibility of engaging with the material through the 5R activities, the two participants (100%) strongly agreed that it is possible to retain, revise, remix, reuse, and redistribute the content.

When asked to list the most positive aspects, that is, what they liked the most about the resource, the participants mentioned the visual and interactive elements:

*“It is very complete, and the diagrams, figures, and colors make it more attractive and engaging.”* (Participant 1)

*“Interactive elements”* (Participant 2)

Regarding the negative aspects, what they liked the least about the resource, one said it would be nice to be able to type answers directly into the content. The other pointed out

the need for more feedback, some spelling corrections, and interactive elements on the reflective activities:

*“It would be very nice to type answers directly”* (Participant 1)

*“Need more feedback after the exercises, still spelling errors around. Need for interactive elements on reflection exercises.”* (Participant 2)

When asked to suggest desirable additions or modifications to the resource, one cited videos where people could present their studies and the addition of more examples of research questions.

*“I would add videos where people quickly present their DBR studies (e.g., tell your PhD in 3-minutes competition). I would add more examples of Research Questions”* (Participant 1)

The other participant, again, mentioned the need for more feedback, some spelling corrections, and interactive elements on the reflective activities, repeating the same comment from the negative aspects.

*“Need more feedback after the exercises, still spelling errors around. Need for interactive elements on reflection exercises.”* (Participant 2)

They also mentioned, in an informal conversation at the end of the workshop, that it would be interesting to add more examples of research questions of other methods to compare to DBR. They added that they would like to have feedback explaining why the incorrect alternatives in the exercise about research questions, for example, were wrong, and recommended checking if the reflective activities presented a step-by-step route to plan the methodology. That is, to see if in the end the students would have their planning ready.

They also mentioned some limitations related to H5P, which were the submission of answers to open-ended questions and the automatic insertion of CC licenses in the content.

Considering this feedback, some modifications were made to the second version of the prototype and are presented in the next subsection (see Appendix L to visualize all the answers from the open-ended questions).

#### **4.2.3.1 Changes from Cycle 2 (second workshop)**

Participant 1 suggested that more examples of research questions should be added. More three examples were added, including one example that had a slightly different structure but with the same meaning (see Figure 50).

## The overall research question in DBR

Here we have some examples of research question structures that might help you when elaborating yours, in case you are going to conduct research using DBR as the research method.

- *What are the characteristics of an intervention X for the purpose/outcome Y in context Z?* (Plomp, 2013)
- *What are the characteristics of an effective teaching and learning strategy aimed at acquiring certain learning outcomes in a certain context?*

Examples of research questions using the structure above are:

- *What are the characteristics of an intervention for promoting academic research writing which will best support graduates in education in the proposal stage of their research?* (Dowse & Howie, 2013)
- *What are the characteristics of micro-scale chemistry curriculum materials so that they contribute to the implementation of effective practical work in chemistry teaching in Tanzania schools?* (Mafumiko, Voogt, & van den Akker, 2013)
- *What are the characteristics of an effective programme for second language teachers through which they develop the ability to apply student-centred pedagogical methods?*
- *What are the characteristics of a curriculum that facilitates the implementation of laboratory activities in chemistry education?*

Although not all the research questions use this type of phrasing, the wording always implies a search for characteristics. Example:

- *What is an adequate learning and teaching strategy for genetics in upper secondary biology education in order to cope with the main difficulties in learning and teaching genetics, and to promote the acquisition of a meaningful and coherent understanding of hereditary phenomena?* (Knippels, 2002)

**Figure 50. Changes on page 4: examples of research question**

Participant 2 mentioned that the exercises needed more feedback. Thus, feedback was added to the research questions exercises on page 4, as can be seen in Figure 51.

**Please, check all the research questions that apply to DBR:**

- ✘ What are the differences and similarities between the UK and the USA curriculum for primary education? (-1)
 

main research function: to **compare** the UK and the USA curriculum for primary education (not to design and develop an intervention/strategy).
- ✘ What are the causes of poor performance in mathematics in public schools? (-1)
 

main research function: to **explain** or to **predict** the poor performance in mathematics in public schools (not to design and develop an intervention/strategy).
- ✔ What are the characteristics of a digital resource for teaching and learning mathematics in secondary schools? (+1)
 

main research function: to design and develop an intervention/strategy | digital resource (intervention/strategy) + teaching and learning mathematics (purpose) + secondary schools (context)
- ✘ How can Open Education Resources impact students' autonomy during the pandemic? (-1)
 

main research function: to **evaluate** the impact of Open Education Resources on students' autonomy during the pandemic (not to design and develop an intervention/strategy).
- ✘ What effect does daily use of social media have on the attention span of high school students? (-1)
 

main research function: to **evaluate** the effect of social media on high school students' attention span (not to design and develop an intervention/strategy).
- ✔ What is an adequate strategy for using communication technologies to engage students in face-to-face courses? (+1)
 

main research function: to design and develop an intervention/strategy | communication technologies (intervention/strategy) + to engage students (purpose) + face-to-face courses (context)
- ✘ What are the advantages and disadvantages of using communication technologies to engage students in face-to-face courses? (-1)
 

main research function: to **describe** the use of communication technologies to engage students in face-to-face courses (not to design and develop an intervention/strategy).
- ✔ What are the characteristics of an online course aimed at enhancing second language acquisition in higher education? (+1)
 

main research function: to design and develop an intervention/strategy | online course (intervention/strategy) + enhancing second language acquisition (purpose) + higher education (context)

**Figure 51. Changes on page 4: feedback on the research question exercise**

Participant 2 also cited that the content had some spelling errors, so we revised the whole text using the platform Grammarly<sup>21</sup> to correct not only spelling errors but also some grammar mistakes.

We also added some reading recommendations on page 8 after studying and reading more articles and books about design-based research to improve the prototype:

For more references and sources, please check chapter 6 *References and Sources on Educational Design Research* from the book *Educational design research: an Introduction* by Plomp and Nieveen (2013).

Plomp, T., & Nieveen, N. (2013). *Educational design research: an Introduction*. Enschede, the Netherlands: SLO.

To compare the two versions of the prototype, visit <https://h5p.org/node/1294169> to see the second version, and visit <https://h5p.org/node/1318149> to see the third version.

<sup>21</sup> An online writing assistant: <https://app.grammarly.com/>

#### 4.2.4 Cycle 3: DBR workshop

The workshops from Cycle 3, about DBR, were held in November and December 2022 at the University of Aveiro, Portugal (see Table 15). In total, 48 participants answered the survey about the third version of the prototype, which can be visualized in the following link: <https://h5p.org/node/1318149>.

	What?	When?	Where?	How many?
Cycle 3	DBR Workshop	17 November 2022	Master's program in Audio-visual Communication for New Media (Portugal)	15 participants
		22 November 2022	Master's program in Communication and Web Technologies (Portugal)	14 participants
		23 November 2022	Master's program in Digital Game Development (Portugal)	7 participants
		23 November 2022	By Students for Students Program (Portugal)	4 participants
		9 December 2022	PhD course in New Media (Portugal)	2 participants
		12 December 2022	PhD course in Multimedia in Education (Portugal)	6 participants

**Table 14. DBR workshops (Cycle 3)**

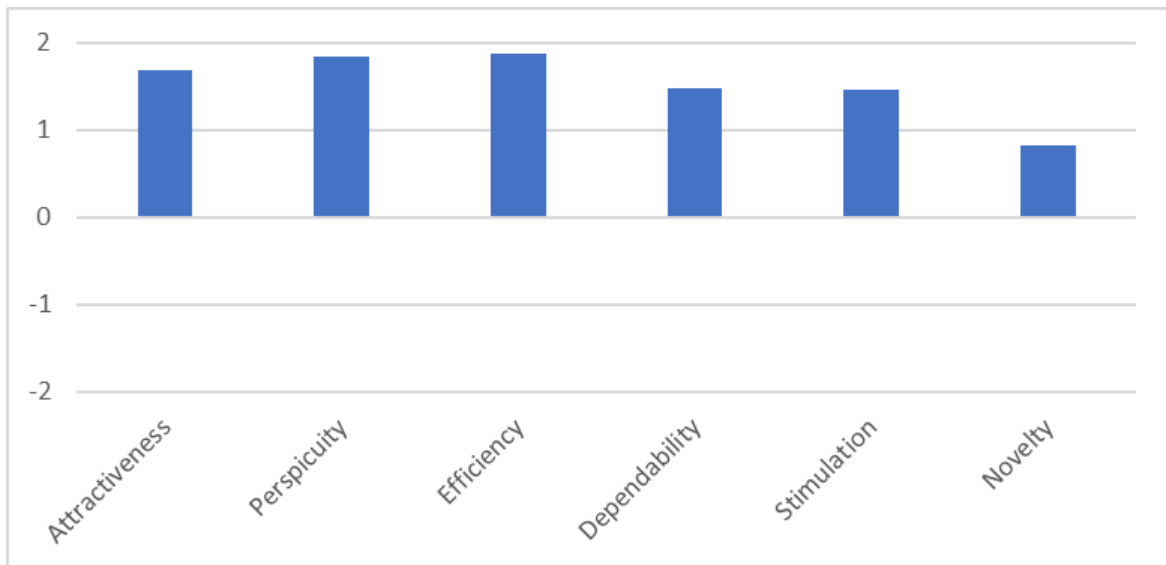
According to the UEQ data analysis tool, mean values higher than 0.8 represent a positive evaluation and, as can be seen in Table 16, all the scales achieved a positive evaluation. The scales with the highest mean values were efficiency ( $m = 1.87$ ), perspicuity ( $m = 1.84$ ), attractiveness ( $m = 1.68$ ), dependability ( $m = 1.47$ ), and stimulation ( $m = 1.47$ ). The scale with the lowest mean value was novelty ( $m = 0.82$ ), which refers to the resource being creative. The variance value of all scales was below 1, which means that the answers did not spread out a lot from the mean value. In other words, the participants had similar opinions.

UEQ Scales	Mean	Variance
Attractiveness	1.68	0.70
Perspicuity	1.84	0.79
Efficiency	1.87	0.49

Dependability	1.47	0.60
Stimulation	1.47	0.71
Novelty	0.82	0.86

**Table 15. UEQ Scales and values (Cycle 3)**

Figure 52 communicates these results with the reduced scale -2 to +2, as suggested in the UEQ data analysis tool.



**Figure 52. UEQ scales (Cycle 3)**

When asked what they liked the most about the resource, that is, what were the most positive aspects, 18 participants said that the content was helpful, well-organized, and easy to use and understand.

*“It’s very helpful; Easy to use; Organized”* (Participant 16)

*“Overall, it produces well structured information about DBR.”* (Participant 18)

*“Informative and well organized. A good tool to clarify and revise information about DBR.”* (Participant 34)

Two of them also mentioned the compilation of useful information in one place and the access to other references:

*“Easy to use and understand; Has all the information compiled”* (Participant 30)

*“It was a way to compile very valuable information in one place, while still having access to the references.”* (Participant 40)

Fifteen participants considered the interactivity in the exercises as the most positive aspect. Some of them also pointed out the feedback displayed in the exercises.



*"I liked the interactive aspect"* (Participant 8)

*"Information is organized; Explains very clear the subject; Even has little exercises, where if we chose the wrong answer, the same explains why that is the wrong answer"* (Participant 35)

*"I liked that the "exercises" come after the informative sections. I also liked the way that feedback of the answers was given."* (Participant 39)

Regarding the negative aspects or what they liked the least about the resource, ten participants expressed dissatisfaction with the visual aspect of the resource, such as the layout of the content:

*"Could be more dynamic."* (Participant 5)

*"Graphic layout"* (Participant 12)

*"The overall layout of the resource."* (Participant 21)

*"Aesthetic. Looks like an old site with very basic interactivity. Perhaps it helps to keep information clear and organized but doesn't make me want to use it."* (Participant 34)

*"It could be more aesthetically pleasing, with more color"* (Participant 40)

However, some of these criticisms were related to the limitations of the tool itself, as can be seen in these comments:

*"It should be able to go forward and back using the arrow keys or by swiping"*<sup>22</sup> (Participant 17)

*"The interface could be more user-friendly and up-to-date and more navigable [...]"*<sup>23</sup> (Participant 27)

About the desirable additions or modifications to the resource, ten participants suggested modifications related to the visual aspects of the resource and two of them recommended the addition of other types of content.

*"Sounds. Video. Motion Graphic."* (Participant 5)

*"The practical exercises could be more interesting, either visually and/or mechanically."* (participant 34)

*"Maybe include (I don't know if it is possible) some audiovisual media (videos, podcasts, something more interactive...). I think it would be more interesting"*<sup>24</sup> (Participant 47)

Although some suggestions could not be accomplished due to H5P limitations, in the next subsections we present the changes made after the analysis of these comments (see Appendix M to visualize all the answers from the open-ended questions).

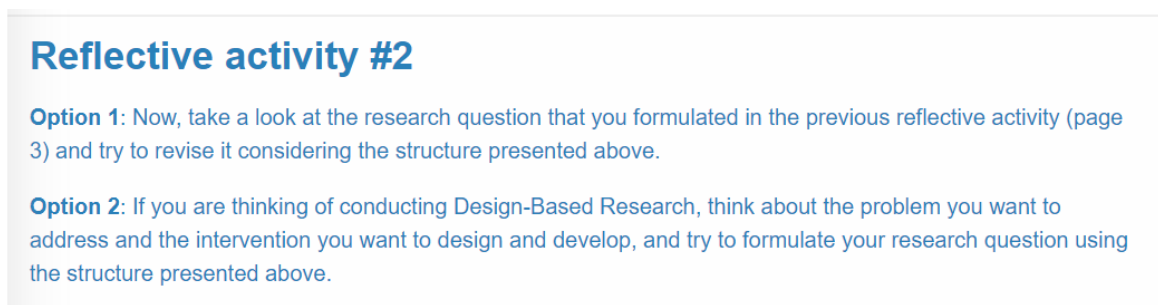
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<sup>22</sup> Translation from Portuguese: *"Devia dar para avançar e voltar pelas setas do teclado ou a fazer swipe."*

<sup>23</sup> Translation from Portuguese: *"A interface poderia ser mais amigável e atual e ser mais navegável [...]"*

#### 4.2.4.1 Changes from Cycle 3

Considering the comments related to the negative aspects of the resource, the suggestions for improvement, and the limitations of H5P itself, some changes were made in the third version of the prototype. We modified the text colour of the reflective activities (pages 3, 4, and 6) from black to blue in order to highlight and differentiate them from the rest of the text, as can be seen in Figure 53.



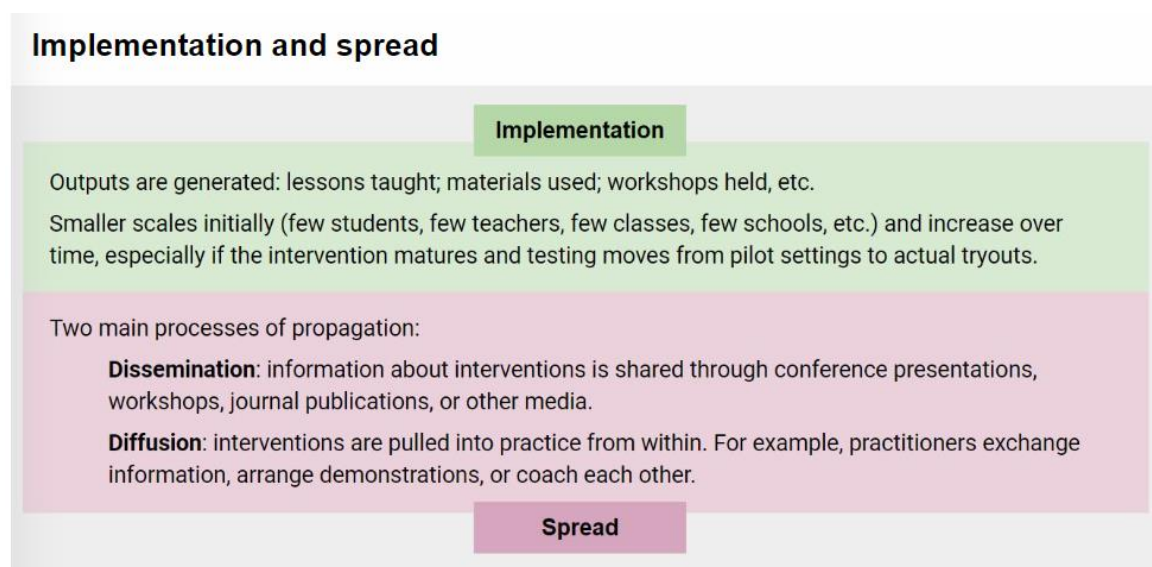
**Reflective activity #2**

**Option 1:** Now, take a look at the research question that you formulated in the previous reflective activity (page 3) and try to revise it considering the structure presented above.

**Option 2:** If you are thinking of conducting Design-Based Research, think about the problem you want to address and the intervention you want to design and develop, and try to formulate your research question using the structure presented above.

**Figure 53. Change of the text colour of reflective activities (pages 3, 4, and 6)**

In the section regarding the main activities in each phase (page 6), we changed the way the text about implementation and spread was organized. Instead of plain text, we improved the layout and followed the same style used to present the activities in the first, second, and third phases (Figure 54):



**Implementation and spread**

**Implementation**

Outputs are generated: lessons taught; materials used; workshops held, etc.

Smaller scales initially (few students, few teachers, few classes, few schools, etc.) and increase over time, especially if the intervention matures and testing moves from pilot settings to actual tryouts.

Two main processes of propagation:

- Dissemination:** information about interventions is shared through conference presentations, workshops, journal publications, or other media.
- Diffusion:** interventions are pulled into practice from within. For example, practitioners exchange information, arrange demonstrations, or coach each other.

**Spread**

**Figure 54. Main activities in each phase: implementation and spread (page 6)**

As some participants recommended the addition of other kinds of media, such as videos and sounds, we added the recording of a Spring Webinar that happened in 2021 as part

<sup>24</sup> Translation from Portuguese: “*Talvez incluir (não sei se é possível) alguns meios audiovisuais (vídeos, podcasts, algo mais interativo... ). Acho que ficaria mais interessante*”

of the project DE-TEL. The presentation introduced DBR in the area of TEL and this video is available on YouTube as an OER. Besides, we also attached a link to the slide presentation of this webinar into the prototype (Figure 55).

### Webinar: Introduction to Design-Based Research



Slides used in the webinar presentation: [link](#)

**Figure 55. Video and presentation from the DE-TEL Spring Webinar 2021**

#### 4.2.5 Other changes after the workshops

After the three cycles of formative evaluation, the prototype went through some general revisions. We changed the image on the cover of the interactive book, the H5P content type used to build the prototype (Figure 56), and the text on page 1 explaining the structure of the content. On page 1, instead of using the terminology *module*, we substituted for *content* and added the information about the video of the DE-TEL Spring Webinar that was introduced in the prototype.



**Figure 56. New cover of the interactive book**

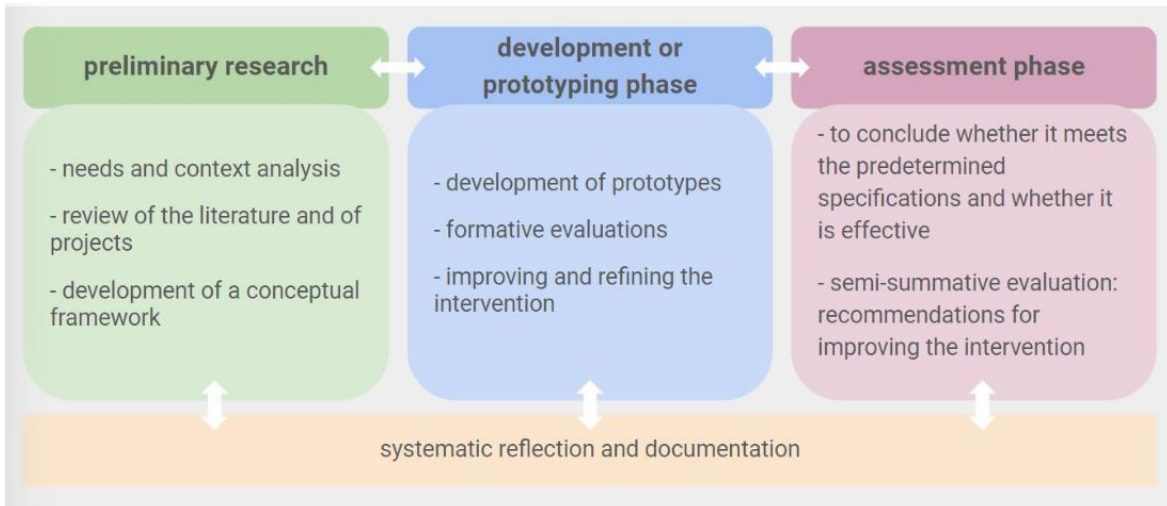
Still on page 1, we added the information about the CC license used in this content, which was the CC BY, and an explanation on how to reuse the resource in case anyone wants to retain, revise, remix, or reuse it (see Figure 57):



**Figure 57. CC license and reusing the content (page 1)**

We also corrected some misspellings as, for example, *Educational* in the fourth question of the research question exercise on page 4 and *strategy* in the sixth question.

On page 5, we changed the image at the end of the page that summarized the cycles and phases of the models presented by different authors. This image (Figure 58) was used in the workshops and gives a better visualization of the activities in each phase when compared to the previous image used in the third version of the prototype.



**Figure 58. Summary of the cycles and phases (page 5)**

Besides, we also made some minor changes in the content of the images on page 6 that present the main activities in each phase. After repeating the presentation of the main activities in each phase in six workshops, the information on the images was reviewed and summarized in order to be more concise and objective.

To conclude the modifications in the third version of the prototype, we changed the order of pages 6 (main activities in each phase) and 7 (characteristics and generic model) to follow the same order displayed by Plomp (2013) and by the presentation of the workshops.

To compare the two versions of the prototype, visit <https://h5p.org/node/1318149> to see the third version, and visit <https://h5p.org/node/1347661> to see the fourth version.

### 4.3 Third phase: results from the interviews

This section presents and discusses the results of the four interviews conducted in the third phase of this research, the semi-summative evaluation, and the last changes and adjustments carried out in the DBR prototype. The content of the interviews was categorized into three main themes: experience with research methods and DBR, prototype evaluation, and OER concept and application. Each theme, in turn, was divided into categories as can be visualized in Figure 59.

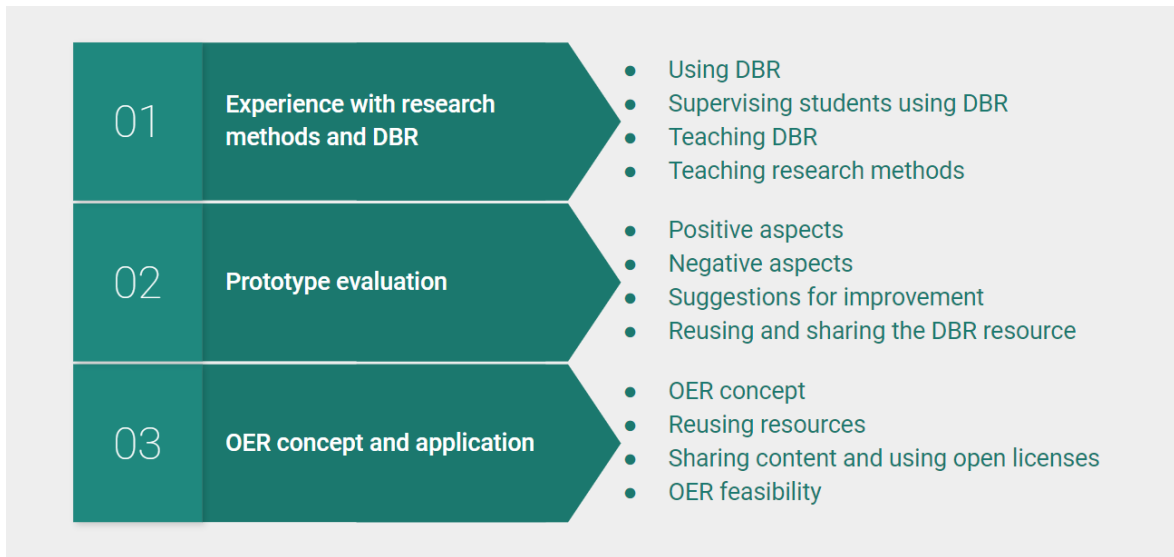


Figure 59. Themes and categories of the interviews analysis

### 4.3.1 Experience with research methods and DBR

Experts were asked about their experience with research methods and DBR and their answers were divided into four categories. Two experts said they used DBR in their doctoral thesis, four experts have supervised master's or doctoral students that used DBR, two have taught DBR, and three have taught research methods in general (see Table 19).

Theme	Code	Number of references
Experience with research methods and DBR	Using DBR in their research	2
	Supervising students that used DBR	4
	Teaching DBR	2
	Teaching research methods	3

Table 16. Experience with research methods and DBR

Regarding the first category, Experts 2 and 4 said that they worked with development research in their PhD.

*My PhD was in development research. I also did a PhD in multimedia in education and at the time we developed an educational resource that wasn't open, it was marketable, but then it became open, and at that time I applied multi-methods for development research as a case study.*<sup>25</sup> (Expert 2)

<sup>25</sup> Translated from Portuguese: *Meu doutoramento foi em investigação em desenvolvimento. Fiz doutoramento também em multimédia em educação e na altura desenvolvemos um recurso educativo não aberto, era comercializável, mas depois ficou aberto, e nessa altura apliquei multi-métodos para investigação em desenvolvimento como estudo de caso.*

*The methodology I used in my doctorate and the one I use the most in the type of work I do is development research.*<sup>26</sup> (Expert 4)

Concerning students' supervision, three of them reported supervising master's or PhD students that used DBR.

*I've supervised several projects. Several master's and doctorates studies. I'm now supervising two, three in fact, that use design-based research.*<sup>27</sup> (Expert 1)

*[...] yes, some of my doctoral students used it to develop their doctoral projects.*<sup>28</sup> (Expert 3)

*My students usually develop educational resources, so it's probably the methodology I use the most.*<sup>29</sup> (Expert 4)

Expert 2 supervised a PhD student that worked with DBR but in her/his thesis she/he defended it as action research.

*[...] the only student I worked with, even though he had defined or defended in his thesis that it was action research, I think that, with investigation, it might have been (elimination of sensitive content).*<sup>30</sup> (Expert 2)

With reference to the category of teaching DBR, Experts 1 and 2 said that they organized seminars about DBR and research methods in general.

*[...] especially in a session that I've been organizing precisely on design-based research and that I've also been organizing as part of the research methodology sessions, as part of the doctorate in technologies and education.*<sup>31</sup> (Expert 1)

*[...] I do a lot of seminars on research methodologies, some of which are very much geared towards the area of software development, the mobile parts, technologies...*<sup>32</sup> (Expert 2)

Experts 1 and 3 also mentioned teaching research methods in master's and doctoral courses.

*Yes, research methodologies as part of both the doctorate in Science Didactics and the*

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<sup>26</sup> Translated from Portuguese: *A metodologia que eu utilizei no meu doutoramento e é a que mais utilizo no tipo de trabalhos que oriento é a development research.*

<sup>27</sup> Translated from Portuguese: *Orientei vários trabalhos. Vários trabalhos de mestrado e também de doutorados. Estou precisamente a orientar agora dois, aliás, três que recorrem ao design-based research.*

<sup>28</sup> Translated from Portuguese: *[...] sim, alguns dos meus doutorandos utilizaram para desenvolver os seus projetos de doutoramento.*

<sup>29</sup> Translated from Portuguese: *Meus alunos normalmente desenvolvem recursos educacionais, por isso é provavelmente a metodologia que eu mais utilizo.*

<sup>30</sup> Translated from Portuguese: *[...] o único aluno que eu trabalhei com, apesar de ele ter definido ou defendido na tese que era investigação-ação, acho que com investigações realmente talvez fosse o (eliminação de conteúdo sensível).*

<sup>31</sup> Translated from Portuguese: *[...] principalmente numa sessão que eu tenho organizado precisamente sobre design-based research e que também tenho organizado no âmbito das sessões de metodologia de investigação, no âmbito do doutoramento em tecnologias e educação.*

<sup>32</sup> Translated from Portuguese: *[...] eu faço muitos seminários de metodologias de investigação, alguns muito orientados só para a área de desenvolvimento de software, as partes mobile, tecnologias...*

master's course in Innovation in Education.<sup>33</sup> (Expert 1)

And throughout my time as a researcher, I've been invited to teach research methodologies courses where the department where I also teach is responsible or collaborates in these doctoral programs. So, for a few years now, I've been teaching courses on research methodologies in education in the doctoral program in education and in the doctoral program in multimedia in education. I'm no longer teaching in the doctoral programs. And for two years I also taught a curricular unit (unintelligible text segment) for the master's courses, if not also the methodologies curricular unit.<sup>34</sup> (Expert 3)

### 4.3.2 Prototype evaluation

Experts were asked which were the most positive and negative aspects regarding the educational resource that was developed, which suggestions for improvement they had, and in which context they would like to reuse and share this DBR content. The positive and negative aspects as well as the suggestions for improvement were divided into three subcategories, named content, visual, and tool (see Table 18).

Theme	Code	Subcode	Number of references
Prototype evaluation	Positive aspects	content	4
		visual	0
		tool	0
	Negative aspects	content	0
		visual	2
		tool	2
	Suggestions for improvement	content	8
		visual	2
		tool	4

Table 17. Prototype evaluation

<sup>33</sup> Translated from Portuguese: *Sim, metodologias de investigação também no âmbito tanto do doutorado em Didática das Ciências como também no mestrado em Inovação em Educação.*

<sup>34</sup> Translated from Portuguese: *E ao longo do meu tempo enquanto investigadora fui convidada para lecionar as unidades curriculares de metodologias de investigação onde o departamento onde eu também leciono é responsável ou colabora nesses programas doutorais. E, portanto, de alguns anos para cá eu leciono, no programa doutoral em educação e no programa doutoral em multimédia em educação, as unidades curriculares de metodologias de investigação em educação. Atualmente já não estou a lecionar ao programa doutoral. E lectionei também durante dois anos uma unidade curricular (segmento de texto incompreensível) aos mestrados, senão também a unidade curricular de metodologias.*



#### 4.3.2.1 Positive aspects

Experts were asked which were the most positive aspects they saw in the OER prototype about DBR. All the answers were related to the content of the prototype.

Expert 1, for instance, said that the prototype summarized and encompassed the main aspects related to this research method. She/he also said that this prototype could work as a chapter about DBR, containing relevant and useful information and following a logical sequence for those who were preparing or conducting an investigation, or even studying this theme.

*Precisely the fact that it ends up summarizing, including everything that I consider to be the main aspects [...]. So I think that what you have here is not just a synthesis, I even believe that it's not just a synthesis. It goes much further, so it almost ends up functioning as a chapter on design-based research, with information that I consider relevant and useful, following precisely a logical sequence that ends up being a particularly logical sequence, I think, both for those who are preparing research, are carrying out research of this type, or for those who are studying the subject.<sup>35</sup> (Expert 1)*

Similarly, Expert 2 emphasized the structure of the prototype and the sequence that the information was presented in, which seemed to follow the structure of a traditional research project, explaining the phases of the DBR method.

*Look, it's its structure. I don't know if it follows the instructional design of content development, but it's the sequence you've laid out. From the definitions to the rationale. Because, in a way, it almost follows the structure of a traditional research project, doesn't it? [...] It follows the different phases of the methodology itself for those who use it.<sup>36</sup> (Expert 2)*

Expert 3 stated that what she/he liked the most was the usefulness and relevance of the prototype. She/he added that the theoretical systematization could help especially those who were at the beginning of their research path and that the references were very relevant. Another interesting aspect that she/he cited was the exercises, which suggested an application and reflection on the theoretical presentation.

*What I liked most was its usefulness and relevance. I think it's really useful and that's why it's relevant. I really liked the theoretical systematization, I think it's very helpful, and especially*

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<sup>35</sup> Translated from Portuguese: *Precisamente o fato de acabar por resumir, por incluir tudo aquilo que são o que eu considero ser os aspectos principais [...]. Logo eu acho que o que tem aqui é não só uma síntese, eu creio até inclusivamente que não se limita só a uma síntese. Tem, vai bastante mais além, logo acaba por quase como a funcionar como um capítulo sobre o design-based research, com informação que eu considero relevante e útil, seguindo precisamente uma sequência lógica que acaba por ser uma sequência particularmente lógica, acho que quer para quem está a preparar uma investigação, está a realizar uma investigação deste tipo, ou para quem está a estudar o tema.*

<sup>36</sup> Translated from Portuguese: *Olha, é a estrutura dele. Não sei se segue o design instrucional de desenvolvimento de conteúdos, mas é a sequência que vocês colocaram. Desde as definições à fundamentação. Porque ele, de alguma forma, quase segue a estrutura de um projeto de investigação tradicional, não é? [...] Ele segue bem diferentes fases da própria metodologia para quem a utilizar.*

looking now at those who are doing research, who are just starting out, this theoretical systematization is very interesting. [...] I also think it's very advantageous to have there, I don't want to say, it's not stored, but it's localized, let's say, the references I can take out and the ones I can get and this concern that they are in fact current, I think that's very good, very relevant. The part about the exercises, consulting what could be a more theoretical and systematized presentation of information with the part... because I think the exercises suggest reflection, and that's important. An application, isn't it? An application of what is being covered. I also found it very interesting.<sup>37</sup> (Expert 3)

Expert 4 also commented on the use of several important authors that approached the theme of DBR.

*The first thing I see is that Lorena knows several authors that I know. So one of the aspects that I think is important is to realize that you're familiar with the subject, right?*<sup>38</sup> (Expert 4)

#### 4.3.2.2 Negative aspects

Experts were also asked which the most negative aspects were related to the OER prototype about DBR. We had two mentions related to the visual aspect of the resource (graphical aspect) and two mentions related to the tool used to develop the prototype, pointing out the lack of interaction and the openness of the content.

Expert 2 said that the elements she/he liked the least were the design of the resource, such as the type of font and the organization of the information. She/he said that this resource deserved something more appealing regarding its graphical look and feel.

*What I liked least has to do with the design of the resource, it has to do with the font, it has to do with the contrasts and the font... It's more about the organization of the information than the content. [...] in my opinion, this resource deserves something more appealing from a graphic point of view.*<sup>39</sup> (Expert 2)

Expert 1 said that the lack of interaction was the main negative aspect of the prototype. Although there were some reflective activities throughout the prototype, she/he said that

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<sup>37</sup> Translated from Portuguese: *O que eu mais gostei foi de sua utilidade e relevância. Eu acho que é realmente útil e por isso é relevante. Gostei muito da sistematização teórica, acho que ajuda bastante e principalmente olhando agora para quem está a fazer investigação, não é, quem está a iniciar o seu percurso, essa sistematização teórica é muito interessante. [...] Acho também muito vantajoso ter ali um, eu não queria dizer, não é armazenado, mas é localizado, digamos assim, as referências que eu posso retirar e as que eu posso ir buscar e esta preocupação de que sejam de fato atuais, acho isso muito bom, muito relevante. A parte dos exercícios, de consultar aquilo que poderia ser uma apresentação mais teórica e sistematizada de informação com a parte... porque acho que os exercícios sugerem uma reflexão, e isso é importante. Uma aplicação, não é? Uma aplicação daquilo que está a ser abordado. Achei também um aspecto muito interessante.*

<sup>38</sup> Translated from Portuguese: *A primeira coisa que eu vejo é que a Lorena conhece, traz vários autores que eu conheço. Por isso, uns dos aspectos que me parecem importantes é perceber que está dentro do assunto, não é?*

<sup>39</sup> Translated from Portuguese: *O que eu menos gostei tem a ver com o design do recurso, tem a ver com o tipo de letra, tem a ver com os contrastes e tipo de letra... É mais com a organização da informação do que propriamente o conteúdo. [...] este recurso na minha opinião merece algo mais apelativo do ponto de vista do aspecto gráfico.*

these activities were individual and did not draw interaction. She/he also added that, despite the prototype achieving its objectives, she/he agreed that the graphic aspect could be more appealing.

*The lack of interaction is the main aspect, despite the fact that they've set up various activities. But they're individual activities, they're reflection activities, well, I think it's very good, I missed that interaction. [...] And maybe, I don't know if this is a criticism or not, I'm looking at the resource again. The resource is constructed in a way that, in a way, reminds me of pages, sections of a book. [...] So maybe the graphic aspect isn't the graphic aspect that I find most appealing, but it also fulfills the objectives quite well. But perhaps the graphic aspect could be slightly more appealing.<sup>40</sup> (Expert 1)*

Expert 3 discussed the openness of the material. She/he said that it was not necessarily a negative aspect, but if this resource was supposed to be used with experienced researchers, it would be interesting to have it open to discussion. If the resource was to be used with researchers who were developing an investigation and needed to have access to systematized information, this would not be a disadvantage. She/he suggested that this resource should be open in order to be fed and updated and not become obsolete.

*I'm not sure if that's a negative aspect, okay? Because it depends. For example, if the tool is for working, I don't know, with more experienced, more senior researchers, I think that being open to discussion would be interesting. [...] In the sense of a useful tool, while I am, as a researcher, on my way and want to use this and have to systematize the information, I'm not sure if this is a disadvantage, you know? I'd like it to be... not closed off so that it doesn't just depend on you, for example, so that it doesn't "die". Because if it depends on one person, if that person moves away, it ends up being a bit obsolete because it's no longer fed and I don't like to look at the methodology as something static, do you?<sup>41</sup> (Expert 3)*

#### **4.3.2.3 Suggestions for improving the DBR prototype**

Experts were asked if they had any suggestions for improving the content of the OER prototype and what they would revise, that is, what they would edit, adapt, or modify if they had the opportunity. These two questions were made in two different moments of the interview but to avoid repetition and also to better organize the results, we compiled the

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<sup>40</sup> Translated from Portuguese: *A falta de interação é o principal aspecto, apesar de terem, pronto, colocado as várias atividades. Mas são atividades individuais, são atividades de reflexão, bom, acho muito bem, senti falta dessa interação. [...] E talvez, não sei até que ponto é que isso possa ser uma crítica ou não, estou outra vez a olhar para o recurso. O recurso está construído de uma forma que, de certa forma, me lembra como páginas, seções de um livro. [...] Logo talvez o aspecto gráfico não seja o aspecto gráfico que eu considere mais apelativo, mas também cumpre perfeitamente os objetivos bastante bem. Mas talvez o aspecto gráfico pudesse ser ligeiramente mais apelativo.*

<sup>41</sup> Translated from Portuguese: *Eu não sei bem se isso é um aspecto negativo, tá bem? Porque depende. Por exemplo, se a ferramenta for para trabalhar, sei lá, com investigadores mais experientes, mais seniores, eu acho que essa parte de poder ser aberta à discussão era interessante. [...] No sentido de ferramenta útil, enquanto eu como investigadora, que estou no percurso e quero usar isto e tenho que ter toda uma sistematização da informação, eu não sei bem se isto era alguma desvantagem, sabe? Eu gostava era de ter... ela não ficasse fechada para não depender só de si por exemplo, pra não "morrer". Porque dada a altura depender de uma pessoa, se a pessoa se afasta, acaba por ficar um bocadinho obsoleta porque já não é alimentada e eu não gosto de olhar para a metodologia como algo estático, não é?*

answers in this section. There were eight suggestions regarding the content, two recommendations related to the visual aspect of the resource, and four related to the tool used to develop the prototype.

Regarding the content, Expert 1 recommended adding some scientific articles, dissertations, and theses in Portuguese, depending on the context that this resource was going to be applied to, so that students could have access to studies and research undertaken in Portugal, Brazil, and other countries that speak Portuguese as examples of the use of DBR.

*If it's part of a national program, it could be in Portugal, it could be in Brazil, I think something would have to be done to incorporate more, for example, articles in Portuguese, or dissertations, theses, according to DBR. [...] Perhaps a slight adaptation in terms of the materials that are offered for consultation. There are some here that aren't, we can't get away from these basic materials, but then in concrete situations, I think it would be nice for the people who are reading to identify more if they also saw work done in Portugal or Brazil and, well, in spaces, in contexts close to each of them.*<sup>42</sup> (Expert 1)

Experts 3 and 4 said that it would be interesting to include an explanation of how to design a good research question since a solid research question was essential to the successful development of a good research project. Expert 3 said that this was one of the most difficult topics in educational investigation and also the most challenging one.

*And perhaps I could make a suggestion, which is one of the most difficult issues to deal with in educational research and which I find most difficult in my classes with the students, which is the construction of research questions. [...] But it would be very interesting to think of a tool that can help with the different stages of constructing a solid research question and that also makes it possible to develop a good project. That would be spectacular.*<sup>43</sup> (Expert 3)

*One aspect that might be interesting once you get into the research question is how to design a research question. There are several examples of research questions here, but what makes a good research question? Because this is fundamental for me to design my research model.*<sup>44</sup> (Expert 4)

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<sup>42</sup> Translated from Portuguese: *Se for inserido num programa nacional, pode ser em Portugal, pode ser no Brasil, creio que teria que ser feito algo de forma a incorporar mais, por exemplo, ou artigos em língua portuguesa, ou dissertações, teses, segundo DBR. [...] Talvez uma ligeira adaptação em termos dos materiais que são propostos para consulta. Há alguns aqui que não há, não conseguimos fugir a esses materiais que são de base, mas depois já em situações concretas, aí creio que seria agradável para as pessoas que estão a ler se identificariam mais se vissem trabalhos também feitos em Portugal ou no Brasil e, pronto, em espaços, em contextos próximos a cada um deles.*

<sup>43</sup> Translated from Portuguese: *E talvez eu possa deixar uma sugestão, que é uma das questões mais difíceis de fazer em investigação em educação e que eu tenho mais dificuldades nas aulas com os alunos, que é a construção das questões de investigação. [...] Mas era muito interessante pensar-se numa ferramenta que consegue ajudar as diferentes fases de construção de uma questão de investigação sólida e que seja também possibilitadora do desenvolvimento de um bom projeto. Isso era espetacular.* (Expert 3)

<sup>44</sup> Translated from Portuguese: *Um aspecto que pode ser interessante uma vez que entra pela questão de investigação é como desenhar uma questão de investigação. Aqui tem vários exemplos de questões de investigação, mas o que é que faz uma boa questão de investigação? Porque isto é fundamental para eu desenhar o meu modelo de investigação.*

Although we presented in the DBR prototype the other terminologies used as synonyms, Expert 4 recommended explaining why we decided to call the content *design-based research* and not *development research*, since they were very similar and sometimes used as synonyms. In addition to it, Expert 4 suggested adding an explanation of how the different models of DBR differed from each other. The different models were different ways of designing an investigation and knowing their differences could help the researcher choose the model that better suited her/his investigation.

*From the point of view of what design-based research is, ok, it's here and it's called design-based research but it could also have been called development research or, for example, why did you call it design-based research? That question could also be asked. [...] Do you have an explanation here of how these various models are the same and how they differ? It could be interesting. [...] In other words, I have five different ways of designing my research. In which situations should I choose one or the other?<sup>45</sup> (Expert 4)*

Another suggestion by Expert 4 was the resource indicating different paths that a researcher could follow according to the problem she/he wanted to solve or the question she/he wanted to answer. Instead of just presenting the possibilities and the research method, the resource would work as a recommendation tool.

*Or if a student, for example, has this, this and this problem, which way can I go? I'd probably have a fantastic resource here for students to study and use in their research methodology classes, in their master's courses and doctorates. If you can make it not just "there's this, this and this", but "if I have this concern, the best way is, instead of looking for all this, is it this or this?" [...] If there are some ways you can point them out, I think a lot more people will want to use this resource.<sup>46</sup> (Expert 4)*

Experts 2 and 3 suggested extending this kind of resource to other research methods. Expert 3 said that it would be spectacular to access a platform where she/he could see content not only about DBR but also about other methods.

*The other extension would be to then validate this, extend it to other methods and techniques that could also be explored.<sup>47</sup> (Expert 2)*

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<sup>45</sup> Translated from Portuguese: *Do ponto de vista do que é o design-based research, ok, está aqui e isto chamou de design-based research mas podia ter chamado também de development research ou, por exemplo, por que é que chamou design-based research? Essa questão também se podia colocar. [...] Tem aqui em algum momento a explicação em que é que estes vários modelos são iguais e em que é que os vários modelos diferem? Poderia ser interessante. [...] Ou seja, eu tenho aqui cinco formas diferentes de desenhar a minha investigação. Em que situações é que eu devo escolher uma ou outra?*

<sup>46</sup> Translated from Portuguese: *Ou se um aluno, por exemplo, tiver esta, esta e este problema, qual é o caminho que eu posso seguir? Provavelmente teria aqui um recurso fantástico para os alunos estudarem e utilizarem nas aulas de metodologias de investigação, nos mestrados e nos doutoramentos. Se conseguir que não seja só "existe isto, isto e isto", mas "se eu tiver esta preocupação, o melhor caminho é, em vez de buscar isto tudo, é esta ou este?" [...] Se tiver aqui alguns caminhos que se possam indicar, acho que vai ter muito mais gente a querer utilizar este recurso.*

<sup>47</sup> Translated from Portuguese: *O outro alargamento seria depois validar isto, alargar a outros métodos e técnicas que pudessem também ser explorados.*

*I think it would be an interesting project to be able to extend, I don't know if I wrote it in the email at the time, but to be able to do the same as you did for other research methods because I think it would be spectacular. I could access a platform where I could go and look at DBR but I could also go and look at other things.<sup>48</sup> (Expert 3)*

Regarding the visual dimension, Experts 2 and 4 suggested turning the content more interactive and changing some texts to other formats. Expert 2, for example, recommended making some videos explaining the theoretical models and Expert 4 suggested creating quizzes to present the content that was in textual format. The graphical element was also mentioned as a negative aspect by Experts 1 and 2.

*What I would do differently is make it more interactive. [...] you could even make some video tutorials, if only to explain those theoretical models you have further on, without any voice, it could be almost just clicks.<sup>49</sup> (Expert 2)*

*I think that, from what I know of my students, if we could have more interactivity here, in other words, Lorena has concentrated a series of authors on a web page. [...] What could be interesting is that some of these texts could be in another format. [...] If Lorena has the opportunity, some of these, of what I see here in text, could help, perhaps with quizzes...<sup>50</sup> (Expert 4)*

Concerning the tool used, H5P, Expert 2 suggested having somehow attached another tool, like an HTML editor, that enabled taking notes and making comments on the material. These notes and comments could be downloaded, its content could be edited, references could be added, and, therefore, the student could retain the material to herself/himself.

*Yes, another improvement is that on each page I could have a personal log. [...] At the end I'd have a tool that would be a very simple HTML editor, where it would take notes on what I'm reading, almost like comments, personal notes. [...] And in the end I could have it, I could remove it easily. [...] The possibility of adjusting or adding references to my content and from there being able to turn it into something of my own in terms of using the content.<sup>51</sup> (Expert 2)*

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<sup>48</sup> Translated from Portuguese: *Eu acho que era um projeto interessante poder alargar, ou seja, eu não sei se escrevi no email na altura, mas poder fazer o mesmo que fez para outros métodos de investigação porque acho que era espetacular. Eu poder aceder a uma plataforma em que eu posso ir ver DBR mas também posso ir ver outras coisas.*

<sup>49</sup> Translated from Portuguese: *O que eu faria de diferente era torná-lo mais interativo. [...] até se podia fazer alguns vídeos tutoriais, nem que fosse para explicar aqueles modelos teóricos que têm mais a frente, sem ter qualquer voz, podia ser quase só com cliques.*

<sup>50</sup> Translated from Portuguese: *Eu acho que, do que eu conheço os meus alunos, se conseguíssemos ter aqui mais interatividade, ou seja, a Lorena concentrou numa página web uma série de autores. [...] O que pode ser interessante é algumas destas do que está em texto poder se ter outro tipo de formato. [...] Se a Lorena tiver a oportunidade de alguns destes, daquilo que estou a ver aqui em texto poder ajudar, talvez com quizzes...*

<sup>51</sup> Translated from Portuguese: *Sim, outra melhoria é em cada página poder ter a possibilidade de eu ter um diário de bordo pessoal. [...] no final eu teria uma ferramenta que seria um editor de HTML muito simples, em que ele retirava notas sobre aquilo que estou a ler, quase como se fossem comentários, notas pessoais. [...] E no final poder ter, poder retirar isso facilmente. [...] A possibilidade de ajustar ou acrescentar referências aos conteúdos meus e a partir daí poder transformar em algo meu em termos da utilização dos conteúdos.*

Expert 2 added that it would be interesting to retain the content and give it continuity, updating and adding other bibliographical references. Besides retaining the content, she/he also said that it would be interesting to make the content more open to enable anyone to reuse and adapt it according to their needs. She/he also talked about its format and said that it was a way of making it more appealing.

*[...] that could be appropriated by the user, in other words, what do I mean by this? [...] for example, I would have the basis of what you shared with me, then you don't continue, but I have the possibility of that being my starting point and adding my own resources or bibliography. In other words, I can appropriate it myself and update it according to my theoretical framework. [...] In other words, I would have the possibility of adjusting that structure to what I wanted. So the main observations were to make it more open, i.e. not a closed tool, just for consumption, where I could, as a user, influence what I use and adapt it for myself and then, with the type of technology, make it, using types of formats to make it more appealing.<sup>52</sup> (Expert 2)*

Similarly, Expert 3 talked about the openness of the material not only in the sense of making the content public and disseminating it in master's and doctoral programs but also in a way through which people could contribute with notes, comments, and bibliographical references. She/he suggested not having a totally open resource to which anyone could edit, like Wikipedia, but having a resource where people could add other perspectives about DBR. She/he pointed out that she/he did not know exactly how to do it, but it would be interesting to gather contributions from different and more experienced researchers. This (lack of) openness feature was also mentioned as a negative aspect by Expert 3.

*What I think would be very interesting is for it to be in an open, public format, but for it to be an open resource that can be used, that can be disseminated, I think that's very important for students in doctoral programs, for master's students. And I think that being open, being able to... There are some problems, I don't know if being totally open, that is, being totally open to illustrate and being able to include information, but being able to have a note, let's say, "look, it would be interesting if we could include this author", or "it would be interesting if we could include this perspective", or maybe "see, for example, this article on what obstacles this method has". We don't really know how this can be done, you know? But it doesn't have to be totally open, it doesn't have to be like Wikipedia. But it could be open enough for us to be able to add, let's say, contributions, not from just anyone but, for example, from a researcher, other colleagues who are also doing research into methodologies and methods, I think that would be interesting.<sup>53</sup> (Expert 3)*

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<sup>52</sup> Translated from Portuguese: *[...] que fosse passível de ele ser apropriado pelo utilizador, ou seja, o que quero dizer com isto? [...] por exemplo, eu teria a base daquilo que partilhou comigo, a seguir não dá continuidade, mas eu tenho a possibilidade daquilo ser meu ponto de partida e acrescentar eu recursos meus ou bibliografia minha. Ou seja, eu próprio poder fazer a apropriação e o update consoante o meu referencial teórico. [...] Ou seja, eu teria a possibilidade de ajustar aquela estrutura àquilo que eu pretendia. Por isso, as principais observações era deixá-lo mais aberto, ou seja, não ser uma ferramenta fechada, apenas pra consumo, em que eu pudesse, eu também enquanto utilizador, influenciar naquilo que eu uso e adaptar para mim e depois, com o tipo de tecnologia, torná-la, usando tipo de formatos para tornar mais atrativo.*

<sup>53</sup> Translated from Portuguese: *O que eu acho, seria muito interessante, é que ele estivesse em formato aberto, público, mas que fosse um recurso open, que pudesse ser utilizado, que fosse divulgado, acho que é muito importante para alunos de programas doutorais, para alunos de mestrados. E acho que ser aberto, podermos... É que tem algumas tretas, não sei se ser totalmente aberto, ou seja, ser totalmente aberto para*

Expert 1 mentioned that he missed the interaction between students who were at the same level and that probably could help each other through discussions and sharing of materials and experiences. This lack of interaction was also mentioned as a negative aspect by Expert 1.

*However, I feel there is a lack of interaction between people here. I feel there's a lack of interaction between, for example, colleagues who are at the same level, that there's a kind of component here that involves discussing, for example, the work done, the answers given by different colleagues, so that they can discuss different perspectives. I miss this interaction.*<sup>54</sup> (Expert 1)

Considering these comments, the prototype went through the final changes and these adjustments are presented in subsection 4.3.4 *Last changes and adjustments*.

#### **4.3.2.4 Reusing and sharing the DBR resource**

Experts were asked if they would like to share the resource and in which context they would like to reuse it. Expert 1 said that the DBR resource would be perfectly usable in the research method training in master's and doctoral programs and that it would be useful to include this content in a space, such as Moodle, dedicated to the learning of research methods.

*I think it would be perfectly usable for training in research methodology for students at various levels, both at master's and doctoral level. So I think that something that should always be included in a space, for example, Moodle dedicated to these subjects and that includes precisely this resource, I think would be particularly useful.*<sup>55</sup> (Expert 1)

Similarly, although she/he was not teaching at that moment, Expert 2 said that she/he would add this content to the research methods curriculum in PhD courses such as Multimedia in Education and Education. She/he added that she/he would like to add this

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*ilustrar e poder incluir informação não, mas poderemos ter uma nota, digamos assim, "olhe seria interessante podemos incluir mais este autor", ou "seria interessante podemos incluir mais esta perspectiva", ou talvez "ver, por exemplo, este artigo sobre qual obstáculo tem este método". Termos, de alguma forma, ir incluindo... A gente não sabe muito bem como é que isso pode ser feito, tá a ver? Mas não ser totalmente aberto, não ser tipo meio wikipedia, não é preciso. Mas poder ser aberto o suficiente para poder irmos juntando, digamos assim, contributos, não de qualquer pessoa mas, por exemplo, de um investigador, outros colegas que também estejam a fazer investigação sobre metodologias e métodos, acho que seria interessante.*

<sup>54</sup> Translated from Portuguese: *No entanto, eu aqui sinto falta de interação entre as pessoas. Sinto aqui alguma falta de interação entre, por exemplo, colegas que estejam no mesmo nível, que haja uma componente aqui qualquer que remeta para a discussão, por exemplo, dos trabalhos feitos, das respostas dadas por diferentes colegas, da forma que possam discutir diferentes perspectivas. Sinto falta dessa interação.*

<sup>55</sup> Translated from Portuguese: *Creio que seria perfeitamente utilizável na formação a nível de metodologia de investigação, de alunos de vários níveis, tanto ao nível de mestrado quanto ao nível de doutoramento. Logo eu creio que algo de sempre de incluir num espaço, por exemplo, Moodle dedicado a essas disciplinas e que incluía precisamente este recurso, creio que seria particularmente útil.*



resource to her/his bibliographical references so that students who participated in her/his research methods seminars could have access to it.

*If I were to go back to teaching, I'm currently only doing research, but if I were to go back to teaching the research methodologies curricular units, mainly in multimedia in education, and even in education, I would fit this content into the research methodologies part of the curricular unit. [...] As it stands, if it becomes available, I'll put it in my bibliographical references for students to use because I do a lot of seminars on research methodologies, some of which are very much geared towards the area of software development, the mobile parts, technologies... And I'd be happy to disseminate it.<sup>56</sup> (Expert 2)*

Expert 3 mentioned that she/he would like to have used it with two PhD students because she/he thought that the content was really clear and useful. She/he also said that this resource was really useful for doctoral programs and for those who were doing research at any educational level.

*Of course, I really wanted to use it with two of my doctoral students at the time, I really wanted to, because I really think it's clear and useful. In doctoral programs, I think it's also a privileged context because people are very focused on questions of methodology and, therefore, for those who are doing research in general, whether it's for a degree or not, I think it's a very useful tool, okay?<sup>57</sup> (Expert 3)*

Expert 4 said that this DBR resource would be useful for her/his mentees who were using development research methods and said that, if possible, would like to share this content with them.

*This could be great material for when I'm with my students. Whenever possible, I usually guide them towards development methodologies because a lot of the work I guide makes sense with development methodologies, often not, but usually yes. So if Lorena lets me, I'd obviously be happy to share it with them.<sup>58</sup> (Expert 4)*

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<sup>56</sup> Translated from Portuguese: *Se eu voltasse a lecionar, atualmente só estou a fazer investigação, mas se voltasse a lecionar as unidades curriculares das metodologias de investigação, principalmente em multimédia em educação, e mesmo em educação, encaixaria este conteúdo na parte da unidade curricular de metodologias de investigação. [...] Da forma como está, se ele ficar disponível, eu vou pôr nas minhas referências bibliográficas para estudantes usarem porque eu faço muitos seminários de metodologias de investigação, alguns muito orientados só para a área de desenvolvimento de software, as partes mobile, tecnologias... E terei todo gosto em divulgar.*

<sup>57</sup> Translated from Portuguese: *Com certeza, tive imensa vontade de utilizar com duas doutorandas minhas na altura, tive imensa vontade, porque acho realmente que está claro e útil. Nos programas doutorais acho que é um contexto também privilegiado porque as pessoas estão muito focadas nas questões da metodologia e, portanto, para os que estão a fazer investigação em geral, seja para grau ou não seja pra grau, acho que é uma ferramenta muito útil, está bem?*

<sup>58</sup> Translated from Portuguese: *Isto podia ser um belíssimo material para quando estou com meus alunos. Eu normalmente sempre que possível oriento-os para as metodologias de desenvolvimento porque grande parte dos trabalhos que eu oriento tem sentido com as metodologias de desenvolvimento, muitas vezes não, mas normalmente sim. Por isso se a Lorena me deixar eu obviamente teria muito gosto em poder partilhar com eles.*

### 4.3.3 OER concept and application

Regarding the OER concept and practical application, the answers were classified into four categories, OER concept, reusing resources, sharing content and using open licenses, and OER feasibility, and each category was organized into subcategories, as can be seen in Table 19.

Theme	Code	Subcode	Number of references
OER concept and application	OER concept	free access / gratuity	4
		customizable	3
		sustainability	2
	Reusing resources	reusing resources	2
		creating from scratch	0
		doing both things	2
	Sharing content and using open licenses	sharing content	4
		using open licenses	1
		not using open licenses	2
		not clear if she/he uses open licenses	1
	OER feasibility	free access / gratuity	2
		Customising	2
		sustainability	2
		disseminating of content	2

**Table 18. OER concept and application**

#### 4.3.3.1 OER concept

When asked about the definition of OER, experts' answers encompassed different key concepts of OER, such as free access and gratuity, the resource being editable and customisable, and its sustainability.

Expert 1 emphasized the characteristic of having free access to content. She/he said that educational resources could be a lot of things, from videos on YouTube to podcasts and an aspect that she/he considered valuable was the fact of being available for free, not only because there were universities that could not afford materials but also because it was a

strategy for those who wanted to promote their work around the world.

*Well, that's an extremely open definition because what's important about it is that it's open, in other words, freely accessible. Now, educational resources can be multiple, it can even be a video posted on YouTube, it can be a podcast, it can be a thousand things. Now, one aspect that I particularly value is the fact that it is available free of charge, without a doubt. Precisely because there are universities that manage to do it, pay for access to it, while in other countries they can't do it. So the fact that they have materials available for free is particularly useful and worthwhile. For someone who also wants to make their work known, it's strategic because it's a way for many people to have access to this kind of work.<sup>59</sup> (Expert 1)*

Similarly, Expert 2 centred her/his answer on the gratuity and added the possibility of modifying the resource. According to her/him, an OER was a resource that did not require a paid subscription to have access to the content. Considering the technological terms, an open resource tended to have an open code where anyone could add content to it.

*An open resource for me is something that, I'm going to go back to the economic side, in other words, I don't have to make any paid subscriptions to have access to that content. For me, that's an open resource. If it's in technological terms and we follow the open source bases, it tends to be an open source resource, I could also develop modules for this resource. In this case, if it's something that's available free of charge.<sup>60</sup> (Expert 2)*

Expert 2 also raised the discussion about the sustainability of OER. She/he cited the example of Moodle, an open-source learning platform that enables anyone to customize it and keep it updated, and compared it to other open resources that could face the problem of obsolescence because of lack of funding.

*So for me, open resources have this problem of sustainability. Either I have a Moodle-type tool that is fed by a community, and even then it has a series of services that aren't free, they're paid for. Or I could have a problem with having an open resource and, due to lack of investment, start having problems from a scientific or pedagogical point of view. [...] I'm afraid that open resources won't be able to invent themselves because there's no funding. This is a major fear of open resources.<sup>61</sup> (Expert 2)*

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<sup>59</sup> Translated from Portuguese: *Bom, essa é uma definição extremamente aberta porque o que tem a dispor de importante aí é o ser aberto, ou seja, de livre acesso. Agora recursos educacionais ou educativos podem ser múltiplos, pode ser até um vídeo colocado no YouTube, pode ser um podcast, pode ser milhentas coisas. Agora um aspecto que valorizo particularmente é o fato de ser disponibilizado gratuitamente, sem dúvida. Precisamente porque há universidades que o conseguem fazer, pagar o acesso a isso, noutros países não consegue fazer. Logo daí o fato de terem materiais disponíveis gratuitamente, isso é particularmente útil e de valorizar. Para alguém que pretende também fazer conhecer o seu trabalho, é estratégico porque é uma forma de muitos terem acesso a esse tipo de trabalho.*

<sup>60</sup> Translated from Portuguese: *Um recurso aberto pra mim é algo que, vou puxar outra vez para a parte econômica, ou seja, eu não tenho que fazer qualquer subscrição paga para ter acesso a esse conteúdo. Para mim isso é um recurso aberto. Se for em termos tecnológicos e seguirmos as bases do open source, tende a ser um recurso com o código aberto, também poderia desenvolver módulos para esse recurso. Neste caso, se é alguma coisa que fosse disponível sem qualquer taxa.*

<sup>61</sup> Translated from Portuguese: *Então para mim o recurso aberto tem esse problema da sustentabilidade. Ou eu tenho uma ferramenta tipo Moodle em que uma comunidade que alimenta, mesmo assim ele tem uma série de serviços que não são gratuitos, são pagos. Ou então eu posso ter um problema em ter um recurso aberto e por falta de investimento começar a ter problemas do ponto de vista científico ou pedagógico. [...] Tenho medo dos recursos abertos é eles depois não terem forma de se inventarem porque não há financiamento. Este é um grande receio dos recursos abertos.*

In her/his answer, Expert 3 mentioned the topics of free accessibility, sustainability, and adaptation of content. She/he agreed that an educational resource should be open, shareable, and accessible, but it was important to reflect on the other questions that were raised when opening a resource. She/he said that it was important to consider who worked to develop the resource, how to protect it and guarantee its quality, and to whom it would be open if it would be completely open or opened to a certain community. She/he added the topic of sustainability, how an open resource could be maintained, and who would be responsible for ensuring its continuity.

*Of course, then we have to process the whole perspective of what it costs for an Open Resource, don't we? Although those who do research in education, those who work in education, think it should be open, that is, they think it should be shared, that it should be accessible, and so I'm all for it. Now we have to look at the other issues that have been imported by opening up the resource, don't we? I think that, well, we have to consider who works, how that work is protected, how the quality of what is open is guaranteed, to whom it is open, if it is completely open or if it is open to a certain community. So how do you maintain an open resource, who maintains it, who feeds it, who adapts it, right? The demands of everyday life, the dynamics and changes of everyday life.<sup>62</sup> (Expert 3)*

Expert 4 focused her/his definition of OER on the free availability and the possibility of being customized. She/he said that a resource was open because it was free and because anyone could adapt it according to their needs.

*They are resources that I can use in the learning process and they are open because they are free to use, because they can be customized. In other words, I can take a resource and optimize it or customize it for my activity. And it's open because it's freely available and open so that I can change it according to what I need.<sup>63</sup> (Expert 4)*

#### 4.3.3.2 Reusing resources

Experts were also asked whether they reused resources created by other people or created them from scratch when preparing materials to be used with their students. Two of them said they reused resources, no one mentioned creating from scratch, and two said that they did both things, including asking students to create some resources.

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<sup>62</sup> Translated from Portuguese: *É claro que depois temos que processar toda aquela perspectiva que tem a ver o que custa por um Recurso Aberto, não é. Apesar de quem investiga a educação, quem trabalha na educação, acha que deve ser aberto, ou seja, acha que deve ser partilhado, que deve ser acessível e, portanto, eu sou completamente a favor. Agora temos que ver sobre as outras questões que foram importadas ao abrir o recurso, não é? Isso eu acho que, bom, nós temos que considerar quem trabalha, como se protege aquele trabalho, como é que garante a qualidade do que é aberto, a quem é aberto, se é completamente open ou se é aberto a uma determinada comunidade. Portanto, como é que se mantém um recurso aberto, quem é que o mantém, quem é que o alimenta, quem é que o adapta, não é? As exigências que vão tendo do dia-a-dia, da dinâmica e das alterações do cotidiano.*

<sup>63</sup> Translated from Portuguese: *São recursos que eu posso usar no processo de aprendizagem e são abertos porque são de utilização livre, porque estão passíveis de poderem ser customizados. Ou seja, eu posso pegar num recurso e otimizá-lo ou customizá-lo para aquilo que é a minha atividade. E ele é aberto porque é disponibilizado livremente e está aberto para eu poder alterá-lo em função daquilo que eu necessito.*

Expert 2 affirmed that she/he reused most of the resources and updated them with new references. Expert 4 said that there were millions of resources available on the internet to be reused and remixed, and, therefore, did not create them from scratch. Besides, she/he dedicated months to creating a prototype with dozens of resources and nowadays only reused them.

*Most of them are reused from previously made resources. But there is always a concern to reuse and update with new references.*<sup>64</sup> (Expert 2)

*I reuse, I'm not a fool. There are millions of resources that I can use and combine, and I've stopped making them from scratch for many years now. I think that from the moment I did my PhD and spent many years developing a prototype that itself had dozens of resources that took me months and months to make, I stopped doing that. I mean, I can quickly do a search on the internet, as long as I know where I'm going to look, and I'll find all the materials, learning objects, open resources that I need, so I usually go looking for what already exists.*<sup>65</sup> (Expert 4)

Expert 3 also said that she/he did both things, especially because she/he tried to keep the materials updated. When she/he found a material that was updated and relevant, she/he reused it. But when she/he did not find any resource that was adequate for what she/he needed, she/he created the material from scratch.

*It depends. It depends on various situations, doesn't it? I really try to be up-to-date with the things I use and, therefore, this implies that I also do some of the research. There are resources that are available, that are current, that are relevant, that are suitable for what you want, so I don't invent the wheel and I use what exists. And that's a way of spreading the word about what exists, isn't it? And they're much better than I could do, so I spread the word, I use them. When it's something I see or there isn't something that's quite right for what I want or there isn't much yet, I make it and I make it from scratch. So it's a mixture, isn't it?*<sup>66</sup> (Expert 3)

Expert 1 said that she/he did both things, including asking students to create resources. When students had to develop an educational resource, they needed to clarify the content in order to teach it and, therefore, could learn more.

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<sup>64</sup> Translated from Portuguese: *A maior parte são reaproveitados de recursos feitos anteriormente. Mas há sempre uma preocupação de reutilizar e de atualizar com novas referências.*

<sup>65</sup> Translated from Portuguese: *Reutilizo, não sou tolo. Há milhões de recursos que eu possa usar e posso combinar, e já há muitos anos que deixei de fazer do zero. Acho que desde que, do que eu me lembro que fazia os meus recursos todos, a partir do momento em que fiz o meu doutoramento e que passei muitos anos a desenvolver um protótipo que ele próprio tinha dezenas de recursos que me demoraram meses e meses a fazer, que deixei de fazer isso. Quer dizer, eu posso rapidamente fazer uma pesquisa na internet, desde que saiba onde vou procurar, que encontro os materiais, os objetos de aprendizagem, os recursos abertos todos que eu preciso, por isso, por norma vou à procura do que já existe.*

<sup>66</sup> Translated from Portuguese: *Depende. Depende de várias situações, não é? Eu tento de fato ser atual nas coisas que uso e, portanto, isso implica que eu também faça uma parte da pesquisa, não é, que vá pesquisar aquilo que diz. Há recursos que estão disponíveis, que são atuais, que são relevantes, que são adequados ao que pretendem, portanto eu não vou inventar a roda e utilizo o que existe. E essa é uma forma de divulgar o que existe, não é? E que estão muitos melhores do que eu conseguiria fazer e, portanto, divulgo, utilizo. Quando é alguma coisa que eu vejo ou que não existe algo que seja muito adequado ao que eu pretendo ou que ainda de fato não exista muita coisa, eu faço e faço do zero. Portanto, é uma mistura, não é?*

*Another thing I also use are podcasts on methodology, but I often ask the students to build some kind of resource of this kind, precisely because the fact that they build the educational resource to teach others means that they have to clarify a certain aspect in their heads very well.*<sup>67</sup> (Expert 1)

#### 4.3.3.3 Sharing content and using open licenses

All the experts affirmed sharing their content with their students and when asked if they used an open license when redistributing the resources, only Expert 1 said yes. Two admitted not thinking about it, and another one seemed not to have understood the question.

Expert 1 said that he/she almost always used the most open license.

*It depends on the context, but in general I use it. I often use even the most open license, which is the one that people are free to use as long as they acknowledge authorship. That's what I usually do.*<sup>68</sup> (Expert 1)

Expert 4 said that she/he had never thought about open licenses. Expert 2 reported that she/he used to share the content and ask students to give her/him the credits, but did not seem to understand how to use the open licenses to this end.

*I'm not very careful, to be honest.*<sup>69</sup> (Expert 4)

*Good question. Now I'm going to ask a question: what do you mean by sharing an open license? For example, if I have a PowerPoint or a Prezi, when I share it, what should I put? [...] When someone asks me for content that I've made, what I ask for is what I do. For example, if I share a powerpoint that I have here with me, what I would ask them to do is to put "adapted from" because I'm going to take it, I'm not going to use it in its entirety, there are parts that may even be the same, but I'm going to adapt it. So normally what I ask when someone asks me for content or a PowerPoint is that they put "adapted from (deletion of sensitive content)".*<sup>70</sup> (Expert 2)

Still about the use of open licenses, Expert 3 reported using tools and platforms to share content with her/his students but did not answer if she/he used open licenses.

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<sup>67</sup> Translated from Portuguese: *Outra coisa que eu também utilizo são podcasts sobre metodologia também, mas muitas vezes peço também aos alunos para construir algum tipo de recurso desse gênero, precisamente porque o fato de construírem o recurso educativo para ensinar outros implica clarificarem muito bem determinado aspecto na sua na sua cabeça.*

<sup>68</sup> Translated from Portuguese: *Depende dos contextos, mas de uma maneira geral utilizo. Utilizo muitas vezes até a licença mais aberta que é a que as pessoas estão livres de utilizar desde que reconheçam a autoria. É o que eu costumo fazer.*

<sup>69</sup> Translated from Portuguese: *Não tenho muito esse cuidado para ser sincero.*

<sup>70</sup> Translated from Portuguese: *Boa pergunta. Agora vou eu fazer uma pergunta: partilhar uma licença aberta, como assim? Por exemplo, se eu tiver um PowerPoint ou então um prezi, quando partilho o que é que eu deveria colocar? [...] Quando alguém me solicita conteúdos construídos por mim o que eu peço é aquilo que eu faço. Por exemplo, se eu partilhar um powerpoint que eu tenho aqui comigo, o que eu ia lhe pedir era que coloque "adaptado de" porque eu vou pegar, não vou usar integralmente, há partes que até podem ser iguais, mas eu vou adaptar para os meus. Então normalmente o que eu peço quando alguém me pede um conteúdo ou um PowerPoint é que coloque que foi "adaptado de (eliminação de conteúdo sensível)".*

*What I usually do in a classroom context or in a guidance context is... For example, in the classroom, we try to make a bank of resources that are related to the theme of the lesson. For example, when it comes to methodology, we can make a bank and use it. Normally, what we use for students is the platform they use and, therefore, the platform they use is the one where we make the content and resources available. In the case of the students, for example, there was a time when I built a blog so that I could share. A blog that basically served as a repository and I gave access to it, in restricted groups that could also complete it, and then we shared it there. But basically we used Teams. I used the blog for a while, but I confess I've stopped using it. To share, I basically use these.<sup>71</sup> (Expert 3)*

#### **4.3.3.4 OER feasibility**

When they were asked if they believed in the OER principles, if they believed that these principles were feasible, relevant, and useful to their educational contexts, and, therefore, if they agreed with them, all the experts said yes. Similarly to their OER definitions, their justification covered different categories that encompass key OER concepts, such as free access/gratuity, the resource being customisable, its sustainability, and the dissemination and redistribution of the content.

Similarly to the answer that she/he gave about the OER concept, Expert 1 believed in free access, meaning no cost, as a way of ensuring access to materials for those populations that do not have financial conditions to afford them. Expert 1 also shared that she/he was responsible for the creation of one of the first free and online journals and has also worked as an editor in open-access journals.

*I think so. In fact, I've always been committed to this, to the extent that I was even responsible for creating one of the first free online journals to be created in Portugal, which was Revista Interações at the time, of the Polytechnic Institute of Santarém, a journal that has been around for many years. And I've always continued to work as an editor of open-access journals. So I believe precisely in this as a way of ensuring access to research, to materials for certain populations that otherwise wouldn't have access. [...] So I'm a total supporter of this type of initiative, without a doubt.<sup>72</sup> (Expert 1)*

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<sup>71</sup> Translated from Portuguese: *O que eu faço e normalmente em contexto de aula ou em contexto de orientação... Por exemplo, nós em contexto de aulas tentamos fazer como se fosse um banco de recursos que seja um banco da temática da aula. Por exemplo, nas questões da metodologia, podemos fazer um banco e utilizar. Normalmente o que se usa para os alunos é a plataforma que eles utilizam e, portanto, a plataforma que eles utilizam é aquela que nós disponibilizamos os conteúdos e os recursos. No caso, por exemplo, dos orientandos, houve uma altura em que construí um blog para poder partilhar. Um blog que servia basicamente como um repositório e eu dava acesso, em grupos restritos que também podiam completar, e depois partilhávamos ali. Mas basicamente usamos o Teams. Eu usei durante algum tempo o blog, confesso que deixei de usar. Para partilhar utilizo basicamente estes.*

<sup>72</sup> Translated from Portuguese: *Eu creio que sim. Aliás, sempre apostei nisso na medida em que até fui responsável pela criação de uma das primeiras revistas online gratuitas, ou seja, de acesso livre, que foram criadas em Portugal, que foi a Revista Interações na altura, pronto, do Instituto Politécnico do Santarém, e que foi criada uma revista que já tem imensos anos. E tenho continuado sempre a trabalhar também como editor de revistas de livre acesso. Logo, acredito precisamente nisso como uma forma de assegurar o acesso à investigação, a materiais a determinadas populações que de outra forma não teriam acesso. [...] Logo, sou um apoiante total desse tipo de iniciativa sem dúvida.*

Expert 2 pointed out the topics of free access, the possibility of updating the material, and its sustainability. She/he said that she/he believed that the OER principles were feasible but it depended on the tool or platform that was being used to display the content. If the tool or platform kept free and enabled the content update, it was feasible. However, if the technology used became obsolete and did not permit the portability of the content to other systems, it would be more difficult to maintain its viability. Expert 2 concluded by saying that she/he believed that everything free would be paid somehow.

*Yes, they are. I think they're feasible, but they depend. For example, if I have content made here on H5P or on another platform, if it remains free and I have the possibility of updating it, it's feasible. If I move on to something developed, like WebQDA, that's something different. It again involves investment to maintain it. Because sometimes it's not just investment in the content, the content may be the same, but the technology used may become obsolete, right? In a few years' time, we may be talking about content that needs another type of approach to be presented, or because H5P has disappeared and I don't know if this system can be ported to other systems, I don't know if I can export it, I haven't tried it here. I think it's viable, but I still believe that everything that's free is paid for in some way, isn't it?<sup>73</sup> (Expert 2)*

Expert 3 mentioned the topics of dissemination of content and its sustainability. She/he shared her/his experience in two projects that she/he participated in. One was related to the production of resources in general and another one aimed at developing OER. She/he said that there were advantages and disadvantages in both projects, but that the one related to OER had a completely different control since it was open and nobody owned the resources. Besides, it had a completely different dissemination and had continuity.

*I've done it open and I've done it closed. And in both experiences I've seen positive and negative aspects. [...] But [open] has a completely different reach, it has completely different control. [...] It also has completely different dissemination and continuity, you know? [...] A platform with open educational resources for all subjects, for all educational levels. So this is a spectacular project, which involves a lot of people, a lot of money, obviously, and has a different scope. So I see advantages and disadvantages in both situations. But I'm in favor of openness.<sup>74</sup> (Expert 3)*

Expert 4 pointed out the topics of disseminating the resource and making changes to it.

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<sup>73</sup> Translated from Portuguese: *Sim, são. Acho que são praticáveis, mas dependem. Por exemplo, se tiver um conteúdo feito aqui no H5P ou noutra plataforma, se ela se mantiver gratuita e se eu tiver a possibilidade de fazer uma atualização, ela é praticável. Se eu avanço para algo desenvolvido, como o WebQDA, já é algo diferente. Já implica novamente investimento para se manter. Porque às vezes não é só investimento do conteúdo, o conteúdo pode ser o mesmo, mas a tecnologia usada pode se tornar obsoleta, não é? Daqui a uns anos podemos estar a falar de um conteúdo que necessite de outro tipo de abordagem para ser apresentado ou porque o H5P desapareceu e rapidamente não sei se esse sistema tem a portabilidade para outros sistemas, não sei se consigo exportar, neste aqui eu não experimentei. Eu acho que é viável, mas eu continuo a acreditar que tudo que é gratuito ele é pago de alguma forma, não é?*

<sup>74</sup> Translated from Portuguese: *Eu já fiz aberto e já fiz fechado. E nas duas experiências eu vi aspectos positivos e aspectos negativos. [...] Mas [o aberto] tem um alcance completamente diferente, tem um controle completamente diferente. [...] E também tem uma divulgação completamente diferente e tem continuidade, tá a ver? [...] Uma plataforma com recursos educativos abertos para todos os assuntos, para todos os níveis educativos. Pronto, isto é que é um projeto espetacular, que envolve muitas pessoas, muito dinheiro obviamente e tem um alcance diferente. Por isso eu vejo vantagens e desvantagens nas duas situações. Mas sou a favor do aberto.*



She/he agreed that the OER principles were relevant and shared that she/he developed this habit of reusing and sharing good resources with students a long time ago. She/he continued saying that it did not make sense to show the content to students and not share it with them. She/he said that the more her/his materials were visualized and adapted, the better.

*Yes, they're very relevant, very important, and this habit is one that I learned a long time ago, which is to use and spread the word about the good resources that exist and then share them with the students. I think there's absolutely no point in getting resources that are closed, that are mine, that I show to the students and then don't let them use. That's why I put all the materials on the platforms I use in my classes and the students use them afterwards. The more they are viewed and changed, the better. I mean, they had a purpose and they served that purpose.<sup>75</sup> (Expert 4)*

#### **4.3.4 Last changes and adjustments**

With reference to the suggestions on the content, one expert recommended adding references in Portuguese. As the objective of this resource is to reach as many doctoral programs in TEL around the world as possible, we decided not to add articles, dissertations, and theses in Portuguese and keep them all in English, that is now used as a universal form of communication in science.

Other experts suggested adding more information on how to create a good research question since it is an important topic for master's and doctoral students when developing their research projects. However, the focus of the content is on DBR and not research methods in general, and there is already a section on how to create a research question using DBR.

Experts also suggested extending this kind of content to other research methods and this is an idea for future research. Another recommendation by one expert and also an idea for future research is to create a tool where students answer some questions regarding their research and the tool indicates the method that best fits their study.

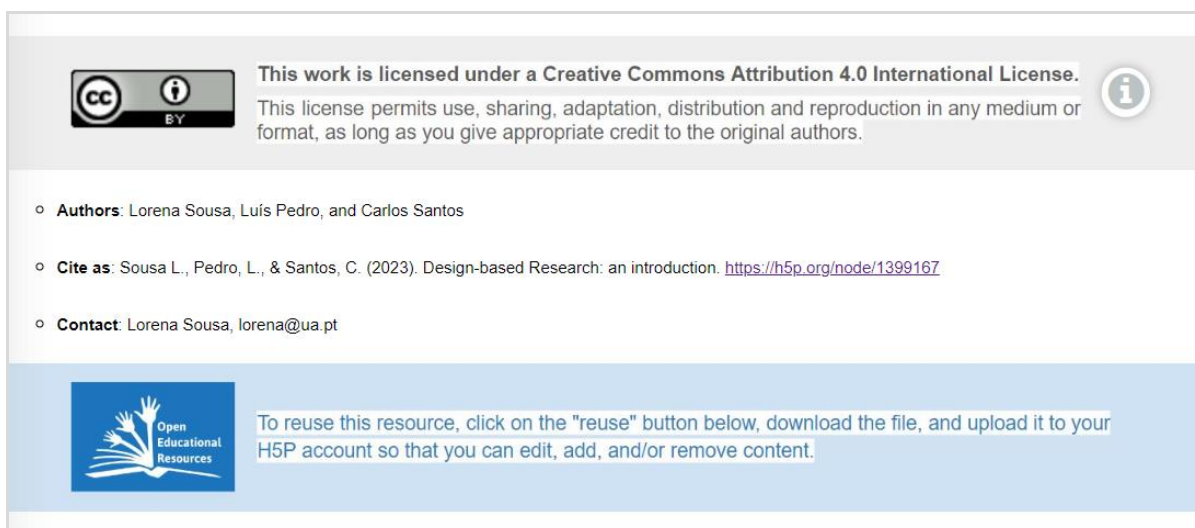
Another expert suggested explaining the difference between the DBR models and indicating when students should use one instead of another. However, the objective of this DBR resource is to present and describe DBR, being as neutral as possible.

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<sup>75</sup> Translated from Portuguese: *Sim, são muito relevantes, muito importantes e este hábito é um hábito que eu aprendi há muito tempo que é de utilizar, difundir aquilo que são os bons recursos que existem e depois partilhar com os alunos esses recursos. Acho que já não tem sentido absolutamente nenhum eu obter recursos que são fechados, que são meus, que eu os mostro aos alunos e depois não os deixo utilizar. Por isso, todos os materiais eu coloco nas plataformas que utilizo nas minhas aulas e os alunos utilizam depois. Quanto mais eles forem visualizados e alterados, melhor. Quer dizer, que tiveram um propósito e serviram a esse propósito.*

Considering experts' suggestions regarding the tool, it is not possible to add interaction between users in H5P, but it is possible to integrate this content created with H5P on Moodle, for example, and use a Moodle discussion forum for interaction. H5P does not accept annotations and, therefore, it is not possible to add notes to the content as suggested by another expert.


About its openness, H5P does not enable the users to edit or add content directly like Wikipedia, for instance. To do this, the users need to download the material, upload it to their own accounts on H5P, and then they can make any changes they want, also becoming the owner of the content. At the end of the first page, there is information on how to do this and on the license that legally instructs the users on what they can do with the content. We added more details about the license so that the users do not have any doubt about what they can do with this resource (see Figure 60).



The screenshot shows a license notice for a Creative Commons Attribution 4.0 International License. It includes the CC BY logo, a text box explaining the license, and a list of authors, citation information, and contact details. Below this is a blue banner with the Open Educational Resources logo and instructions on how to reuse the resource by downloading and uploading it to an H5P account.

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- **Authors:** Lorena Sousa, Luis Pedro, and Carlos Santos
- **Cite as:** Sousa L., Pedro, L., & Santos, C. (2023). Design-based Research: an introduction. <https://h5p.org/node/1399167>
- **Contact:** Lorena Sousa, lorena@ua.pt

 To reuse this resource, click on the "reuse" button below, download the file, and upload it to your H5P account so that you can edit, add, and/or remove content.

**Figure 60. Information about the license**

Therefore, although the users can not technically change the material directly, they can retain the resource and are given legal permission to do whatever they want with it. Our next phase is to disseminate this content in master's and doctoral programs in TEL around the world.

There were also some recommendations on the visual aspect of the prototype as experts suggested making the content more interactive and adding other formats, such as videos and quizzes. As a product of doctoral research, the prototype has already reached its main objective as the content, the main aspect of it, has been sufficient and appropriate to be used with students. As we do not have any knowledge on design, we decided to keep it as it is.

Any other modification, adjustment, or adaptation can be made by anyone since it is an OER which permits any revising since the user gives credit to the authors.

To compare the two versions of the prototype, visit <https://h5p.org/node/1347661> to see the fourth version, and visit <https://h5p.org/node/1399167> to see the fifth and final version.

## **CHAPTER 5: CONCLUSIONS**

### **5.1 Summary of the main results**

The main objective of this study was to develop OER for doctoral education in TEL. Under the Educational Research Design methodological approach, this investigation consisted of three main phases - context analysis, development and formative evaluation, and semi-summative evaluation, and was guided by five research questions that are going to be resumed below.

#### **RQ1: How are OER used in doctoral education?**

In the first phase, a systematic review was carried out to analyse the use of OER in doctoral education. Few articles were found related to this theme, which can indicate that OER are not frequently used at the doctoral education level. This result agrees with the results reported by the DE-TEL project, which suggested that PhD candidates and PhD holders were not used to adopting OER as a learning source.

#### **RQ2. Which characteristics can contribute to the development of OER for doctoral education?**

Still in the first phase, a survey was conducted among PhD candidates, researchers, and practitioners to identify the main OER characteristics they preferred and analyse their OER concept. The results indicated that PhD candidates, researchers, and practitioners preferred resources that were properly referenced, had scientific rigor, and were created by a reputable institution or person. The characteristics of having an open license or allowing adaptation, for example, were not considered a priority to them.

#### **RQ3. How do PhD candidates, practitioners, and researchers define OER?**

Regarding their OER concept, the three main attributes they would include in their OER definition were being available for free, giving attribution to the original author, and being possible to share and redistribute. This may suggest that including open licenses, being easy to edit or combine with other materials did not reach the same level of importance in their answers.

#### **RQ4. Which characteristic should an OER developed for doctoral education have?**

In the second phase, a prototype about Design-based Research, the most used research method and also the one that students needed more training, was developed using a tool called H5P. The H5P content type chosen was the interactive book because, as the name

suggests, it is possible to include different other interactive content types through its pages. Considering the characteristics the participants of the survey considered relevant, the content was based on scientific rigor, with reliable references, and its content was also part of the materials produced by the DE-TEL project, a project that reunited reputable European institutions.

#### **RQ5. How do the users evaluate the developed OER?**

Still in the second phase, this prototype went through three cycles of formative evaluation. In Cycle 1, the scientific content was validated by four experts. In Cycle 2, the prototype was evaluated through two workshops about H5P and OER. And in Cycle 3, the prototype was evaluated through six workshops about DBR. After each cycle, the prototype suffered some adjustments and improvements.

In the third phase of this investigation, interviews were carried out with four experts in research methods and/or DBR to make a semi-summative evaluation of the prototype. In short, the prototype did not suffer deep changes in its content, which is a positive evaluation and may indicate that the prototype achieved its objectives. However, it was suggested that its visual aspect could be more appealing. This suggestion was also observed in the formative evaluation in the second phase of this study. It may indicate that there are some limitations regarding the tool used, H5P, since its features are not very appealing, it is not possible to edit the content directly, and the tool does not support interactions between the users.

## **5.2 Limitations of this study and suggestions for further research**

A limitation reported about the prototype was related to its visual aspect. Although our focus was on the content, future research should focus on tools that permit the creation of more appealing interactive content. Another important feature that the tool should have and was considered a technical constraint by some experts is giving permission to the user to edit the content directly, putting into practice the 5R and its real openness. In other words, search for other options of tools that enable the creation of OER, emphasizing especially the technical aspects of it, such as the easy editing of the content.

A limitation of the first phase of this study was the number of participants who responded to the survey (n = 92), which aimed at understanding their OER preferences and concept. Besides the small number of respondents, almost 90% of them belonged to three countries, Portugal, Brazil, and Spain. Future research should focus on getting a higher

number of participants, especially those involved in master's and doctoral education and from other countries in Europe and America.

Future research could focus on understanding why OER was not chosen by PhD students and PhD holders when they were asked which learning sources they used to deepen their knowledge of TEL topics, doctoral training topics, and research methods. One of the possibilities can be that they are not familiarized with the concept of OER. They have probably used OER as a support to their learning, but they do not know that those resources were OER. Another possibility can be the lack of OER available at the doctoral level. As a result, it is more difficult to have access to OER at this level of education.

Similarly, we did not find many articles about the use of OER in doctoral education during the conduction of the systematic review. Another idea for further research is to conduct a systematic review on OER and graduate courses, including master's, not only doctoral education. Perhaps this can help verify if this trend repeats at the master's level and can help understand why OER are underused at the doctoral level.

### **5.3 Contributions to the field of Technology-Enhanced Learning**

The contributions of this thesis to the area of TEL can be categorized into practical and theoretical. Theoretically, this study hopes to contribute to the gap that exists in the empirical research about the use of OER in doctoral education. A systematic review on this topic was carried out and the results revealed that few studies cover the use of OER at this level of education. Besides, a report published by the DE-TEL project also showed that PhD students and PhD holders were not used to adopting OER to deepen their knowledge of TEL topics, doctoral training topics, and research methods. With this investigation, we expect to raise PhD candidates, researchers, and practitioners' awareness about the importance of OER.

Still theoretically, this study is an example of how to use the Educational Research Design (or DBR) methodological approach in a practical way, being also an example of how to develop a prototype covering the topic of DBR and methodologies in general. As DBR has different models and in each phase, there are plenty of activities that can be adopted, this investigation process can support other master's and PhD students during their research path, showing a practical example of how to use this kind of methodology.

Practically speaking, this study concluded with a real resource that went through cycles of evaluation and is now ready to be disseminated and used by other researchers from

several levels of education. As we saw, DBR is the most used research method and the one PhD and PhD candidates need more training, thus, we hope that this content can give them good help with this research method. This resource can also be used as a model of how to construct OER that cover the topic of methodological approaches.

Last but not least, we hope to see this resource being used in master's and doctoral courses and that professors and students feel free to retain, reuse, and modify this material according to their necessities, practicing the core activities of OER. The plan now is to disseminate this resource in master's and doctoral programs in TEL in Europe and Brazil, so that this study can have continuity and can support a lot of students, professors, and other researchers.

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## **LIST OF APPENDICES**

## Appendix A

### Survey of the first phase (context analysis)

#### Educational Resources for doctoral education training

This survey is part of an investigation on the development of educational resources for doctoral education training and aims at identifying which characteristics, factors, and formats can contribute to making educational resources an engaging solution for PhD candidates, practitioners, and researchers.

It is being developed by Lorena Sousa (lorena@ua.pt), a PhD candidate in Multimedia in Education at the University of Aveiro, Portugal, under the supervision of professors Luís Pedro and Carlos Santos.

Who should answer: PhD candidates, practitioners, and researchers.

Thank you for your interest in participating in this survey. Its completion will take between 15 and 20 minutes.

#### **This survey is anonymous.**

The record of your survey responses does not contain any identifying information about you, unless a specific survey question explicitly asked for it.

If you used an identifying token to access this survey, please rest assured that this token will not be stored together with your responses. It is managed in a separate database and will only be updated to indicate whether you did (or did not) complete this survey. There is no way of matching identification tokens with survey responses.

#### **Data policy**

Participation in this survey is voluntary. Your answers will be registered electronically. The survey will not track any additional data, such as your IP address. All answers will be treated confidentially and remain anonymous. All published results will be anonymous. All data will be deleted at the latest 31 December 2023.

We will only use the data as described in this statement. All the data management processes are in line with the EU General Protection Data Regulation (GDPR). If you have any questions or need more information, please contact Lorena Sousa (lorena@ua.pt).

By pressing the “Next” button to proceed further, you provide us with permission to use your responses for the purposes of this research work as described above. Once you submit the survey, it will be impossible to retract your answer. Please do not include any personal identifiable information in your responses. As long as you can be identified in the collected data, you have the right to access the personal data that is being processed about you; request that your personal data is deleted; request that incorrect personal data about you are corrected/rectified; receive a copy of your personal data (data portability), and send a complaint to the Data Protection Officer at the University of Aveiro regarding the processing of your personal data.

**To continue please first accept our survey data policy.**

### Section 1 - Personal background

Some questions from this section were adapted from the survey conducted by the DE-TEL project (<https://ea-tel.eu/de-tel/survey>)

#### **What is your age?**

- Below 20
- 20-29
- 30-39
- 40-49
- 50 and above
- Prefer not to specify
- No answer



**What is your gender?**

- Female
- Male
- Prefer not to specify
- No answer
- Other

**Country of residence:**

dropdown with the 252 countries:

<https://gist.github.com/nicolsc/77b8a6f8726bc9b48f43dc3737b1220b>

**Choose the option that best describes you:**

- I hold a degree that is lower than a Master's or equivalent.
- I currently hold a Master's degree or equivalent, and this is my highest degree.
- I am a PhD candidate.
- I hold a PhD degree and I am a PhD supervisor..
- I hold a PhD degree, but I am not a PhD supervisor.

**What is the main field of your study, research or work?**

- Education
- Arts and humanities
- Social sciences, journalism and information
- Business, administration and law
- Natural sciences, mathematics and statistics
- Information and Communication Technologies
- Engineering, manufacturing and construction
- Agriculture, forestry, fisheries and veterinary
- Health and welfare
- Services
- Other

**Is your study, research or work related to Technology-Enhanced Learning?**

- Yes
- No

**Section 2 - Characteristics of educational resources**

This section was adapted from an assessment tool developed by João Maria Gomes Henriques (2016) in his dissertation "*Catálogo de características para análise e avaliação de Recursos Educacionais Abertos (REA): ferramenta de avaliação no formato checklist*"

**According to your opinion, how relevant are these characteristics when searching for resources within the scope of doctoral education training?**

**Choose from 1 (not relevant) to 5 (highly relevant).**

		1	2	3	4	5	No answer
1	The resource has identification data: subject, author(s), co-author(s), developer(s), institution.						
2	It complies with accessibility criteria.						
3	The content has scientific rigor.						
4	The content conforms to the legislation on gender, diversity, inclusion.						

5	The content is according to environmental legislation.								
6	The didactic-methodological approach allows its recontextualization.								
7	The didactic-methodological approach allows its retemporalization (to reuse at another time).								
8	It has an open license (e.g. Creative Commons).								
9	It has an open license that permits open access, reuse, redesign, sharing, etc.								
10	Scientific articles, texts taken from the internet, sections or chapters of books are properly referenced with the identification of authors and their sources.								
11	The images, tables and charts are referenced.								
12	In the images, tables and charts the reference sources are indicated.								
13	It presents the credits of the team that participated in the production.								
14	The new versions indicate the author(s) of previous ones.								
15	It is in accordance with the rules of ethical standards of research with human beings and animals.								
16	It is completely free.								
17	The access is possible for any user.								
18	It allows the user to download it from the internet.								
19	It allows the user to download immediately (without the need for registration).								
20	It is available in public portals and open databases.								
21	It is easily accessible.								
22	It allows to be copied.								
23	It allows to be shared.								
24	It allows to be adapted or modified.								
25	It allows to be combined with other resources to create something new.								
26	It allows the user to redistribute copies of the original or remixed resource.								
27	It allows to be translated / doubled into another language.								
28	It allows to be adapted to special education.								

**Do you have any additional comments about which characteristics do you consider relevant when searching for resources within the scope of doctoral education training? Please, let us know.**

### **Section 3 - Factors for selecting educational resources**

This section was adapted from the survey developed by the Hewlett-funded OER Research Hub, an open research project based at The Open University (UK).

**According to your opinion, which of the following factors would make you more likely to select a particular resource when searching for resources within the scope of doctoral education training?**

**Choose from 1 (not likely) to 5 (very likely).**

		1	2	3	4	5	No answer
1	Evidence of interest in that resource (e.g. lots of downloads)						
2	The resource being recently created, uploaded or updated						
3	The resource being easy to download						
4	A description of learning objectives or outcomes being provided						
5	The resource being created/uploaded by a reputable/trusted institution or person						
6	The resource having an open license (e.g. Creative Commons)						
7	The resource having an open license allowing adaptation						
8	The length/complexity of the resource						
9	Use of interactive or multimedia content (e.g. video or quiz) in the resource						
10	Positive user ratings or comments about the resource						
11	Personal recommendation						
12	Having previously used this resource successfully						
13	The resource being relevant to my particular interests/needs						
14	The resource featuring a catchy title or attractive image(s)						
15	Being required to use a resource for a project or study task						
16	The resource having previously been used with others						
17	A detailed description of the resource content being provided						

**Do you have any additional comments about which factors would make you more likely to select a particular resource when searching for resources within the scope of doctoral education training? Please, let us know.**

## Section 4 - Formats of educational resources

This section was adapted from the survey developed by the Hewlett-funded OER Research Hub, an open research project based at The Open University (UK).

**According to your opinion, which of the following formats would make you more likely to select a particular resource when searching for resources within the scope of doctoral education training?**

**Choose from 1 (not likely) to 5 (very likely).**

		1	2	3	4	5	No answer
1	E-books						
2	Open Textbooks						
3	Whole courses						
4	Elements of a course (e.g. module/unit)						
5	Videos						
6	Audio podcasts						
7	Images						
8	Infographics						
9	Interactive games						
10	Lectures						
11	Tutorials						
12	Quizzes						
13	Lesson plans						
14	Data Sets						
15	Learning tools, instruments and software plugins						

**Do you have any additional comments about which formats would make you more likely to select a particular resource when searching for resources within the scope of doctoral education training? Please, let us know.**

## Final section

This section was adapted from *Opening Public Institutions: OER in North Dakota and the Nation* (Spilovoy & Seaman, 2015).

**If you were to describe the concept of Open Educational Resources to someone, which of the following characteristics would you include in your description?**

	would include	may or may not include	not include	No answer
available for free				

can be edited, adapted or modified				
easy to edit, adapt or modify				
can be shared and redistributed				
can be combined with other materials				
easy to combine with other materials				
must include some license				
must attribute to the original author				

**What is your level of confidence regarding your answers above?**

- 1: none
- 2: low
- 3: medium
- 4: high
- 5: expert
- No answer

**Please, write here any final comments you might have.**

Thank you for participating in this survey. Should you have any questions, please do not hesitate to contact Lorena Sousa ([lorena@ua.pt](mailto:lorena@ua.pt)).

## Appendix B

### Confirmation letter from the Data Protection Officer

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universidade  
de aveiro

encarregado de proteção de dados | data protection officer | epd@ua.pt

Organiz

#### Confirmation Letter

I, the undersigned official designated Data Protection Officer of Aveiro's University (UAv), hereby certify that all personal data collection and processing that will be performed as part of the project "Developing Open Educational Resources for doctoral education training: an Educational Design Research approach" as sustained by the local project managers, **Lorena Azevedo de Sousa**, will occur in the exact terms of the European (GDPR) and Portuguese legislation on that matter in practice on this University.

Aveiro, 14 december 2022

Data Protection Officer,



Fernando Ferreira Batista

# Appendix C

## Slide presentation: DE-TEL Spring Webinars 2021

### Design-Based Research in Technology-Enhanced Learning

Lorena Sousa  
University of Aveiro  
Portugal

Viktoria Pammer-Schindler  
Graz University of Technology  
Austria

Laia Albó  
Universitat Pompeu Fabra  
Spain

**DETEL**  
Webinar series 2021

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### Learning outcomes

- After the course, you will...
- ... be familiar with Design-Based Research (DBR) as a research method, including terminology, definitions and characteristics.
  - ... understand different categories of research questions, research functions and research designs;
  - ... be introduced to DBR phases (analysis, development and evaluation); and different models for conducting DBR in technology-enhanced learning
  - ... be introduced to a hierarchical principle of evaluating learning interventions.

### Agenda

- Definitions
- Other terminologies
- Research questions, research functions and research designs
- DBR models, phases and characteristics
- Activity
- Field studies as evaluation method in DBR

### What is DBR?



Piomp (2013)

### What is DBR?

"design research encompasses the systematic study of designing, developing and evaluating educational interventions"



Piomp (2013, p.11)

### What is DBR?

"educational research is often divorced from the problems and issues of everyday practice – a split that resulted in a credibility gap and creates a need for new research approaches that speak directly to problems of practice and that lead to the development of 'usable knowledge'."



Design-Based Research Collective (2003, p.5)

### What is DBR?

"Most educational research describes or evaluates education as it currently is. Some educational research analyzes education as it was. Design research, however, is about education as it *could be* or even as it *should be*."

Bakker (2018, p.3)

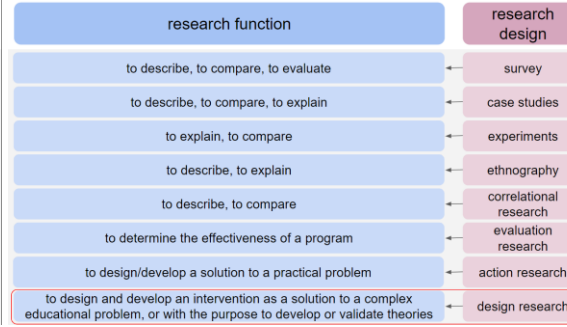
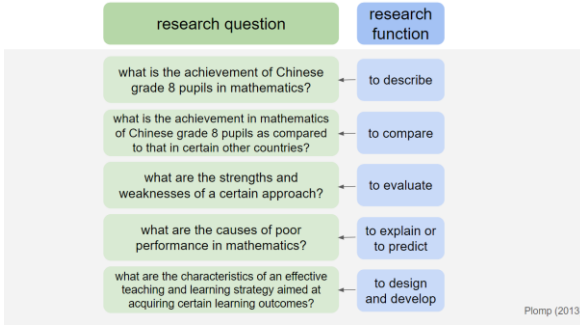


Reeves (2006); Piomp (2013)

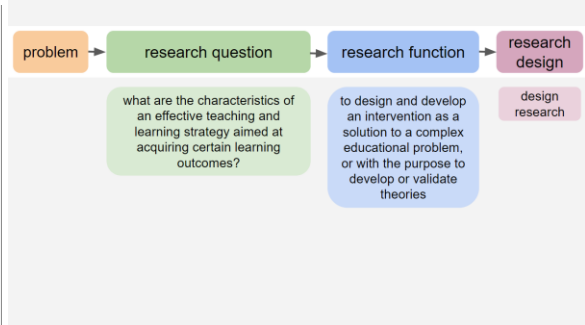
### Terminology

- design studies
- development or developmental research
- engineering research
- participatory action research
- design-based implementation research

Plomp (2013)



Action research	Design research
<b>similarities</b>	
solve real problems	
researchers + practitioners	
<b>differences</b>	
improvement of practice	generation of theory to solve problems
teacher initiates, researcher facilitates	researcher initiates and can have various roles



### The overall research question in design research

**What are the characteristics of an intervention x for the purpose/outcome Y in context Z?**

Plomp, 2013

What are the characteristics of an intervention for promoting academic research writing which will best support graduates in education in the proposal stage of their research?  
Dowse & Howie, 2013

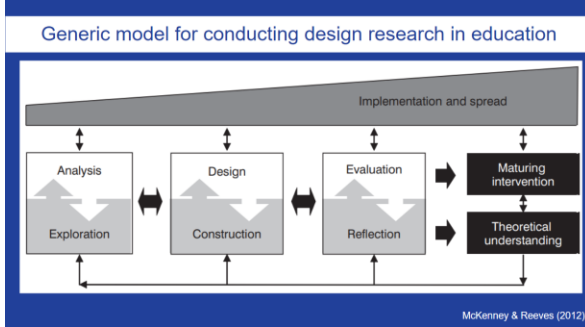
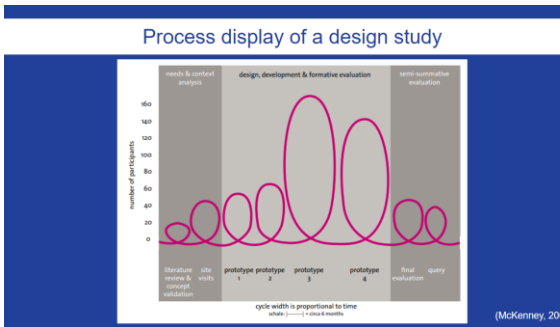
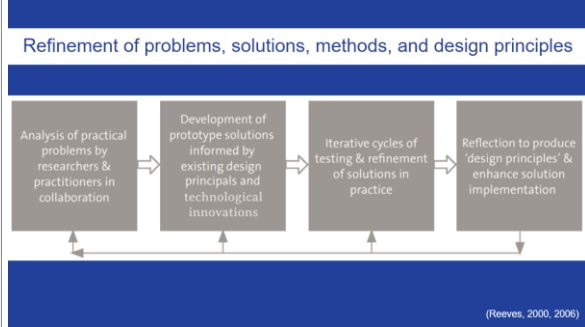
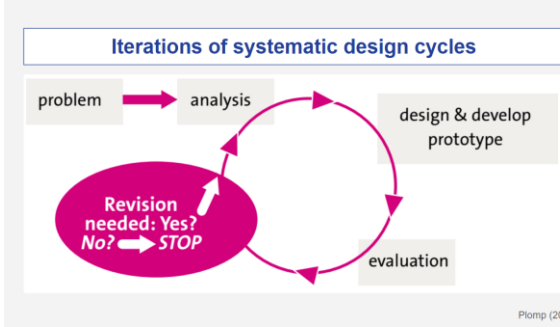
What are the characteristics of micro-scale chemistry curriculum materials so that they contribute to the implementation of effective practical work in chemistry teaching in Tanzania schools?  
Mafumko, Voogt, & van den Akker, 2013

### Research question - activity

Think of some examples of educational problems from your context and how you can design and develop an intervention as a solution.

Remember: interventions can be: programs, learning environments, teaching-learning materials, products, systems, etc....

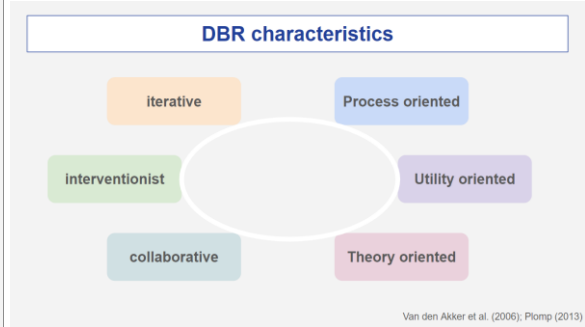
You must contextualize the problem and create the research question:  
**What are the characteristics of an intervention x for the purpose/outcome Y in context Z?**



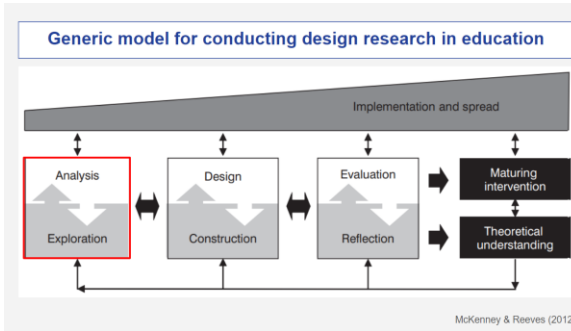
### Three main phases

<b>preliminary research</b> - needs and context analysis - review of the literature and of projects - development of a conceptual framework	<b>development or prototyping phase</b> - prototypes - formative evaluations - improving and refining the intervention	<b>assessment phase</b> - semi-summative evaluation
--	---	--

systematic reflection and documentation







## Analysis / Exploration

### [initial orientation]

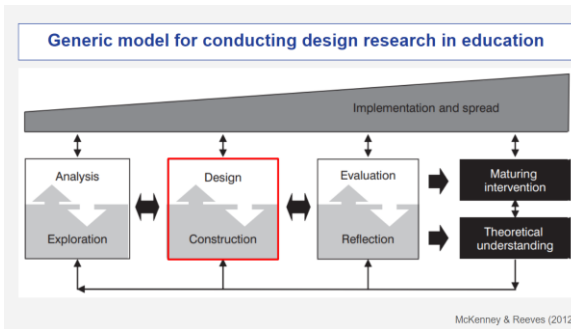
What do we want to know?

### [literature review]

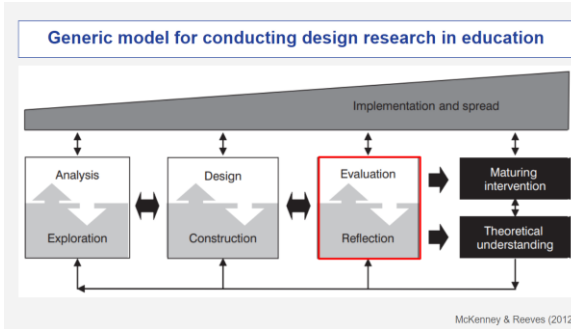
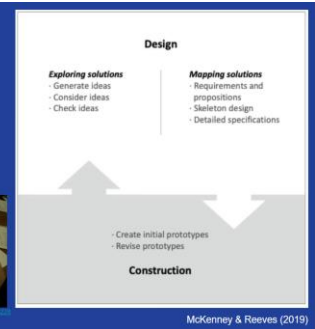
to understand how others have experienced similar problems, and how these problems were addressed

### [field-based investigation]

data are collected to describe the setting, its actors, mechanisms, and other relevant factors



## Design / Construction



## Evaluation / Reflection

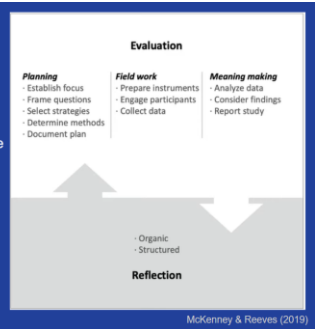
### [organic reflection]

a kind of intended contemplation

it takes place during times when there is very little agenda

### [structured reflection]

preparation  
image forming  
conclusion drawing



## Activity

1. Think of your research problem and how you can develop an intervention as a solution to it.
2. Contextualize the problem and write the research question using the following structure:  
*What are the characteristics of an intervention X for the purpose/outcome Y in context Z?*
3. Which activities do you plan to develop in the main three phases?  
1st phase: analysis / exploration  
2nd phase: design / construction  
3rd phase: evaluation / reflection

## References

### Introduction to DBR

- Bakker, A. (2018). *Design research in education: A practical guide for early career researchers*. London: Routledge
- Design-Based Research Collective. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher*, 32(1), 5-8.
- McKenney, S. (2001). *Computer based support for science education materials developers in Africa: Exploring potentials*. University of Twente, Enschede, The Netherlands. Retrieved from <http://doc.utwente.nl/75705/>
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- Plomp, T. (2013). Educational Design Research: an Introduction. In T. Plomp & N. Nieveen (Eds.), *An introduction to Educational Design Research* (pp. 11-50). Netherlands Institute for Curriculum Development.
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- Reeves, T. C. (2006). Design research from the technology perspective. In J. van den Akker, K. Gravemeijer, S. McKenney & N. Nieveen (Eds.), *Educational Design Research* (pp. 86-109). London: Routledge.
- van den Akker, J., Gravemeijer, K., McKenney, S., & Nieveen, N. (2006). *Educational design research*. London: Routledge.

## Appendix D

### Validation of the scientific content: form from Cycle 1

#### Validation of the scientific content on DBR for doctoral education training

This survey was built to guide you through the validation of the scientific content on Design-based Research for doctoral education training.

It consists of 21 questions, distributed over 5 sections.

At the end of each section, there is an open-ended question in case you need to add any additional comments.

Link to the first version of the prototype: <https://h5p.org/node/1265482>

#### This survey is anonymous.

The record of your survey responses does not contain any identifying information about you, unless a specific survey question explicitly asked for it.

If you used an identifying token to access this survey, please rest assured that this token will not be stored together with your responses. It is managed in a separate database and will only be updated to indicate whether you did (or did not) complete this survey. There is no way of matching identification tokens with survey responses.

#### Data policy

Participation in this survey is voluntary. Your answers will be registered electronically. The survey will not track any additional data, such as your IP address. All answers will be treated confidentially and remain anonymous. All published results will be anonymous. All data will be deleted at the latest 31 December 2023.

We will only use the data as described in this statement. All the data management processes are in line with the EU General Protection Data Regulation (GDPR). If you have any questions or need more information, please contact Lorena Sousa ([lorena@ua.pt](mailto:lorena@ua.pt)).

By pressing the “Next” button to proceed further, you provide us with permission to use your responses for the purposes of this research work as described above. Once you submit the survey, it will be impossible to retract your answer. Please do not include any personal identifiable information in your responses. As long as you can be identified in the collected data, you have the right to access the personal data that is being processed about you; request that your personal data is deleted; request that incorrect personal data about you are corrected/rectified; receive a copy of your personal data (data portability), and send a complaint to the Data Protection Officer at the University of Aveiro regarding the processing of your personal data.

**To continue please first accept our survey data policy.**

#### Section 1: Introduction, definitions and terminology (pages 1 and 2)

1. Content is useful and relevant  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
2. Content is accurate and reliable  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
3. Content is sufficient and meets learners' needs  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
4. Please, write here any additional comments you might have on this section:  
Open-ended question

#### Section 2: Research functions, research designs and research question (pages 3 and 4)

1. Content is useful and relevant  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
2. Content is accurate and reliable  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
3. Content is sufficient and meets learners' needs  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
4. Please, write here any additional comments you might have on this section:  
Open-ended question

**Section 3: Cycles, phases and main activities in each phase (pages 5 and 6)**

1. Content is useful and relevant  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
2. Content is accurate and reliable  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
3. Content is sufficient and meets learners' needs  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
4. Please, write here any additional comments you might have on this section:  
Open-ended question

**Section 4: Characteristics (page 7)**

1. Content is useful and relevant  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
2. Content is accurate and reliable  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
3. Content is sufficient and meets learners' needs  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
4. Please, write here any additional comments you might have on this section:  
Open-ended question

**Section 5: Reading recommendations and references (throughout the book, pages 8 and 9)**

1. They are useful and relevant  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
2. They are accurate and reliable  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
3. They are sufficient and meet learners' needs  
Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree
4. Please, write here any additional comments you might have on this section:  
Open-ended question

Do you have any additional comments about the scientific content? Please, let us know.

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Thank you for participating in this survey. Should you have any questions, please do not hesitate to contact Lorena Sousa ([lorena@ua.pt](mailto:lorena@ua.pt)).

## Appendix E

### Evaluation of the OER prototype: survey from Cycles 2 and 3

#### Formative evaluation of the OER prototype about DBR

Dear colleague,

My name is Lorena Sousa (lorena@ua.pt) and I am a PhD candidate in Multimedia in Education at the University of Aveiro, Portugal.

This survey is part of my PhD investigation on the development of Open Educational Resources (OER) for doctoral education training in Technology-Enhanced Learning (TEL), and I am under the supervision of professors Luis Pedro and Carlos Santos.

The objective of this survey is to evaluate the OER prototype so that I can make adjustments and improvements until we have a final version.

Thank you for your interest in participating in this survey. Its completion will take about 10 minutes.

#### **This survey is anonymous.**

The record of your survey responses does not contain any identifying information about you, unless a specific survey question explicitly asked for it.

If you used an identifying token to access this survey, please rest assured that this token will not be stored together with your responses. It is managed in a separate database and will only be updated to indicate whether you did (or did not) complete this survey. There is no way of matching identification tokens with survey responses.

#### **Data policy**

Participation in this survey is voluntary. Your answers will be registered electronically. The survey will not track any additional data, such as your IP address. All answers will be treated confidentially and remain anonymous. All published results will be anonymous. All data will be deleted at the latest 31 December 2023.

We will only use the data as described in this statement. All the data management processes are in line with the EU General Protection Data Regulation (GDPR). If you have any questions or need more information, please contact Lorena Sousa (lorena@ua.pt).

By pressing the “Next” button to proceed further, you provide us with permission to use your responses for the purposes of this research work as described above. Once you submit the survey, it will be impossible to retract your answer. Please do not include any personal identifiable information in your responses. As long as you can be identified in the collected data, you have the right to access the personal data that is being processed about you; request that your personal data is deleted; request that incorrect personal data about you are corrected/rectified; receive a copy of your personal data (data portability), and send a complaint to the Data Protection Officer at the University of Aveiro regarding the processing of your personal data.

**To continue please first accept our survey data policy.**

#### **1. User Experience Questionnaire**

For the assessment of the Open Educational Resource, please fill out the following questionnaire. The questionnaire consists of pairs of contrasting attributes that may apply to the resource. The circles between the attributes represent gradations between the opposites. You can express your agreement with the attributes by ticking the circle that most closely reflects your impression.

Please, decide spontaneously. It is your personal opinion that counts. Please remember: there is no wrong or right answer!

	1	2	3	4	5	6	7		
annoying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	enjoyable	1
not understandable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	understandable	2
creative	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	dull	3
easy to learn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	difficult to learn	4
valuable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	inferior	5
boring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	exciting	6
not interesting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	interesting	7
unpredictable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	predictable	8
fast	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	slow	9
inventive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	conventional	10
obstructive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	supportive	11
good	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	bad	12
complicated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	easy	13
unlikable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	pleasing	14
usual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	leading edge	15
unpleasant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	pleasant	16
secure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	not secure	17
motivating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	demotivating	18
meets expectations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	does not meet expectations	19
inefficient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	efficient	20
clear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	confusing	21
impractical	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	practical	22
organized	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	cluttered	23
attractive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	unattractive	24
friendly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	unfriendly	25
conservative	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	innovative	26

## 2. The 5R<sup>76</sup>

OER is any teaching, learning, or research material that is either in the public domain or licensed in a manner that provides everyone with free and perpetual permission to engage in the 5R activities.

Considering these 5R activities, what are your perceptions of the OER prototype about DBR?

It is possible to **retain** the content, that is, to make, own, and control a copy of the resource (e.g., download and keep your own copy).

Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree

It is possible to **revise** the content, that is, to edit, adapt, and modify your copy of the resource (e.g., translate into another language).

Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree

It is possible to **remix** the content, that is, to combine your original or revised copy of the resource with other existing material to create something new (e.g., make a mashup).

Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree

It is possible to **reuse** the content, that is, to use your original, revised, or remixed copy of

<sup>76</sup> This part was included only in the survey of Cycle 2.

the resource publicly (e.g., on a website, in a presentation, in a class).

Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree

It is possible to **redistribute** the content, that is, to share copies of your original, revised, or remixed copy of the resource with others (e.g., post a copy online or give one to a friend).

Strongly disagree - Disagree - Neither agree nor disagree - Agree - Strongly agree

### 3. Opinion about the resource

What did you like the most about this resource? List the most positive aspect(s):  
[open-ended]

What did you like the least about this resource? List the most negative aspect(s):  
[open-ended]

What are your desirable additions or modifications to this resource? Write here your suggestions for improvements:  
[open-ended]

### 4. Personal background

#### What is your age?

- Below 20
- 20-29
- 30-39
- 40-49
- 50 and above
- Prefer not to specify
- No answer

#### What is your gender?

- Female
- Male
- Prefer not to specify
- No answer
- Other

#### Choose the option that best describes you:

- I hold a degree that is lower than a Master's or equivalent.
- I currently hold a Master's degree or equivalent, and this is my highest degree.
- I am a PhD candidate.
- I hold a PhD degree and I am a PhD supervisor..
- I hold a PhD degree, but I am not a PhD supervisor.

#### What is the main field of your study, research or work?

- Education
- Arts and humanities
- Social sciences, journalism and information
- Business, administration and law
- Natural sciences, mathematics and statistics
- Information and Communication Technologies
- Engineering, manufacturing and construction
- Agriculture, forestry, fisheries and veterinary
- Health and welfare
- Services
- Other

**Is your study, research or work related to Technology-Enhanced Learning?**

Yes

No

**Country of residence:**

dropdown with the 252 countries:

<https://gist.github.com/nicolsc/77b8a6f8726bc9b48f43dc3737b1220b>

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Thank you for participating in this survey. Should you have any questions, please do not hesitate to contact Lorena Sousa ([lorena@ua.pt](mailto:lorena@ua.pt)).

# Appendix F

## Workshop: Creating Open Educational Resources with H5P

### Learning outcomes

After this workshop, the participants will...

- ... get to know the H5P tool and its functionalities;
- ... be familiar with some key OER concepts, such as the 5R activities;
- ... have some ideas about how these key OER concepts can be applied and explored with the H5P tool;

### Section description

This session is organized into three main parts:

#### 1. Introduction and overview

- Icebreaker;
- Brief introduction to key concepts of Open Educational Resources and the 5R (retain, reuse, revise, remix, redistribute);
- Presentation of the H5P tool and its functionalities;
- Ideas of how to create Open Educational Resources with the H5P.

#### 2. Hands-on activity

- Participants explore the H5P tool and create an Open Educational Resource about a given topic (e.g., presentation of the city where they are from or a city they would like to visit someday);
- 2-minute pitch to present what they have done;
- Then, they choose an OER created by others, and explore how to share and reuse the content, adding some more information.<sup>77</sup>

#### 3. Evaluation

- They present the challenges and difficulties they faced during the practical activity. A link to padlet is going to be provided so that they can post there their ideas;
- Finally, they evaluate an OER prototype built with H5P using the User Experience Questionnaire.

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<sup>77</sup> This activity was executed only in the second workshop of Cycle 2.



# Appendix G

## Workshop: Design-based research: an introduction

### Learning outcomes

After this workshop, the participants will...

- ... be familiar with Design-Based Research (DBR) as a research method, including some definitions, other terminologies and research question;
- ... be introduced to different models for conducting DBR, their phases (analysis, development and evaluation) and characteristics;

### Section description

This session is organized into three main parts:

**Introduction** | warm-up, learning outcomes and agenda

#### **Warm-up**

- (1) area of investigation or main topic of research
- (2) stage of studies: a) not written the project; b) writing the project; c) the project is ready
- (3) Research method: a) DBR?; b) not DBR?; c) don't know yet.

**Part 1** | Introduction to DBR

- Definitions and other terminologies
- Research functions and research approaches
- DBR research question

**1<sup>st</sup> activity** problem + research question

Think of some examples of problems from your context and how you can design and develop an intervention as a solution. You must contextualize the problem and create the research question.

**Part 2** | DBR models, phases and characteristics

**Part 3** | Main activities of each phase

**2<sup>nd</sup> activity** main activities of each phase

Which activities do you plan to develop in the main three phases?

**Conclusions** | Evaluation of the prototype about DBR

## Appendix H

### Free and informed consent form

# TERMO DE CONSENTIMENTO LIVRE E INFORMADO<sup>78</sup>

## INFORMAÇÃO AO PARTICIPANTE

Este documento pretende informá-lo relativamente aos objetivos do trabalho que pretendemos realizar, informando-o de todas as condições de participação e explicando a forma como estabelecemos as necessárias garantias de confidencialidade e proteção de dados pessoais no que a si respeita.

A entrevista é a terceira e última fase de recolha de dados da tese de doutoramento “Developing Open Educational Resources to doctoral education training”, que está em fase de desenvolvimento no âmbito do Programa Doutoral em Multimédia em Educação da Universidade de Aveiro pela doutoranda Lorena Sousa, sob orientação científica do Professor Doutor Luís Pedro e coorientação científica do Professor Doutor Carlos Santos.

Este estudo destina-se a desenvolver Recursos Educacionais Abertos para programas doutorais na área de Technology-Enhanced Learning, mais especificamente um recurso sobre a abordagem metodológica Design-based Research. A sua participação é fundamental porque contribuirá com os ajustes finais e validação do recurso.

A entrevista será conduzida pela investigadora Lorena Sousa e terá a duração estimada de 30 minutos.

Para facilitar a recolha e a análise da informação, pretendemos também proceder à gravação do áudio da entrevista com o objetivo de transcrevê-lo para análise no NVivo.

Informa-se ainda que:

- A investigação de doutoramento tem como objetivos: (O1) Analisar o uso de Recursos Educacionais Abertos em programas doutorais; (O2) Identificar que características podem contribuir para tornar estes recursos mais atrativos; (O3) Desenvolver um Recurso Educacional Aberto para aprendizagem de métodos de investigação em programas doutorais em Technology-Enhanced Learning; (O4) Avaliar o Recurso Educacional Aberto desenvolvido.
- Todo o processo será confidencial, salvaguardando-se que apenas a investigadora responsável pelo projeto conhecerá a identidade dos participantes para que possa ser realizada a transcrição da entrevista.
- Os dados recolhidos serão armazenados no OneDrive (e-mail @ua.pt) da Universidade de Aveiro, plataforma que permite armazenar dados com segurança, protegidos por login e password do utilizador, garantindo o controlo de acessos. Estes dados serão acedidos apenas pela investigadora Lorena Sousa, para fins estritamente académicos e científicos a fim de concretizar os objetivos de investigação acima descritos.
- Os únicos dados pessoais coletados na entrevista será o áudio, que será transcrito de forma manual para análise no NVivo. A gravação da entrevista será realizada pelo Zoom e ficará conservada no OneDrive até maio de 2023, tempo necessário para transcrição da entrevista e tratamento dos dados. Já a transcrição anonimizada será conservada por pelo menos cinco anos (de acordo com o recomendado pelo Código de Conduta da FCT, aderido pela Universidade de Aveiro).

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<sup>78</sup> Este termo de consentimento segue as regras do Regulamento Geral de Proteção de Dados (RGPD). Para tal, foi ouvida a equipa RGPD da Universidade de Aveiro (UA).

- A sua participação é completamente voluntária e a decisão de não participar, total ou parcialmente, não lhe trará qualquer prejuízo. Poderá desistir a qualquer momento e, se assim o desejar, a informação já recolhida poderá ser imediatamente destruída.
- Ao aceitar participar e na qualidade de titular dos seus dados pessoais informa-se ainda que terá o direito, enquanto aplicável a:
  1. aceder aos seus dados e a receber informação sobre o processamento dos seus dados pessoais;
  2. retificar quaisquer imprecisões sobre os seus dados pessoais durante o período de recolha ou de tratamento dos mesmos;
  3. solicitar o apagamento dos seus dados pessoais;

Para isso, devem entrar em contato com a investigadora responsável pelo tratamento dos dados através do contato de e-mail [lorena@ua.pt](mailto:lorena@ua.pt), que deverá agir de acordo com as suas pretensões.

Também e se assim o entender, pode apresentar dúvidas ou colocar questões ao Encarregado de Proteção de Dados da Universidade de Aveiro, pelo email [epd@ua.pt](mailto:epd@ua.pt), ou através de carta dirigida ao Encarregado de Proteção de Dados, Universidade de Aveiro, Edifício da Antiga Reitoria, piso 4, Campus de Santiago, 3810-193, Aveiro. Poderá ainda e a qualquer momento apresentar uma reclamação perante a autoridade responsável - Comissão Nacional de Proteção de Dados (CNPD), se entender que os seus direitos sobre os seus dados pessoais foram infringidos.

**Para que possamos tratar os seus dados, necessitamos do seu consentimento, que deve ser livre, explícito, inequívoco e informado. Nestes termos e presente toda a informação supra, muito agradecemos proceda à escolha da opção que melhor entenda:**

Declaro, ao abrigo do RGPD e da LPDP, que dou o meu consentimento para a recolha e tratamento dos meus dados pessoais, necessário à execução do projeto identificado.

Declaro, ao abrigo do RGPD e da LPDP, que não dou o meu consentimento para a recolha e tratamento dos meus dados pessoais.

O presente formulário é assinado no dia: \_\_\_/\_\_\_/\_\_\_\_\_ em \_\_\_\_\_ (indicar o local em que assina o formulário)

\_\_\_\_\_  
(Assinatura do Responsável pela Recolha dos dados, conforme documento de identificação)

\_\_\_\_\_  
(Assinatura do Participante, Titular dos dados, conforme documento de identificação)

# Appendix I

## Interview guide

### Introdução

Bom dia / Boa tarde

Primeiramente, gostava de agradecer a disponibilidade do(a) professor(a) para participar desta entrevista.

O objetivo principal desta entrevista é validar a versão final de um Recurso Educacional Aberto sobre Design-based Research que foi criado para o contexto de mestrados e doutoramentos na área de Technology-enhanced Learning. O protótipo deste recurso passou por três ciclos de avaliação formativa através da dinamização de workshops com estudantes de mestrado e doutoramento, investigadores e professores e agora estamos na fase final desta avaliação.

[ Apresentação do recurso - se necessário ]

Gostava de confirmar se o professor leu o termo de consentimento e se podemos prosseguir com a gravação.

[ início da gravação ]

O(A) professor(a) declara, ao abrigo do RGPD e da LPDP, que dá o seu consentimento para a recolha e tratamento dos seus dados pessoais, necessário à execução desta investigação?

### Parte 1 | Metodologias de investigação e DBR

O(A) professor(a) ensina e/ou é especialista na área das metodologias de investigação e/ou DBR... Pode, por favor, contar um pouco sobre esta experiência (se já lecionou a unidade curricular das metodologias, se já utilizou e/ou orientou algum estudante que utilizou o DBR, etc.)? / O professor tem alguma experiência no ensino das metodologias de investigação? Se sim, poderia falar um pouco sobre essa experiência? / O professor tem alguma experiência no ensino do DBR? Já utilizou ou orientou algum aluno que utilizou esta abordagem metodológica?

### Parte 2 | Avaliação do protótipo: 5R

**[revise]** Se o(a) professor(a) tivesse a oportunidade de revisar este conteúdo, ou seja, editar, adaptar e modificar este recurso, o que mudaria?

**[remix]** Se o(a) professor(a) tivesse a oportunidade de remixar este conteúdo, isto é, combinar este recurso com algum outro material existente para criar um novo, com que materiais gostava de remixar?

**[reuse]** Se o(a) professor(a) tivesse a oportunidade de reutilizar este conteúdo, em que contexto reutilizaria?

**[redistribute]** Se o(a) professor(a) tivesse a oportunidade de partilhar este conteúdo, seja a versão original, adaptada ou remixada, com outras pessoas, com quem partilharia?

### Parte 3 | Avaliação do protótipo: aspectos positivos e negativos

O que você mais gostou neste recurso? / Quais os aspectos mais positivos?

O que você menos gostou neste recurso? / Quais os aspectos negativos?

Alguma sugestão de melhoria ou comentário adicional em relação ao recurso?

#### **Parte 4 | Conceito e aplicação dos REA**

O que entende sobre Recurso Educacional Aberto? Como o professor define os Recursos Educacionais Abertos?

Ao preparar o conteúdo e materiais para as aulas, tende a criar algo do zero ou reutiliza materiais disponíveis?

O professor tem o hábito de partilhar os materiais didáticos com alunos e outros professores? Ao partilhar estes materiais, utiliza alguma licença aberta?

Acha que os Recursos Educacionais Abertos são interessantes / relevantes / úteis para o seu contexto? Concorda com os princípios dos Recursos Educacionais Abertos? Acha que são praticáveis?

#### **Conclusão**

Para finalizar, gostava de agradecer mais uma vez a disponibilidade em participar desta entrevista e perguntar se o(a) professor(a) tem algum comentário adicional a fazer.

Muito obrigada.

## Appendix J

### Transcription of the interviews

#### INTERVIEW 1

##### Parte 1 | Metodologias de investigação e DBR

**O professor é especialista na área das metodologias de investigação, em DBR... O professor poderia contar um pouco sobre esta experiência, se já lecionou ou se já orientou algum aluno, estudante de mestrado ou de doutoramento, que utiliza ou utilizou o design-based research?**

Vários. Orientei vários trabalhos. Vários trabalhos de mestrado e também de doutorados. Estou precisamente a orientar agora dois, aliás, três que recorrem ao design-based research.

**O professor leciona metodologias?**

Sim, metodologias de investigação também no âmbito tanto do doutorado em Didática das Ciências como também no mestrado em Inovação em Educação.

##### Parte 2 | Avaliação do protótipo: 5R

**Em relação ao recurso sobre design-based research, se o professor tivesse a oportunidade de revisar este conteúdo, ou seja, editar, adaptar, modificar... O que o professor mudaria?**

Eu creio que o vosso recurso reúne o que são os aspectos mais importantes e também as referências mais importantes sobre o design-based research. Tal como ele está apresentado e perante também as atividades que propõe, que inclui, sempre depreendi que seria um recurso educativo, um recurso educativo digital. Considero que está bastante bem feito, muito bem fundamentado. Há um aspecto que, na minha opinião, não se trabalha e que, na minha opinião, deveria trabalhar-se. Mas não sei também bem como é que aqui se poderia incluir porque isto quase que está construído como se fosse um tutorial, algo que a pessoa consegue, através de várias fases, consegue ir construindo um conhecimento sobre esta metodologia. No entanto, eu aqui sinto falta de interação entre as pessoas. Sinto aqui alguma falta de interação entre, por exemplo, colegas que estejam no mesmo nível, que haja uma componente aqui qualquer que remeta para a discussão, por exemplo, dos trabalhos feitos, das respostas dadas por diferentes colegas, da forma que possam discutir diferentes perspectivas. Sinto falta dessa interação.

**E se o professor tivesse a oportunidade de remixar este conteúdo com algum outro material existente, com que materiais gostava de remixar?**

Eu não conheço nenhum material que reúna tudo isto e material feito com este objetivo não. Conheço alguns aos quais recorrem e que eu considero serem particularmente completos, não só pelos esquemas que disponibilizam, as ideias que apresentam, mas também até os conselhos práticos que dão, por exemplo, relativamente a como construir uma questão de investigação ou um problema de investigação com design-based research, como depois construir o que podem ser as conclusões do design-based research e foi incluído aqui. Eu creio que esse artigo é precisamente aquilo que eu considero mais útil para os alunos conseguirem compreender alguma sutileza no que diz respeito à construção de questões de investigação com o design-based research e depois que conclusões podem ser tiradas a partir deste tipo de metodologia. Agora, recurso educativo digital não conheço nenhum sobre design-based research logo não conheço nenhum que tenha as vossas, pronto, que cubra todas as diferentes fases e que seja tão completo.

**Se o(a) professor(a) tivesse a oportunidade de reutilizar este conteúdo, em que contexto reutilizaria?**

Creio que seria perfeitamente utilizável na formação a nível de metodologia de

investigação, de alunos de vários níveis, tanto ao nível de mestrado quanto ao nível de doutoramento. Logo eu creio que algo de sempre de incluir num espaço, por exemplo, Moodle dedicado a essas disciplinas e que incluía precisamente este recurso, creio que seria particularmente útil.

### **Parte 3 | Avaliação do protótipo: aspectos positivos e negativos**

#### **O que professor mais gostou neste recurso, o que chamou mais atenção?**

Precisamente o fato de acabar por resumir, por incluir tudo aquilo que são o que eu considero ser os aspectos principais e, por exemplo, aquilo que eu costumo abordar nas minhas, principalmente numa sessão que eu tenho organizado precisamente sobre design-based research e que também tenho organizado no âmbito das sessões de metodologia de investigação, no âmbito do doutoramento em tecnologias e educação. E logo, por exemplo, num Powerpoint em que me baseei para estimular a discussão sobre esta metodologia acaba por utilizar a maior parte, se não a totalidade, dos esquemas que estão aqui, retirados de vários autores. Não sei, inclusivamente, se a Lorena teve oportunidade de assistir alguma dessas sessões sobre design-based research.

#### **Tive sim, professor. Foi ótima, muito esclarecedora.**

Logo viu também que muitos desses esquemas eu recorro a eles também nessa sessão. Logo eu acho que o que tem aqui é não só uma síntese, eu creio até inclusivamente que não se limita só a uma síntese. Tem, vai bastante mais além, logo acaba por quase como a funcionar como um capítulo sobre o design-based research, com informação que eu considero relevante e útil, seguindo precisamente uma sequência lógica que acaba por ser uma sequência particularmente lógica, acho que quer para quem está a preparar uma investigação, está a realizar uma investigação deste tipo, ou para quem está a estudar o tema.

#### **E o que o professor menos gostou neste recurso? Tem algum outro aspecto além da falta de interação entre os alunos que o professor citou?**

A falta de interação é o principal aspecto, apesar de terem, pronto, colocado as várias atividades. Mas são atividades individuais, são atividades de reflexão, bom, acho muito bem, senti falta dessa interação. E talvez, não sei até que ponto é que isso possa ser uma crítica ou não, estou outra vez a olhar para o recurso. O recurso está construído de uma forma que, de certa forma, me lembra como páginas, seções de um livro. Creio que inclusivamente em algum sítio eu li que isso está a se referir mesmo a um livro, em algum sítio pareceu-me, segundo me recordo. Logo talvez o aspecto gráfico não seja o aspecto gráfico que eu considere mais apelativo, mas também cumpre perfeitamente os objetivos bastante bem. Mas talvez o aspecto gráfico pudesse ser ligeiramente mais apelativo.

#### **Tá bem. O H5P tem alguns tipos de conteúdos que podem ser utilizados e eu utilizei o livro interativo, eu acho que foi isso que o professor deve ter visto. Além da questão gráfica, o professor tem alguma sugestão de melhoria do conteúdo ou comentário adicional em relação ao recurso?**

Não, Lorena. Acho que... Bom, talvez por acaso aqui incluisse alguma coisa, depende do contexto, pelo contexto em que isto vai ser aplicado, pronto, em contexto de formação de doutoramento mas resta saber aonde. Se for inserido em um projeto internacional, ótimo. Se for inserido num programa nacional, pode ser em Portugal, pode ser no Brasil, creio que teria que ser feito algo de forma a incorporar mais, por exemplo, ou artigos em língua portuguesa, ou dissertações, teses, segundo DBR; ou partes de, ou ideias, ou os problemas de investigação que estavam ali a ser trabalhados. É apenas nesse aspecto. Talvez uma ligeira adaptação em termos dos materiais que são propostos para consulta. Há alguns aqui que não há, não conseguimos fugir a esses materiais que são de base, mas depois já em situações concretas, aí creio que seria agradável para as pessoas que estão a ler se identificariam mais se vissem trabalhos também feitos em Portugal ou no Brasil e, pronto, em espaços, em contextos próximos a cada um deles.

#### **Sim, é uma ótima ideia inserir exemplos de teses e dissertações, em português também, que utilizaram o DBR como exemplos práticos.**

Exato. E claro que podem selecionar aquelas que considerarem mais adequadas para este recurso.

#### **Parte 4 | Conceito e aplicação dos REA**

##### **Sobre os Recursos Educacionais Abertos, o que o professor entende sobre o conceito?**

O que é que eu entendo, é sobre a utilidade...?

##### **Definição, conceito...**

Bom, essa é uma definição extremamente aberta porque o que tem a dispor de importante aí é o ser aberto, ou seja, de livre acesso. Agora recursos educacionais ou educativos podem ser múltiplos, pode ser até um vídeo colocado no YouTube, pode ser um podcast, pode ser milhentas coisas. Agora um aspecto que valorizo particularmente é o fato de ser disponibilizado gratuitamente, sem dúvida. Pelo alcance que se consegue obter e que muitas vezes não nos passa pela cabeça mas ao longo de, se, por exemplo, nos envolvemos na construção desse tipo de recursos ou na divulgação de materiais sobre investigação, vamos passar algum tempo a ver o retorno disso porque começam a surgir imensas citações, imensas... Em resultado precisamente e principalmente de contextos onde as pessoas não têm acesso a muitos materiais. Precisamente porque há universidades que o conseguem fazer, pagar o acesso a isso, noutros países não consegue fazer. Logo daí o fato de terem materiais disponíveis gratuitamente, isso é particularmente útil e de valorizar. Para alguém que pretende também fazer conhecer o seu trabalho, é estratégico porque é uma forma de muitos terem acesso a esse tipo de trabalho.

##### **Ao preparar o conteúdo e materiais para as aulas, o professor tende a criar o conteúdo do zero ou reutiliza materiais disponíveis?**

Faço as duas coisas. Tudo porque quando eu preparo qualquer unidade curricular ela centra-se muito precisamente no espaço moodle e espaço moodle que em que apresenta sempre uma estrutura, pode ser por módulos, pode ser por temática, mas também pode ser inclusivamente quase aula aula, na medida em que em que cada aula ou grupos de aula correspondem a um determinado tema, logo mobilizo para esses temas, posso perfeitamente e costumo fazê-lo, quer integrar vídeos, quer artigos, exemplos de investigação feita a recorrer a determinadas metodologias, vídeos em que determinadas pessoas discutem determinado... Estou a falar só agora, por exemplo, o caso da metodologia de investigação. Ou então também construir recursos ou pedir também a construção de recursos educativos digitais recorrendo, por exemplo, a ferramentas da web 2.0. Outra coisa que eu também utilizo são podcasts sobre metodologia também, mas muitas vezes peço também aos alunos para construir algum tipo de recurso desse género, precisamente porque o fato de construírem o recurso educativo para ensinar outros implica clarificarem muito bem determinado aspecto na sua na sua cabeça. Logo e depois também darem todo, fazerem todo um guião, como tenho certeza que a Lorena fez, um guião sobre como estruturar esse recurso da forma mais eficaz, em que permitisse, facilitasse a construção do conhecimento sobre sobre esta metodologia e ao mesmo tempo desenvolver as competências necessárias à formulação das questões de investigação, à obtenção depois da conclusão, construção de conclusões, tudo isso. Logo, creio que a disponibilização deste tipo, de forma gratuita, deste tipo de recursos é extremamente útil e, por exemplo, quando tiver o vosso disponibilizado terei muito gosto em incluí-lo também nesses espaços.

##### **Com certeza divulgarei para o professor assim que tivermos a versão final. Em relação à partilha destes materiais didáticos, o professor utiliza alguma licença aberta ao disponibilizar estes materiais, os slides que o professor produz, por exemplo?**

Sim. Depende dos contextos mas de uma maneira geral utilizo. Utilizo muitas vezes até a licença mais aberta que é a que as pessoas estão livres de utilizar desde que reconheçam a autoria. É o que eu costumo fazer.



**O professor falou que essa ideia da utilização dos Recursos Educacionais Abertos é bem interessante e bem útil para o contexto da educação. O professor concorda com os princípios dos Recursos Educacionais Abertos? Acha que esses princípios são praticáveis?**

Eu creio que sim. Aliás, sempre apostei nisso na medida em que até fui responsável pela criação de uma das primeiras revistas online gratuitas, ou seja, de acesso livre, que foram criadas em Portugal, que foi a Revista Interações na altura, pronto, do Instituto Politécnico do Santarém, e que foi criada uma revista que já tem imensos anos. E tenho continuado sempre a trabalhar também como editor de revistas de livre acesso. Logo, acredito precisamente nisso como uma forma de assegurar o acesso à investigação, a materiais a determinadas populações que de outra forma não teriam acesso. Claro que mesmo assim para essas populações terem acesso à internet e terem capacidade já desenvolvidas para saberem como aceder e como utilizar, também não é para todos, sem dúvida. Mas pelo menos é algo que, o fato de ser de acesso livre já facilita o acesso a algumas pessoas. Logo, sou um apoiante total desse tipo de iniciativa sem dúvida.

**O professor falou também que gosta de fazer atividades em que os próprios alunos produzem o material e desenvolvem o conteúdo. E esse cuidado com a qualidade do conteúdo, o professor acha que é possível produzir bons materiais mesmo tendo alunos adaptando ou revisando estes conteúdos?**

Eu creio que sim. Aliás em qualquer uma dessas, e agora estou a falar noutra componente, unidades curriculares que coordeno sobre concessão de recursos educativos digitais. Começamos precisamente por discutir critérios de qualidade desses recursos educativos digitais. E, atenção, não impondo listas de critérios, mas pelo menos para que todos eles tenham contato, todos os alunos tenham contato com critérios propostos por vários autores, de forma que eles possam apropriar de alguns desses critérios e os utilizem também na construção desses recursos. Claro que eu depois também tenho, e isso funciona também, um conjunto de critérios de avaliação porque precisamente nessas unidades curriculares eles têm que conceder os recursos educativos, adaptados à realidade que eles quiserem, mas em que eu lhes dou desde o início quais são os critérios, os critérios de avaliação que vou utilizar e que muitos desses critérios de avaliação correspondem aos critérios de qualidade de um recurso educativo digital. Logo, é uma forma de, de certa forma, também os obrigar a seguir esses critérios e precisamente são os critérios que irei ter em conta. Logo eles irão orientar-se segundo esses critérios, aumentando a probabilidade de qualidade nesses recursos. Claro que é tudo muito relativo porque se eu pensar nos primeiros recursos que desenvolvi há muitos anos, se eu olhar para eles agora, olho de uma forma crítica e digo “bom agora eu incluiria também isto ou aquilo, ou outro aspecto”. Logo é relativo isso da qualidade. E o que pode funcionar com os alunos que eu conheço poderá não funcionar tão bem com outros alunos que eu não conheço. Logo daí a importância de cada um adaptar e integrar esses módulos eventualmente se for, se esses recursos educativos digitais tiverem sobre, construídos sobre a forma de módulos, poderem integrá-los da forma que eles considerarem mais adequados ao contexto onde estão a trabalhar.

**E estes conteúdos que os alunos produzem utilizam alguma licença aberta?**

Isso agora dependerá deles. Mas de qualquer forma os materiais são disponibilizados, são construídos em primeiro lugar com ferramentas da web 2.0, ou seja, de livre acesso e que são divulgados depois também em espaços também de livre acesso. São materiais que são desenvolvidos para serem divulgados em redes sociais, em páginas web ou em determinados locais. Logo, já são também elaborados com essa perspectiva de permitir o livre acesso e se destinarem claro a alunos. E esses materiais também são construídos também sempre na perspectiva, não pra depois os alunos apenas os utilizarem lendo ou participando (*segmento de texto incompreensível*), mas são construídos hoje na perspectiva de envolver o leitor, a pessoa que está a utilizar, também eles, na construção de algo utilizando estes mesmos recursos. Logo, é sempre na perspectiva de estimular a utilização dos recursos que eles estão a ver ou que estão a utilizar e também a desenvolverem e serem capazes de desenvolver recursos educativos, eles próprios

também, independentemente de serem, de que nível educativo sejam. Numa escola, perfeitamente pode ser na escola básica, pode ser na escola secundária, ou seja, no ensino médio como dizem no Brasil, onde acharem melhor.

## **Conclusão**

**Bom, para finalizar, gostava de agradecer mais uma vez ao professor pela disponibilidade e perguntar se o professor tem alguma dúvida ou comentário adicional a fazer.**

Dúvidas nenhuma. Comentário, dar-lhe os parabéns pelo trabalho feito. Desejar-lhe melhores felicidades, Lorena, e sempre que precisar de alguma coisa, diga-me. Terei imenso prazer em falar consigo, em conversarmos sobre o que precisar, tá bem?

**Tá bem, professor. Muito obrigada e uma boa tarde.**

## **INTERVIEW 2**

### **Parte 1 | Metodologias de investigação e DBR**

**O professor ensina e é especialista na área das metodologias de investigação. O professor poderia, por favor, contar um pouco sobre esta experiência, e se orienta ou já orientou alunos que utilizaram o design-based research?**

Meu doutoramento foi em investigação em desenvolvimento. Fiz doutoramento também em multimédia em educação e na altura desenvolvemos um recurso educativo não aberto, era comercializável, mas depois ficou aberto, e nessa altura apliquei multi-métodos para investigação em desenvolvimento como estudo de caso. Depois o percurso ao estudo das metodologias ou a parte de investigação e a lecionação ou lecionamento deste tipo de unidades curriculares surgiu com o (*eliminação de conteúdo sensível*). Mais ou menos em meio do meu doutoramento 2009, 2010, eu terminei doutoramento em 2012, fui convidado para integrar uma equipa de autoria do (*eliminação de conteúdo sensível*), software de análise de dados qualitativos, e a partir daí comecei a fazer até um estudo mais focado nas metodologias de investigação qualitativas e atualmente até mistas. Em 2012, consegui, até integrei isso com um pós-doutoramento e esse pós-doutoramento, durante 3 anos, foi estudar metodologias de investigação e depois estudar o ponto de vista técnico do software para fazer a integração. Por isso, com base no que está a fazer, sim já tenho algum conhecimento da design-based research.

**O professor orienta algum aluno que utiliza o design-based research ou já orientou?**

Não, eu estou atualmente só como investigador. Só como investigador é muito difícil conseguir orientações. Gostava de ter tido a possibilidade de ter trabalhado com a Lorena, porque está numa área que a mim estimula bastante. Mas o único aluno que eu trabalhei com, apesar de ele ter definido ou defendido na tese que era investigação-ação, acho que com investigações realmente talvez fosse o (*eliminação de conteúdo sensível*). O resto, maior parte dos estudantes que eu orientei, foram poucos, mais de mestrado e têm áreas diferentes desta, a maioria estudo caso.

### **Parte 2 | Avaliação do protótipo: 5R**

**Em relação ao recurso educacional aberto sobre design-based research que foi partilhado com o professor, se o professor tivesse a oportunidade de editar, adaptar ou modificar este recurso, o que professor mudaria?**

É exatamente, chegamos a um ponto. Eu vou dizer isto partindo do pressuposto que a própria tecnologia que foi usada o (*segmento de texto incompreensível*), certo?

**Foi o H5P.**

Pode até ter limitado, mas pronto, no âmbito do que fez em termos de investigação é suficiente. Agora eu, obviamente, se fosse implementar, se pegássemos agora naquilo e dissesse assim “olhe, professor, eu tenho interesse em pegar naquilo e fazermos algo que

seja bastante mais user-friendly, interativo, mais fácil de usar, a colocar diferentes tipos de interações ou de formatos multimédia, ou seja, em vez de ter um texto tutorial, unicamente texto, meter um vídeo ter algum (*segmento de texto incompreensível*) a explicar algumas coisas algum... O que eu faria de diferente era torná-lo mais interativo e que fosse passível de ele ser apropriado pelo utilizador, ou seja, o que quero dizer com isto? A Lorena disponibilizava uma base, não sei se chegou a ler alguma coisa sobre (*segmento de texto incompreensível*), em que eu tenho uma base, por exemplo, eu teria a base daquilo que partilhou comigo, a seguir não dá continuidade mas eu tenho a possibilidade daquilo ser meu ponto de partida e acrescentar eu recursos meus ou bibliografia minha. Ou seja, eu próprio poder fazer a apropriação e o update consoante o meu referencial teórico. Quase como se seguissemos um diferente alinhamento da teoria fundamentada mais clássica ou a transformada. Ou seja, eu teria a possibilidade de ajustar aquela estrutura àquilo que eu pretendia. Por isso, as principais observações era deixá-lo mais aberto, ou seja, não ser uma ferramenta fechada, apenas pra consumo, em que eu pudesse, eu também enquanto utilizador, influenciar naquilo que eu uso e adaptar para mim e depois, com o tipo de tecnologia, torná-la, usando tipo de formatos para tornar mais atrativo.

**Sim, interessante. Inclusive no projeto DE-TEL, que é o projeto de que estou participando, eles estão utilizando o GitHub para criar o conteúdo. Mas também é muito mais complexo, para quem não tem um conhecimento mais técnico, editar este material.**

Sim, eu acredito que sim. Eu já usei o H5P em termos pessoais e para o projeto que está a fazer, que é de investigação, a não ser que existisse alguém que quisesse investir na tua área, é diferente. Para fazer recolha de dados, fazer a validação. Agora eu sinto falta disso porque o conteúdo está bastante, acho que fez um excelente trabalho. Ele está bastante bem estruturado, pois só senti dele não se tornar tão pesado, mesmo as atividades que ele coloca para se fazer, depois a forma como é explicado. Obviamente com o tipo de, mesmo com a constituição de uma equipa, isto implicaria ter financiamento porque isto é bastante útil. Eu não sei se tem a noção da importância daquilo que fez e que poderá fazer com quem vai usar porque isso é bastante útil porque quando, só voltando atrás, quando eu comecei a trabalhar com as metodologias nós ficamos sempre com a percepção de que eu terminei doutoramento eu tenho a capacidade, eu tenho competências, skills, para dar a cadeira de metodologias. Mas depois desses mais de 12 anos a estudar metodologias, é uma pré-concepção completamente errada, ou seja, este tipo de conteúdos são fundamentais. É penas não serem integrados em algo maior e não ser uma coisa avulsa, não é? Porque o interessante disso é isto não ficar... A Lorena terminava doutoramento, foi ótimo, publicou uns artigos, recolheu dados, tem o seu grau e aquilo fica encostado. Até minha ideia depois, o meu desafio depois era aquilo não ficar parado e dar-lhe outro tipo de, dar-lhe alguma continuidade ou outro tipo de roupagem, podemos dizer assim.

**Sim, sim, com certeza iremos pensar em como fazer essa divulgação melhor para que ele não fique perdido.**

Sim, e poder a Lorena olhar para trás e dizer assim "olhe, tão a ver, eu comecei aquilo mas ele está a continuar". Isso é fantástico. Ter alguma coisa que não seja só, que seja um produto e um serviço que é bastante útil para os estudantes de mestrado e de doutoramento, isto é certo, é muito útil mesmo.

**Que bom. Em relação ao conteúdo em si, se o professor pudesse remixar, isto é, combinar este recurso com algum outro material que o professor tenha, com que materiais o professor gostava de remixar? O professor citou vídeos, não é, colocar alguns outros recursos interativos...**

Sim, aqui trabalhava tipo de formato diferente, não é? Porque ele tem ali partes do conteúdo, ou seja, utilizar metodologia não é fácil, estudar metodologias complica um pouco mais, não é? Uma ideia aqui é tornar de alguma forma a aprendizagem da metodologia, a pessoa poder construir... No fundo o recurso não deixa de ter uma base sócio-construtivista, porque ela não é simplesmente uma página HTML em que me debita

pois permite-me interagir, permite-me fazer... Agora isto pode ser impulsionado. Os formatos da questão do vídeo e do tipo de atividades dependem também da tecnologia que usou. Usando o H5P até poderia colocar alguns vídeos. Os vídeos ficam reféns do idioma, mas a mim parece-me muito bem que seguindo o idioma que usou, que é o idioma da ciência, que é o inglês, até se podia fazer alguns vídeos tutoriais, nem que fosse para explicar aqueles modelos teóricos que tem mais a frente, sem ter qualquer voz, podia ser quase só com cliques. Mas o que estou a dizer não tem base de estudo, eu teria que olhar novamente para aquilo, com mais tempo, e tentar fazer essa transformação. Isso em termos de formato, de uma parte que é mais técnica. A construção em si, não consigo dizer agora. Eu tentava tornar aquilo algo mais não-unidirecional, mas como uma... Acho que seria bastante importante eu poder pegar agora naquilo e dizer assim “olha, eu li dois autores”, daqui a três anos, “eu li dois autores e quero acrescentar esta base de dados e modificar aqui alguma alguma.” Eu sei que essa não era a ideia inicial, é mais a construção do conhecimento de quem usa, não é? Mas pra mim, interessa-me sempre muito a possibilidade de quase funcionar como uma ferramenta de mutação que eu possa também ter alguma intervenção mesmo no uso daqueles conteúdos.

**Sim, com certeza. A ideia é esta mesmo.**

O outro alargamento seria depois validar isto, alargar a outros métodos e técnicas que pudessem também ser explorados. Apesar que este aqui deve ser das principais abordagens metodológicas usadas na área da educação, principalmente focada na multimédia, por isso a aposta foi, a escolha foi bastante pertinente.

**De acordo com o questionário que foi divulgado pelo projeto DE-TEL, o design-based research é o mais utilizado por estudantes da área de Technology-enhanced Learning, por isso decidimos desenvolver o conteúdo sobre design-based research.**

O meu próprio projeto de doutoramento é um reflexo disso, não é?

**Verdade. Se o professor tivesse a oportunidade de reutilizar este conteúdo, em que contexto reutilizaria ou com quem partilharia este conteúdo?**

Se eu voltasse a lecionar, atualmente só estou a fazer investigação, mas se voltasse a lecionar as unidades curriculares das metodologias de investigação, principalmente em multimédia em educação, e mesmo em educação, encaixaria este conteúdo na parte da unidade curricular de metodologias de investigação. Lá está, fazia aquilo que há bocado tava a sugerir. Tentava passar isso pra os estudantes e os estudantes poderem a partir dali, ou seja, integrava quase isto num software em que o próprio aluno poderia, através de uma conta, fazer a utilização desse conteúdo. Da forma como está, se ele ficar disponível, eu vou pôr nas minhas referências bibliográficas para estudantes usarem porque eu faço muitos seminários de metodologias de investigação, alguns muito orientados só para a área de desenvolvimento de software, as partes mobile, tecnologias... E terei todo gosto em divulgar. Agora não sei se já está nessa fase...

### **Parte 3 | Avaliação do protótipo: aspectos positivos e negativos**

**Tá quase, tá pertinho. Em relação ao recurso, que aspecto o professor considera mais positivo, mais relevante, o que o professor mais gostou?**

Olha, é a estrutura dele. Não sei se segue o design instrucional de desenvolvimento de conteúdos, mas é a sequência que vocês colocaram. Desde as definições à fundamentação. Porque ele, de alguma forma, quase segue a estrutura de um projeto de investigação tradicional, não é? Que é os mais utilizados. Eu tenho meu problema, neste caso temos aqui até o design-based research, depois tem o tipo de questões que eu posso colocar, que tipo de funções a que referem da parte de abordagens metodológicas, depois as características, as fases, as principais atividades, por isso eu não acrescentaria... Ele segue bem diferentes fases da própria metodologia para quem a utilizar. Não vejo mais, nesta fase não vejo porque também, como me referi há bocado, isto é uma ressalva, que é para colocar como uma limitação, eu não fiz o estudo, fiz da outra vez, desta vez não tive tempo de fazer o estudo, baseei-me mais com base naquilo que tinha feito da última vez. Não me lembro se há alterações ou não relativamente a este

porque a estrutura é muito idêntica. Não me recordo disso, por isso tudo que eu disser a seguir seria ruído.

**Tivemos algumas alterações mas o conteúdo em si está basicamente o mesmo. Fizemos algumas alterações em alguns aspectos visuais, inserimos um vídeo de um webinar que foi dinamizado pelo projeto, então inseri o vídeo ao final juntamente com os slides de apresentação para que as pessoas possam consultá-los, fazer o download. Foi basicamente isso, mas o conteúdo em si é o mesmo. Em relação aos aspectos negativos, o que o professor menos gostou neste recurso?**

Hum, não sei... Está aqui o webinar no final, não é? Ou seja, no fundo é mais a ver com a minha formação base. O que eu menos gostei tem a ver com o design do recurso, tem a ver com o tipo de letra, tem a ver com os contrastes e tipo de letra... É mais com a organização da informação do que propriamente o conteúdo. Mas isso tem a ver pelo fato da minha formação base ser design, não é? E então estou mais influenciado nisso, ou seja, este recurso na minha opinião merece algo mais apelativo do ponto de vista do aspecto gráfico.

**Então seria uma sugestão de melhoria?**

Sim, outras melhorias é em cada página poder ter a possibilidade de eu ter um diário de bordo pessoal. Por exemplo, se eu estou a ler aqui sobre as características, não é? Isso começa a ter aqui anotações, faço estas interações, faço aqui o check para verificar, tenho alguns modelos teóricos sobre o modelo, tem bibliografia, mas no final, lá está, estamos a tocar no ponto da interatividade, no final eu teria uma ferramenta que seria um editor de HTML muito simples, em que ele retirava notas sobre aquilo que estou a ler, quase como se fossem comentários, notas pessoais. Isso para integrar, obviamente que eu posso fazer isso paralelamente, uso o recurso e posso fazer isso. Mas se eu conseguisse, lá está, a ponte vai ser sempre para a possibilidade de eu usar isso quase que como uma ferramenta de anotação. Fazer anotações ou registros na página em que estou a consultar. E no final poder ter, poder retirar isso facilmente. Eu tô a dizer um exemplo, poderia ser comentários durante o texto, tal como faz o Mendeley; as caixas de texto no final para tirar algumas observações, algumas notas. A possibilidade de ajustar ou acrescentar referências aos conteúdos meus e a partir daí poder transformar em algo meu em termos da utilização dos conteúdos.

**Uma das limitações foi em relação à escolha da ferramenta porque tínhamos o GitHub, temos o H5P, mas ficamos sem muitas opções de ferramentas que o utilizador pudesse facilmente editar, adicionar comentários...**

Na altura quando eu fiz doutoramento eu usei o moodle para fazer gestão de projeto, não usei nenhuma ferramenta específica. Na altura tinha o Redmine, agora existe o Asana para fazer a gestão deste tipo de projetos e na altura usei moodle e funcionou, mas não era o mais... Então acabou por também limitarem algumas interações, perceber quem é que fazia o quê em cada fase, as questões de comunicação foram problemáticas, as questões de coordenação... Mas como eu me referi, este é um projeto de doutoramento, não é? E seria sempre uma limitação, para isso teria que ter alguém, teria que ter verbas para contratar alguém para fazer alguma coisa diferente, assim já mudava tudo, não é?

#### **Parte 4 | Conceito e aplicação dos REA**

**Sim, com certeza. Saindo agora um pouco do recurso, como o professor define os Recursos Educacionais Abertos?**

Define em que, em termos de conceito ou o propósito, o que eles deveriam ser?

**O conceito, o que o professor entende. Para o professor, o que são Recursos Educacionais Abertos?**

Sim. Eu trabalho com uma área que também é aberta, que é os open data, repositórios de dados, falamos muito do open access das publicações. Por isso, nesse alinhamento, os recursos abertos têm interesses sustentáveis. Mais uma vez, tem a ver com meu background. Só para enquadrar, penso que pode ser pertinente, eu fui fazer doutoramento

porque senti necessidade, eu tinha uma empresa a desenvolver recursos educativos comercializáveis e senti a necessidade de melhorar esses recursos educativos através da investigação. Então para mim o recurso aberto tem esse problema da sustentabilidade. Ou eu tenho uma ferramenta tipo Moodle em que uma comunidade que alimenta, mesmo assim ele tem uma série de serviços que não são gratuitos, são pagos. Ou então eu posso ter um problema em ter um recurso aberto e por falta de investimento começar a ter problemas do ponto de vista científico ou pedagógico. Por isso, numa primeira fase do meu doutoramento eu ia desenvolver uma ferramenta que permitisse aos educadores ou aos professores, aos utilizadores do recursos educativos, poderem desenvolver competências para conseguir usar um recurso aberto ou fechado, mas que percebessem se aquilo daria resposta ou não àquilo que eles queriam aplicar em contexto de sala de aula ou fora de aula. Tenho medo dos recursos abertos é eles depois não terem forma de se inventarem porque não há financiamento. Este é um grande receio dos recursos abertos. O meu sonho era poder ter desenvolvido um recurso no departamento de educação com financiamento, não ter que pensar em orçamento, e que fosse aberto e disponível para toda a comunidade. A sustentabilidade dele já é um outro problema.

### **Se o professor pudesse definir “Recursos Educacionais Abertos são...”**

Estamos nas redes sociais. Uma coisa é o meu perfil ser público, outra é aqueles conteúdos serem públicos, não é? Um recurso aberto pra mim é algo que, vou puxar outra vez para a parte econômica, ou seja, eu não tenho que fazer qualquer subscrição paga para ter acesso a esse conteúdo. Para mim isso é um recurso aberto. Se for em termos tecnológicos e seguirmos as bases do open source, tende a ser um recurso com o código aberto, também poderia desenvolver módulos para esse recurso. Neste caso, se é alguma coisa que fosse disponível sem qualquer taxa. Não estamos a falar da questão de sempre que usar tem que referenciar, citar fontes, não estamos a falar das questões de citação, consentimento, ética, de quem é o recurso, não é?

### **Ao preparar os conteúdos e materiais para as aulas ou seminários, o professor tende a criar estes materiais do zero ou reutiliza materiais disponíveis?**

Atualmente não tenho dado aulas, tenho dado seminários. A maior parte são reaproveitados de recursos feitos anteriormente. Mas há sempre uma preocupação de reutilizar e de atualizar com novas referências. Primeira coisa que eu às vezes verifico aqui é as referências. Tenho aqui numa página 99, 2006, 2006, 2003, e a primeira coisa que dá o clique é “será que a Lorena não encontrou referências nesta área nos últimos 5 anos?” Eu sei que na área da metodologia é comum nós fazermos até um passeio cronológico, voltamos atrás. Mas é uma das áreas que nós por vezes não nos atualizamos muito porque a metodologia também não se renova assim tão rapidamente. Mas a primeira coisa que eu vou verificar é os anos das referências. Por exemplo, aqui na página das características a referência mais atual é de 2012. Ou seja, em 11 anos não foi dito mais nada sobre as características do design-based research?

### **Utilizamos mais referências clássicas que trabalham mais o conceito do DBR, mas com certeza devem ter muitos trabalhos, como teses e dissertações, que utilizam o DBR como exemplo.**

Reutilizo, mantenho os clássicos nas referências. Normalmente no segundo ano, se for repetir aquele seminário daquele conteúdo, atualizo o conteúdo, verifico novas perspectivas porque o próprio passado dois anos começa a ficar saturado. Ou seja, para quem eu partilho ou transmito, normalmente é alguém que vai ouvir pela primeira vez. Mas para mim é quase uma necessidade de “eu tenho que renovar este conteúdo e ver o que é que há de novo”. Por isso, normalmente reutilizo mas não sofre uma mudança drástica. Se for design-based research, se fosse uma apresentação, acredito que se fosse para daqui a três anos não ia ser uma mudança drástica porque também teria que fazer certamente, como a Lorena estava a dizer, que era voltar aos clássicos, ver o que é que foi dito de novo, e sabendo que há muitas áreas que não tem surgido muita coisa de novo a não ser o uso dele.

### **Sim, como exemplos, não é?**

Sim

**O professor tem o hábito de partilhar os materiais didáticos com estudantes ou outros professores?**

Sim, sim. Partilho tudo.

**E ao partilhar estes materiais, o professor utiliza alguma licença aberta?**

Boa pergunta. Agora vou eu fazer uma pergunta: partilhar uma licença aberta, como assim? Por exemplo, se eu tiver um power point ou então um prezi, quando partilho o que é que eu deveria colocar?

**Dar permissão para que as pessoas que vão utilizar este material possa alterá-lo, reutilizá-lo em outro contexto...**

Quando alguém me solicita conteúdos construídos por mim o que eu peço é aquilo que eu faço. Por exemplo, se eu partilhar um powerpoint que eu tenho aqui comigo, o que eu ia lhe pedir era que coloque “adaptado de” porque eu vou pegar, não vou usar integralmente, há partes que até podem ser iguais, mas eu vou adaptar para os meus. Então normalmente o que eu peço quando alguém me pede um conteúdo ou um powerpoint é que coloque que foi “adaptado de (*eliminação de conteúdo sensível*)”.

**Certo. Acha que os princípios dos Recursos Educacionais Abertos são interessantes para o seu contexto, acha que são praticáveis?**

Sim, são. Acho que são praticáveis, mas dependem. Por exemplo, se tiver um conteúdo feito aqui no H5P ou noutra plataforma, se ela se mantiver gratuita e se eu tiver a possibilidade de fazer uma atualização, ela é praticável. Se eu avanço para algo desenvolvido, como o WebQDA, já é algo diferente. Já implica novamente investimento para se manter. Porque às vezes não é só investimento do conteúdo, o conteúdo pode ser o mesmo, mas a tecnologia usada pode se tornar obsoleta, não é? Daqui a uns anos podemos estar a falar de um conteúdo que necessite de outro tipo de abordagem para ser apresentado ou porque o H5P desapareceu e rapidamente não sei se esse sistema tem a portabilidade para outros sistemas, não sei se consigo exportar, neste aqui eu não experimentei. Eu acho que é viável, mas eu continuo a acreditar que tudo que é gratuito ele é pago de alguma forma, não é?

### **Conclusão**

**Então para finalizar gostava de agradecer a disponibilidade do professor e perguntar se tem algum comentário adicional que gostaria de fazer.**

Sim, eu faço este último esforço. Não deixe este conteúdo ficar só, depois de terminar o doutoramento, não deixe ele ficar parado. Esse era o meu desafio. Não deixe ficar parado, que seja bastante pertinente. Como eu há doze anos tenho feito imensas viagens e tenho trabalhado as questões das metodologias, não sei se tem a mesma percepção que eu tenho, mas parte das metodologias aplicadas ao desenvolvimento de tecnologias, neste caso para a área da educação, têm muitas fragilidades do ponto de vista. Então um projeto de investigação que eu vou desenvolver uma aplicação, se eu construir mal metodologicamente o desenho metodológico onde isso se encaixa, essencialmente, quando eu recolho dados já é tarde para reestruturar. Ou seja, pensar que mais coisas que podem ser aplicadas aqui, que é até que ponto o próprio investigador consegue aferir ou verificar se o projeto dele é útil usando este tipo de metodologia, como é que eu posso explorar, pois há muita coisa ainda que se pode fazer em torno disto. Por isso, o meu apelo para si é não deixe ficar isto... Eu sei que vai esquecer disto...

**Espero não esquecer e espero que ele seja bem útil para outras pessoas também. Agradeço mais uma vez, muito obrigada.**

### **INTERVIEW 3**

## Parte 1 | Metodologias de investigação e DBR

**A professora é especialista na área das metodologias de investigação. Poderia contar um pouco sobre esta experiência, se já lecionou ou está a lecionar alguma unidade curricular sobre metodologias, se já orientou algum aluno que utilizou o design-based research?**

Então, eu não sei bem se o termo especialista é (*segmento de texto incompreensível*). Fiz investigação exploratória, não é? E, portanto, como investigadora obviamente no dia a dia eu lido com as questões das metodologias de investigação na minha área, que é educação. E ao longo do meu tempo enquanto investigadora fui convidada para lecionar as unidades curriculares de metodologias de investigação onde o departamento onde eu também leciono é responsável ou colabora nesses programas doutorais. E, portanto, de alguns anos pra cá eu leciono, no programa doutoral em educação e no programa doutoral em multimédia em educação, as unidades curriculares de metodologias de investigação em educação. Atualmente já não estou a lecionar ao programa doutoral. E lecionei também durante dois anos uma unidade curricular (*segmento incompreensível*) aos mestrados, senão também a unidade curricular de metodologias. E o design-based research é uma metodologia ou um conjunto de métodos, digamos assim, que nós podemos usar e que, sim, alguns dos meus doutorandos utilizaram para desenvolver os seus projetos de doutoramento.

## Parte 2 | Avaliação do protótipo: 5R

**Em relação ao protótipo sobre Design-Based Research, se a professora tivesse a oportunidade de revisar este conteúdo, ou seja, editar, adaptar, modificar... O que a professora mudaria?**

Olha, eu quero dizer primeiro que o protótipo, quando vi na questão inicial, já na altura me pareceu muito bem. Acho que está muito claro, muito bem organizado, acho que é muito útil. Tive muita pena, na altura, que ele não estivesse ainda público porque acho que é realmente muito útil porque sistematiza, faz uma apresentação na área teórica, não é? Porque esta questão, por exemplo, que eu me referi agora, das terminologias por vezes são várias enquanto estamos a falar do mesmo método ou do mesmo conjunto de métodos, depois essa imprecisão também foi abordada por si, de que diferentes autores podem usar designações distintas para o método que tem etapas semelhantes. Muitas vezes até as próprias etapas têm designações que não são iguais mas que tem o mesmo objetivo no processo. Portanto, eu considero o protótipo muito útil, considero muito interessante também ter complementado a disponibilização sistematizada de informação com alguns exercícios que podiam ajudar. Eu achei muito interessante. Podiam ajudar a solidificar, digamos assim, aquilo que estava a apresentar. A referência bibliográfica também achei bastante completa e pertinente. A questão de podermos incluir também mais informação achei importante porque eu acho o protótipo muito interessante, muito útil. Não me recordo de ter pensado “ah podemos ter incluído mais isto”, não. O que eu acho, seria muito interessante, é que ele estivesse em formato aberto, público, mas que fosse um recurso open, que pudesse ser utilizado, que fosse divulgado, acho que é muito importante para alunos de programas doutorais, para alunos de mestrados. E acho que ser aberto, podermos... É que tem algumas tretas, não sei se ser totalmente aberto, ou seja, ser totalmente aberto para ilustrar e poder incluir informação não, mas podermos ter uma nota, digamos assim, “olhe seria interessante podemos incluir mais este autor”, ou “seria interessante podemos incluir mais esta perspectiva”, ou talvez “ver, por exemplo, este artigo sobre qual obstáculo tem este método”. Termos, de alguma forma, ir incluindo... A gente não sabe muito bem como é que isso pode ser feito, tá a ver? Mas não ser totalmente aberto, não ser tipo meio wikipedia, não é preciso. Mas poder ser aberto o suficiente para poder irmos juntando, digamos assim, contributos, não de qualquer pessoa mas, por exemplo, de um investigador, outros colegas que também estejam a fazer investigação sobre metodologias e métodos, acho que seria interessante.

**O objetivo é que ele seja aberto mesmo, que seja um Recurso Educacional Aberto. Entretanto, a ferramenta que estamos a utilizar não ajuda muito nesta edição, digamos assim. Tem essa limitação. Mas o objetivo é que ele seja mesmo aberto e**



**iremos com certeza disseminar este recurso nos cursos. A professora gostava de remixar este conteúdo com algum outro material existente? Com que materiais gostava de remixar?**

Ou seja, se eu gostava na altura, se eu tenho, por exemplo, mais referências, é isso?

**Sim, pode ser.**

Não sei, posso eventualmente comparar, mas sim posso ver e posso, se tiver alguma coisa extra, por exemplo, enviar para a Lorena para poder acrescentar. Não sei de cor os que tenho.

**Tá bem, sem problemas. E se a professora tivesse a oportunidade de reutilizar este conteúdo ou partilhar, em que contexto reutilizaria e com quem partilharia?**

Com certeza, tive imensa vontade de utilizar com duas doutorandas minhas na altura, tive imensa vontade, porque acho realmente que tá claro e útil. Nos programas doutorais acho que é um contexto também privilegiado porque as pessoas estão muito focadas nas questões da metodologia e, portanto, pros que estão a fazer investigação em geral, seja pra grau ou não seja pra grau, acho que é uma ferramenta muito útil, tá bem? As questões da metodologia eu vejo que por vezes se tornam um bocadinho obscuras e não são tão explicitamente discutidas, não é? Refletidas. E às vezes nós vamos andando e vamos “ah, tenho que me preocupar agora com essa questão da metodologia, como é que se chama aquilo que estou a fazer?” É um bocadinho ao contrário ou “deixe-me ver aquilo que estou a fazer, se tem aqui algum enquadramento teórico, ou o que é que a teoria diz sobre isto”. Mas eu acho que a abordagem à metodologia deve ser uma abordagem distinta. Eu acho que tem que ser uma abordagem muito consciente do que diz, portanto, muito conhecedora do que diz. E a partir daí ser refletida no sentido “ok, então como é que eu posso, não é, usar aquilo que está previsto num quadro teórico, não é, que é de referência pra o que estou a fazer?” Não acredito em receitas e por isso, Lorena, talvez ter aqui um bocadinho de atenção na estrutura e na forma de ter explícito isso, que não é uma receita. O design-based research tem etapas, tem estratégias em cada etapa, tem objetivos definidos, tem o público ou os intervenientes também identificados. Mas eu tenho um bocadinho de medo das receitas, de serem aplicadas seriamente. E essa questão é uma questão... Quando nós apresentamos um método que tem fases e que em cada fase tem etapas, podemos correr um bocadinho esse risco. Ou seja, eu acho que também é de responsabilidade do investigador, sendo conhecedor do quadro teórico, poder refletir e questionar e conseguir aplicar de uma forma não cega, isso também é muito interessante. E uma ferramenta dessas pode de alguma forma facilitar essa aplicação cega. Por isso, acho que do ponto de vista de quem conceber a ferramenta e depois de quem a divulga também pode haver aqui um bocadinho deste trabalho de construção de uma aplicação, de um receituário que eu desenvolvi e fiz. Mas acho muito, muito útil, Lorena, muita vontade de usar principalmente com doutorandos.

**A professora pode divulgar o conteúdo com orientandos, se quiser. Ainda não é a versão final, mas se a professora acha que já está ok e apropriado, não tem problema. Mas com certeza enviarei a versão final para a professora.**

Ótimo, obrigada. Vou usar.

**Pode usar.**

### **Parte 3 | Avaliação do protótipo: aspectos positivos e negativos**

**Em relação aos aspectos positivos, a professora citou alguns... Há algum comentário a mais em relação a isso? O que a professora mais gostou neste recurso?**

O que eu mais gostei foi de sua utilidade e relevância. Eu acho que é realmente útil e por isso é relevante. Gostei muito da sistematização teórica, acho que ajuda bastante e principalmente olhando agora para quem está a fazer investigação, não é, quem está a iniciar o seu percurso, essa sistematização teórica é muito interessante. Até porque é uma revisão já bastante ampla, ou seja, dá uma ideia de fato de como é que isto evoluiu, quais

são as diferentes abordagens, quais foram as perspectivas, como é que foram complementando ou não, que diferenças ainda que foram feitas e que existem entre os diferentes autores e qual é uma proposta atual, digamos assim, de uma abordagem design-based research, isso é uma grande vantagem. Acho também muito vantajoso ter ali um, eu não queria dizer, não é armazenado, mas é localizado, digamos assim, as referências que eu posso retirar e as que eu posso ir buscar e esta preocupação de que sejam de fato atuais, acho isso muito bom, muito relevante. E a parte dos exercícios eu achei muito interessante, podermos juntar aqui (*segmento de texto incompreensível*) qual é o propósito e incentivar uma reflexão um pouco menos teórica sobre aquilo que eu estou a mostrar. Portanto, talvez destacar estas características.

**Desculpa, professora, o áudio travou um pouco. Poderia repetir o finalzinho, por favor?**

A parte dos exercícios, de consultar aquilo que poderia ser uma apresentação mais teórica e sistematizada de informação com a parte... porque acho que os exercícios sugerem uma reflexão, e isso é importante. Uma aplicação, não é? Uma aplicação daquilo que está a ser abordado. Achei também um aspecto muito interessante.

**A professora falou sobre a questão da possibilidade de poder contribuir com o material, adicionar algum comentário, referências... Há algum outro aspecto negativo que a professora gostava de citar?**

Eu não sei bem se isso é um aspecto negativo, tá bem? Porque depende. Por exemplo, se a ferramenta for para trabalhar, sei lá, com investigadores mais experientes, mais seniors, eu acho que essa parte de poder ser aberta à discussão era interessante. Até no sentido de colocar, sei lá, literatura sobre, eu não diria desvantagens mas obstáculos desta abordagem, ou comparando essa abordagem com outra, mas já numa perspectiva mais madura. No sentido de ferramenta útil, enquanto eu como investigadora, que estou no percurso e quero usar isto e tenho que ter toda uma sistematização da informação, eu não sei bem se isto era alguma desvantagem, sabe? Eu gostava era de ter... ela não ficasse fechada para não depender só de si por exemplo, pra não "morrer". Porque dada a altura depender de uma pessoa, se a pessoa se afasta, acaba por ficar um bocadinho obsoleta porque já não é alimentada e eu não gosto de olhar para a metodologia como algo estático, não é? Eu acho que a metodologia é uma coisa dinâmica, que flui e que tem que se adaptar às questões de investigação. Os métodos que nós usamos adaptam-se às questões de investigação, e as questões de investigação são dinâmicas, sofrem alterações com os contextos, por vivências que nós possamos ter. E portanto eu não consigo olhar para a metodologia como um bloco de conhecimentos fechados que está ali e que se usa sempre da mesma maneira. Portanto, tá a ver? É mais esta... não sei bem se é uma desvantagem, mas também não sei como é que se poderia pôr isto em prática. Mas gostava que ela pudesse ser aberta à discussão no sentido de ampliar, de alargar os horizontes. Mas não a ser, a que cada um pudesse livremente adicionar conteúdo, não era bem isso. Não sei... É mais uma questão minha do que propriamente...

**Seria mais uma reflexão como sugestão de melhoria?**

Não sei, não sei nem como é que poderia pôr isto em prática, como é que poderia operacionalizar. Esta questão é uma questão distante.

**Tá bem. A professora tem alguma sugestão de melhoria do conteúdo ou comentário adicional em relação ao conteúdo?**

Não. Com essa estrutura poderia realmente ver aquela questão, se há mais algum outro autor, ou alguma outra abordagem que pudesse ser incluída, mas é uma coisa de pormenor. E também, como eu digo, como não sei de cor, também não estou a ver "olhe, falta-lhe este autor ou falta-lhe aquela abordagem", não, nada disso. Por isso, acho que não. Só o ser realmente mais divulgado e ser aberto, eu acho que isso era importante.

#### **Parte 4 | Conceito e aplicação dos REA**

**Como a professora define os Recursos Educacionais Abertos?**

Olha, acho que são fundamentais. Acho que não faz sentido quando trabalhamos a educação... É claro que depois temos que processar toda aquela perspectiva que tem a ver o que custa por um Recurso Aberto, não é. Apesar de quem investiga a educação, quem trabalha na educação, acha que deve ser aberto, ou seja, acha que deve ser partilhado, que deve ser acessível e, portanto, eu sou completamente a favor. Agora temos que ver sobre as outras questões que foram importadas ao abrir o recurso, não é? Isso eu acho que, bom, nós temos que considerar quem trabalha, como se protege aquele trabalho, como é que garante a qualidade do que é aberto, a quem é aberto, se é completamente open ou se é aberto a uma determinada comunidade. Portanto, como é que se mantém um recurso aberto, quem é que o mantém, quem é que o alimenta, quem é que o adapta, não é? As exigências que vão tendo do dia-a-dia, da dinâmica e das alterações do cotidiano. Por isso eu sou a favor mais de ter recursos abertos do que propriamente que a investigação alimente recursos fechados, não é? Que abra à comunidade.

**Quando a professora prepara o conteúdo e materiais das aulas, tende a criar algo do zero ou reutiliza materiais disponíveis?**

Depende. Depende de várias situações, não é? Eu tento de fato ser atual nas coisas que uso e, portanto, isso implica que eu também faça uma parte da pesquisa, não é, que vá pesquisar aquilo que diz. Há recursos que estão disponíveis, que são atuais, que são relevantes, que são adequados ao que pretendem, portanto eu não vou inventar a roda e utilizo o que existe. E essa é uma forma de divulgar o que existe, não é? E que estão muitos melhores do que eu conseguiria fazer e, portanto, divulgo, utilizo. Quando é alguma coisa que eu vejo ou que não existe algo que seja muito adequado ao que eu pretendo ou que ainda de fato não exista muita coisa, eu faço e faço do zero. Portanto, é uma mistura, não é?

**A professora tem o hábito de partilhar estes materiais com os alunos ou outros professores?**

Sim.

**E a professora utiliza alguma licença aberta, como as da Creative Commons?**

O que eu faço e normalmente em contexto de aula ou em contexto de orientação... Por exemplo, nós em contexto de aulas tentamos fazer como se fosse um banco de recursos que seja um banco da temática da aula. Por exemplo, nas questões da metodologia, podemos fazer um banco e utilizar. Normalmente o que se usa para os alunos é a plataforma que eles utilizam e, portanto, a plataforma que eles utilizam é aquela que nós disponibilizamos os conteúdos e os recursos. No caso, por exemplo, dos orientandos, houve uma altura em que construí um blog para poder partilhar. Um blog que servia basicamente como um repositório e eu dava acesso, em grupos restritos que também podiam completar, e depois partilhávamos ali. Mas basicamente usamos o Teams. Eu usei durante algum tempo o blog, confesso que deixei de usar. Para partilhar utilizo basicamente estes.

**A professora acha que os Recursos Educacionais Abertos são interessantes e úteis para o contexto dos doutoramentos? Ou seja, a professora concorda com os princípios dos Recursos Educacionais Abertos? Acha que são praticáveis?**

Essa é outra questão, não é? Talvez faça sentido aqui partilhar um bocadinho isto contigo porque... *[o fone da professora descarregou]*

**Desculpa, professora, está sem áudio.**

*[a professora desconectou os fones]* Consegue me ouvir agora?

**Agora sim.**

Eu deixei de ouvi-la também porque fiquei sem bateria aqui nos fones. Eu vou partilhar talvez um bocadinho uma experiência sobre o que é fazer um recurso educativo. Eu já fiz aberto e já fiz fechado. E nas duas experiências eu vi aspectos positivos e aspectos negativos. Pronto. O primeiro recurso educativo que eu fiz foi fechado e foi no âmbito do

meu doutoramento e era um software na altura. E foi complicado, por quê? Porque para trabalhar no desenvolvimento do conteúdo deste software eu precisei de constituir uma equipa e eu na altura era uma doutoranda. E o que é que isso implicou? Eu não tinha o know-how, como não tenho hoje em dia, suficiente para sozinha poder desenvolver todas as dimensões que um recurso educativo implica. Eu na altura tinha o conhecimento do conteúdo do recurso, que era um conhecimento didático e do assunto, do tema. Mas depois eu precisava de todos os outros colegas para conseguir desenvolver o conteúdo de um software, e precisava de um programador, e precisava de um ilustrador, e precisava, sei lá, não é, de vários outros colegas. Pronto. E foi constituída uma equipa. A dada altura, o que é que aconteceu? Era preciso pagar as pessoas porque nem todas as pessoas estavam a fazer investigação e, portanto, havia que pagar as pessoas, ok? E então onde é que se vai buscar dinheiro para pagar o desenvolvimento de um recurso? Ok, podemos submeter um projeto e ter, não é, um financiamento do próprio projeto ou podemos ter mecenas, por exemplo, ou podemos ter alguém que possa vir patrocinar. Na altura, tivemos imensa sorte, estávamos a trabalhar com um colega que era investigador e também tinha uma empresa e através da empresa conseguimos um financiamento excelente da BP. E conseguimos financiamento, não só a BP pagou todo o desenvolvimento do software, a divulgação do software e pagou ainda a produção de exemplares e formação de professores pra usar o software. Foi uma experiência espetacular, mas foi financiada por uma empresa, ok? Em alguns milhares de euros. Ok. Vantagens: tivemos farto dinheiro e portanto não houve aqui nenhum travão. O único travão era o nosso tempo que era limitado porque a investigação a começar uma das desvantagens e uma das limitações é ser temporalmente limitada e depois ficou fechado por quê? Porque depois por questões de direitos de autor, por questões de, mesmo não só de autoria mas também de quem é que era o recurso, existe isso tudo, não é? Também não pudemos abrir, não pudemos abrir. Chegou a algumas escolas, era pago quando as escolas o adquiriam, e portanto era um negócio, certo? Portanto, tinha essa desvantagem e teve que ser pago. Posteriormente, agora há pouco tempo, ficou aberto acho que o ano passado, o Ministério da Educação convidou uma equipa para fazer exatamente isso: desenvolvimento de recursos educativos abertos, que o ministério queria abrir a todos os níveis educativos, sobre as mais variadas disciplinas, os mais variados conteúdos. E eu fiz parte da equipa que fez o desenvolvimento desses recursos educativos digitais para o primeiro ciclo e foi uma experiência, Lorena, espetacular, envolveu diferentes centros de investigação, diferentes universidades, dezenas de investigadores, envolveu dinheiro mas foi o PO CH, os “donos” do recurso ou da plataforma onde estão disponibilizados os recursos é o ministério, ele é aberto, foi só aberto quando o ministério entendeu. Mas tá aberto e foi uma experiência espetacular porque tivemos investigadores de topo, desde investigadores mais do design da tecnologia, mais da programação, depois nós, os da educação, e os da didática, mais ilustradores sei lá, uma equipa espetacular pra fazer esse desenvolvimento. Foram muito mais nessa segunda experiência do que na primeira, envolveu muito mais dinheiro também, não é? Mas tem um alcance completamente diferente, tem um controle completamente diferente. O controle não é da universidade, o controle é do ministério. E também tem uma divulgação completamente diferente e tem continuidade, tá a ver? Nós fizemos agora para o primeiro ciclo mas já há projetos abertos para fazer até o 12º ano para todas as unidades curriculares. Uma plataforma com recursos educativos abertos para todos os assuntos, para todos os níveis educativos. Pronto, isto é que é um projeto espetacular, que envolve muitas pessoas, muito dinheiro obviamente e tem um alcance diferente. Por isso eu vejo vantagens e desvantagens nas duas situações. Mas sou a favor do aberto.

**A professora acredita que depois desse financiamento esses recursos são sustentáveis? Eles irão se manter mesmo sem financiamento?**

A questão é mesmo essa, não é. Que era aquela que eu estava a dizer a si, como é que o seu recurso vai depender só de si e vai depender do seu tempo porque depende de quem está a gerir, não é? Depende de quem assume essa responsabilidade. A sustentabilidade de um recurso é uma questão muito importante e é algo que deve ser tido em conta no início do projeto, como é que ele se mantém no fim do timing do projeto. Quem é que o vai alimentar, quem é que o vai manter, não é? Quem é que o vai atualizar, quem é que o vai

divulgar quando é usado. Quem é que suporta, dá apoio a essa utilização. Por exemplo, isso também acontece com os CAQDAS, não é? Quando nós utilizamos um software de análise de conteúdo, ele está a ser alimentado por alguém, não é? Pode ser uma empresa, pode ser uma universidade, tem que ter um conjunto de técnicos que possam dar suporte. Portanto, essa questão da sustentabilidade dos recursos é uma questão muito importante porque senão as coisas morrem, ficam obsoletas e morrem, não é? Portanto, tudo isso eu penso que tem que ser considerado quando o recurso é ainda um projeto. E a sustentabilidade, a possibilidade de continuar a usar e a atualizar o recurso tem que ser definido na altura em que ele ainda é um projeto. Acho que é uma das grandes dificuldades, não é?

**Com certeza, professora. É um desafio.**

## **Conclusão**

**Só para finalizar gostava de agradecer mais uma vez a disponibilidade da professora e perguntar se a professora tem algum comentário adicional sobre o recurso.**

Sobre o recurso, não. Quero dizer-lhe mais uma vez, Lorena, porque acho que foi realmente um trabalho, está muito bem feito, muito bem pensado. Claro que é mérito seu e de seus orientadores e, portanto, parabéns.

**Obrigada, professora.**

Parabéns aos três por isto. Eu acho que era um projeto interessante poder alargar, ou seja, eu não sei se escrevi no email na altura, mas poder fazer o mesmo que fez para outros métodos de investigação porque acho que era espetacular. Eu poder aceder a uma plataforma em que eu posso ir ver DBR mas também posso ir ver outras coisas. E talvez eu possa deixar uma sugestão, que é uma das questões mais difíceis de fazer em investigação em educação e que eu tenho mais dificuldades nas aulas com os alunos, que é a construção das questões de investigação. Nas questões da saúde há uma estratégia, para quando nós estamos a fazer investigação. É o PICO, conhece? Sistema PICO.

**Não, mas vou anotar para pesquisar depois.**

É um sistema faseado para a construção de questões de investigação e quando a investigação é na área da saúde, eles utilizam muito. Se tiver curiosidade, pode ver mais tarde.

**Sim, com certeza.**

Mas era muito interessante pensar-se numa ferramenta que consegue ajudar as diferentes fases de construção de uma questão de investigação sólida e que seja também possibilitadora do desenvolvimento de um bom projeto. Isso era espetacular. Ou abrir a outras questões das metodologias. Eu acho que era um caminho muito interessante para ser explorado, por isso só isso e dar-lhe os sinceros parabéns, Lorena. Eu vou divulgar porque eu acho que é realmente útil, tá bem? E vou querer receber novidades sobre o seu trabalho e novidades do que depois vem a seguir a isto.

**Tá bem, professora. Eu agradeço novamente pelas palavras. Com certeza irei divulgar a versão final. Ainda é um protótipo, está quase na versão final, mas já dá para auxiliar muitos doutorandos. E quero continuar nesta área das metodologias, acho que é bastante útil elaborar outros recursos sobre outras metodologias, objetivos como este, que ajudem os investigadores nesses primeiros passos em que ainda estamos definindo o que iremos fazer, que pergunta queremos responder, não é?**

É muito difícil. Mas mesmo para os investigadores mais velhos, as questões das metodologias são sempre questões de discussão, polémicas, muito pertinentes e muito relevantes. Ainda agora o propósito no centro de investigação estamos a discutir precisamente como é que se fazem questões de investigação, de onde é que elas surgem, quem é que contribui. É um académico que está fechado na universidade que faz a questão e que chega depois lá fora e diz “não, isto é que é importante”, ou as questões

emergem dos contextos acadêmicos também? Como é que se constrói isso? Quais são as questões relevantes? Por isso a metodologia é sempre, sempre, sempre uma coisa que deve estar presente quando se está a fazer investigação. É relevante para os seniors, para os juniors, em qualquer fase. Muitos parabéns. Não é muito fácil, não são todas as pessoas que têm a coragem para trabalhar as questões das metodologias, mas é muito relevante.

**Tá bem. Muito obrigada, professora. Com certeza enviarei a versão final para a professora. Acho que até julho teremos a versão final disponível.**

Muito obrigada e até breve.

**Obrigada e até breve.**

## **INTERVIEW 4**

### **Parte 1 | Metodologias de investigação e DBR**

**Para iniciar, o professor tem alguma experiência no ensino das metodologias de investigação? Se sim, poderia falar um pouco sobre essa experiência?**

Sim, nós todos quando fazemos um doutoramento pelo menos temos alguma expertise na metodologia que utilizamos. A metodologia que eu utilizei no meu doutoramento e é a que mais utilizo no tipo de trabalhos que oriento é a development research. A development research é muito semelhante na forma como é concretizada como o design-based research, só que development research normalmente tem um protótipo associado. Ou seja, é uma metodologia de desenvolvimento que obriga, ou que valoriza mais do que obriga, que valoriza tanto o que é o trabalho do designer como a implementação educacional. Ou seja, ao mesmo tempo que se vai desenvolvendo um recurso aberto como aquele que fez, que é um recurso para ser utilizado num processo de aprendizagem, normalmente o que é valorizado é a mais valia educacional, mas na development research também é valorizado os momentos de desenvolvimento do recurso, do protótipo do recurso. Por isso, é a metodologia que eu mais utilizo com os meus alunos. Meus alunos normalmente desenvolvem recursos educacionais, por isso é provavelmente a metodologia que eu mais utilizo. E depois há variantes. Todas essas metodologias de desenvolvimento têm variantes, às vezes das várias fases em que são postas em prática, muitas vezes o propósito. Por exemplo, eu utilizo o modelo da development research que é o do Van Den Akker, que é da escola holandesa, e utilizo para desenvolvimento de modelos pedagógicos. Ou seja, muitas vezes não tenho, ao contrário do que faz o autor que propôs este modelo, que há um protótipo educacional que é desenvolvido e por isso é importante valorizar o aspecto do design desse protótipo, muitas vezes o protótipo pode ser uma intervenção pedagógica só. As várias fases que eu preciso para fazer, utilizar, por exemplo, aquilo que é a área que me interessa, que são as tecnologias digitais ou um modelo pedagógico que permita tirar partido dessas tecnologias digitais. Normalmente as questões das tecnologias digitais não são uma questão de tecnologia mas uma questão de pedagogia, por isso é como é que eu adapto, como é que eu utilizo aquela tecnologia digital para os momentos de aprendizagem. Por isso, a development research permite essas diferentes variantes e é por isso que me interessa.

### **Parte 2 | Avaliação do protótipo: 5R**

**Em relação ao Recurso Educacional Aberto que foi partilhado com o professor, sobre design-based research, se o professor tivesse a oportunidade de revisar o conteúdo, isto é, modificar, alterar, o que o professor mudaria?**

O problema é que eu não vi o recurso.

**Posso enviar o link pelo chat.**

Deveria ter visto mas não vi, eu ando sempre a correr.

**Sem problemas. Pronto, enviei no chat.**

Ok, eu estou a olhar para cima porque eu tenho um ecrã aqui em cima onde o recurso abriu. Qual é o objetivo deste recurso?

**O recurso é para ser utilizado no contexto de doutoramento e até de mestrados também, seja por alunos, por investigadores ou professores, para ajudar no processo de aprendizagem do design-based research.**

Ok. Quer dizer que um aluno que esteja a desenvolver um qualquer recurso educacional pode utilizar esta metodologia e é para ele compreender como é que esta metodologia se desenvolve. Ok.

**E também estarem em contato com outras referências caso necessitem de uma leitura mais detalhada sobre o assunto.**

Há aqui autores que são os autores da development research. Por exemplo, este Plomp que eu estava aqui a ver no princípio, o Plomp, que fala sobre a design-based research, é um dos autores que é um discípulo do Van Den Akker, da escola holandesa. O que é que nós temos aqui, temos o Plomp, o Reeves, e Reeves faz a mesma coisa desses, só que muda algum bocadinho da forma como se implementa. O Van Den Akker está aqui também, development research. Elas são todas muito parecidas, não é? Ok, o tipo de terminologias, isto também já... A development research utiliza todos os instrumentos de recolha, análise de dados que as outras metodologias, utiliza os mesmos instrumentos que as outras metodologias, por isso esse ponto de vista é... Há um problema, ok... Uma análise, o design de desenvolvimento, avaliação, os vários ciclos de avaliação. É muito semelhante também as metodologias de desenvolvimento ao que é a investigação-ação por causa destes ciclos e por partir de um problema do terreno, ou seja, nunca se pode desenhar um modelo para intervir porque o modelo precisa de conhecer o contexto para poder ser desenhado. Este é o modelo, aquilo que está o do Reeves é o do Van Den Akker, análise dos problemas, desenvolvimento do protótipo ou das soluções, no caso os ciclos iterativos de refinamento e depois a solução. Protótipo 1, protótipo, literature review, ok, needs and context analysis... tão a ver aqui que é sempre mais ou menos a volta do mesmo. Aqui é McKenney e o Reeves, análise, design, construção. E este que é o do Van Den Akker. Van Den Akker normalmente tem três momentos e acho que o do Reeves tinha cinco porque ele divide um deles em dois, ok... Olhe, isto tá muito giro porque... Todas estas... Esta ideia dos contributos para teoria são importantes também e eu no final posso ter o protótipo, pode ser o conceito e a forma como é esse conceito contribui para o estado da arte sobre esta metodologia. Design Research model. Muitas vezes os autores o que fazem é exatamente, o modelo é exatamente o mesmo, eles dão-lhe outro nome e alteram algumas pequenas coisas. O que eu gosto mais também, um aspecto que eu gosto muito é partir sempre de problemas reais, por exemplo, mesmo dos alunos que eu tenho em estágio, ir ao terreno, conhecer a turma, conhecer os alunos e verificar "ok, como eu vou desenhar uma intervenção?" Mesmo essa intervenção vai beber aqui as metodologias de desenvolvimento. Sabe que estas metodologias de desenvolvimento nascem de uma coisa que é uma das razões por que muitos de nossos colegas da educação não gostam e tem alguns preconceitos, é isto é, entra numa lógica daquilo que os engenheiros chamam do design de produto. Eu preciso perceber qual é o problema que quero resolver, preciso de ver o que é que já é, num segundo momento o que é que já existe que possa levar a resolver esse problema e depois arranjar uma possível solução, ver, adaptar a solução aquele problema e depois redefinir como é que aquilo, como é que o processo aconteceu. Esta é a ideia de contribuir para a teoria, para o que já existe, para o estado da arte, para a literatura. É importante porque nós, quando usamos a development research, nós temos que identificar todos os passos que vamos fazendo, ao contrário que muitas vezes as metodologias que são aplicadas e nós só conhecemos os resultados finais. Aqui, nós, mesmo todos os insucessos são dignos de registro, por quê? Porque indicam a quem ler o trabalho, aquela investigação, quais são os caminhos que podem levar, ou seja, os caminhos que já se comprovou que não tiveram sucesso. Que é uma das coisas que muitas vezes os alunos têm dificuldade em aceitar. Que é "Por que é que eu vou pôr na minha tese uma coisa que, eu fiz isto três vezes e correu mal, por que que eu vou estar a pôr?" Não. É correr mal exatamente para quem vier a seguir, quem estiver a ler, saber como é que chegou a solução certa, que não foi

por magia, mas porque tentou aqui, tentou ali, tentou acolá e chegou à conclusão que todos esses insucessos ajudaram a ter sucesso. Gosto muito disso.

**Em relação ao recurso em si, o que o professor sugere de alteração, isto é, o que o professor mudaria ou adicionaria neste conteúdo?**

Eu devo dizer-lhe que o que eu tenho, o que eu uso para os meus alunos poderem saber como é que se põe em prática, é os exemplos meus, porque eu fiz isto no meu doutoramento numa altura em que nem era muito usado, em 2002, 2003, não se falava muito. O livro do Van Den Akker fala pela primeira vez disso em 1999, por isso em 2002 quando usei foi algo novo, eu tive que explicar na minha tese por que é que estava a usar, por que achava que esta metodologia tinha sentido. Não havia uma tradução para português. Depois, a professora Clara Coutinho escreveu um texto em que lhe chamou metodologia de desenvolvimento apenas. Nós chegamos inclusive a escrever um texto que nunca chegou a ser publicado, em que propúnhamos uma nomenclatura portuguesa, em português, para este modelo. Mas o que eu faço normalmente é mostrar os exemplos e remeter para o texto do Van Den Akker que explica como é que o modelo, qual é o conceito do modelo. O que tem aqui é muito melhor porque está muito mais, as várias fases... Apesar que eu tenho uma abordagem um bocadinho pouco ortodoxa em relação a essas coisas que é, eu prefiro que os alunos utilizem... Por exemplo, aqui tem uma série de autores. Van Den Akker propõe quatro etapas, o Reeves propõe cinco, depois há uma série, há um autor muito interessante, deixe-me ver como ele se chama, que eu costumo enviar, dar esse também aos meus alunos... Por isso, tem aqui... O Thomas Reeves já tem aí, Susan McKenney também já tem aí... Há um livro muito interessante, há um texto da Rita Richey que é também, que se chama developmental research, deixe eu ver se tenho aqui. Tem aqui onde diz, Van Den Akker... Mas o da Rita é muitas vezes também se chama instructional design porque tem aquelas coisas do instructional muito passo a passo.

**Então o professor acha interessante adicionar essas referências e também exemplos práticos?**

O que eu acho é que ter exemplos de prática é sempre bom. Mas eu gosto do pouco que os meus alunos, ou seja, que é bom saber que isto é importante, que é bom saber que há autores diferentes que fazem abordagens diferentes e os caminhos podem ser, as abordagens podem ser diferentes também, mas eu prefiro que eles sigam um autor. A partir do momento em que sabem isto, ter conceito, o que é que são os development studies, ou que essa terminologia depende muito do autor que utiliza, as etapas são diferentes, mas depois escolher um autor e seguir esse autor. Porque muitas vezes quando se faz um mestrado ou doutoramento tem-se pouco tempo para andar a ver 40 modelos diferentes. Se conseguir ter tudo num mesmo sítio, é que é sempre mais interessante. O fato de estar em inglês é ótimo porque permite ser visto e ser lido e ser por mais que um autor. Mas o que a Lorena faz é dizer “existem estes sete ou oito que são muito parecidos, de acordo com o autor, isto pode ser feito de várias formas”, não é? É o que estou a ver...

**Em relação ainda a este recurso se o professor tivesse a oportunidade de reutilizá-lo em que contexto reutilizaria? Se o professor tem interesse em partilhar com outros estudantes ou com outros professores?**

Isto podia ser um belíssimo material para quando estou com meus alunos. Eu normalmente sempre que possível oriento-os para as metodologias de desenvolvimento porque grande parte dos trabalhos que eu oriento tem sentido com as metodologias de desenvolvimento, muitas vezes não, mas normalmente sim. Por isso se a Lorena me deixar eu obviamente teria muito gosto em poder partilhar com eles.

**Ainda é um protótipo, estamos nas últimas fases de avaliação, mas se o professor acha apropriado, pode partilhar, sem problemas.**

O que pode ser interessante é algumas destas do que está em texto poder se ter outro tipo de formato. Também estou a ver que tem aqui um vídeo... Que material é este, é seu, ok. Depois tem aqui, por exemplo, que estes artigos têm os autores... Tem aqui em algum



momento a explicação em quê que estes vários modelos são iguais e em quê que os vários modelos diferem?

**Não...**

Poderia ser interessante. Eu podia uma vez que, por exemplo, o da Susan McKenney e do Thomas Reeves é ligeiramente diferente. Por que é que ele fez uma coisa ligeiramente diferente? Às vezes é só para escrever e poder ser citado. Mas outras vezes pode ter sentido no âmbito de algum tipo de investigação porque se nós pensarmos um bocadinho, o modelo é quase aquele modelo do ADDIE, Análise, Desenho, Desenvolvimento, Implementação e Avaliação, não é? ADDIA em português, que é o do design de produto. Eu vejo qual é o meu problema, analiso, vejo o quê que a literatura diz sobre isto, desenho uma intervenção, testo várias vezes em vários ciclos e depois posso ter ou um produto para ser implementado na sua versão final ou um produto ou uma reflexão teórica sobre como é que o produto pode ser posto em prática.

### **Parte 3 | Avaliação do protótipo: aspectos positivos e negativos**

**Ainda em relação ao recurso, o que o professor mais gostou? Quais são os aspectos mais positivos?**

A primeira coisa que eu vejo é que a Lorena conhece, traz vários autores que eu conheço. Imagino que por isso, eu há um bocadinho ia ver um, havia um aqui que eu acho que também podia estar que não está. Por isso, uns dos aspectos que me parecem importantes é perceber que está dentro do assunto, não é? Do meu ponto de vista. Deixe-me só ver aqui que tinha um autor que também me parece interessante para a Lorena poder adicionar, por isso deixe-me ver... Há um livro que eu, por exemplo, eu tenho um livro da Susan McKenney e Thomas Reeves e é uma variante do trabalho do Van Den Akker... Essa ferramenta é que define as questões, define como é que o modelo aparece... Rita Richey... Eu tenho vários, de vários autores... Deixe-me dizer um que... Onde é que está... Bem não encontro.

**Não tem problema.**

Mas não é importante porque todos esses autores depois vão, do meu ponto de vista, vão beber ao que diz o Van Den Akker. Mesmo este do Plomp e a Nieken Nieveen, que são autores que trabalharam com o, da mesma universidade da escola de educação do Van Den Akker, a Nieken Nievenn e o Plomp.

**Em relação aos aspectos negativos, o que o professor menos gostou neste recurso?**

Tem aqui a research question, este quiz aqui é um quiz para quê? Check all the research questions that apply to design-based research, o que é que pretende com isso?

**É mais uma forma interativa de apresentar o conteúdo. Temos diferentes perguntas de investigação com diferentes objetivos. Seria mais uma forma interativa de apresentar o conteúdo sobre as diferentes estruturas das questões de investigação e checar as que são relacionadas ao design-based research.**

Ok. Reflective activity...

**Temos algumas, três reflective activities pelo recurso para que o aluno possa parar e pensar, tentar pôr em prática os conceitos que estão sendo estudados.**

Um aspecto que pode ser interessante uma vez que entra pela questão de investigação é como desenhar uma questão de investigação. Aqui tem vários exemplos de questões de investigação, mas o que é que faz uma boa questão de investigação? Porque isto é fundamental para eu desenhar o meu modelo de investigação. O que é que eu vou, o que é que eu preciso, qual é o meu problema, o que é que eu quero dar resposta. Depois tem aqui... Podia ser interessante aqui nestes vários ciclos dizer o que é que estes ciclos, o que é que os vários modelos têm de alternativa entre eles, diferenças entre eles. Por que é que um tem três etapas, o outro tem quatro, o outro tem, o de cima tem cinco, o outro tem, usa uma etapa dividida em duas, o outro tem três... O que é que faz com que estes

modelos sejam diferentes. Será que um modelo se apropria mais ao tipo de desenho que eu estou a fazer, ao tipo de investigação que estou a fazer?

**O professor tem mais alguma sugestão de melhoria em relação ao conteúdo?**

Não sei... Eu acho que, do que eu conheço os meus alunos, se conseguíssemos ter aqui mais interatividade, ou seja, a Lorena concentrou numa página web uma série de autores. Do ponto de vista do que é o design-based research, ok, está aqui e isto chamou de design-based research mas podia ter chamado também de development research ou, por exemplo, por que é que chamou design-based research? Essa questão também se podia colocar. Em que situações é que o modelo 1 é melhor que o modelo 2 ou que o modelo 3 ou que o modelo 4, não é? Os vários autores que tem aqui, houveram aqui estas fases, isto é ótimo para se tiver com aluno e ele rapidamente ficar dentro do assunto, perceber. Mas qual é a diferença entre o modelo que tá ali do Plomp ou do Thomas Reeves ou da Susan McKenney? Porque a Susan McKenney tem muitos textos com Thomas Reeves, tem aqui um modelo ligeiramente diferente, em que situações é que... Depois tem um que é da McKenney e do Thomas Reeves, depois tem o do Plomp outra vez. E há mais modelos. Há modelos em que têm muito mais etapas, era aquele que eu estava aqui a procurar e depois eu lhe envio, que é: em que situações é que um aluno que vai fazer investigação deve usar o modelo de três etapas ou de quatro etapas ou de cinco etapas? O que é que eles têm de diferente que possa ter sentido fazer mais uma etapa ou menos outra? Em que é que elas são diferentes? Por exemplo, temos aqui, todas partem de um problema e da análise desse problema, não é? Needs, context analysis, analysis, analysis, exploration, preliminary research, por exemplo, isto aqui é o que diz Plomp, mas isso aqui é muito parecido com aquele do Van Den Akker. Ou seja, eu tenho aqui cinco formas diferentes de desenhar a minha investigação. Em que situações é que eu devo escolher uma ou outra? O que é que elas têm de igual, o que é que elas têm de diferente e em que situações é que a Lorena enquanto investigadora propõe que se adote um ou o outro? Porque muitas vezes eu tenho essas questões que os alunos me perguntam e eu digo: "eu normalmente, eu, com o modelo do Van Den Akker, eu resolvo todas as situações".

**Parte 4 | Conceito e aplicação dos REA**

**Saindo agora do recurso, como o professor define os Recursos Educacionais Abertos?**

Como é que eu defino?

**Sim, qual o conceito?**

É o que são pra mim?

**Isso.**

São recursos que eu posso usar no processo de aprendizagem e são abertos porque são de utilização livre, porque estão passíveis de poderem ser customizados. Ou seja, eu posso pegar num recurso e otimizá-lo ou customizá-lo para aquilo que é a minha atividade. E ele é aberto porque é disponibilizado livremente e está aberto para eu poder alterá-lo em função daquilo que eu necessito.

**O professor ao preparar conteúdo e materiais para as aulas ou para os alunos de mestrado e doutoramento, tende a criar esses materiais do zero ou reutiliza materiais já disponíveis?**

Reutilizo, não sou tolo. Há milhões de recursos que eu possa usar e posso combinar, e já há muitos anos que deixei de fazer do zero. Acho que desde que, do que eu me lembro que fazia os meus recursos todos, a partir do momento em que fiz o meu doutoramento e que passei muitos anos a desenvolver um protótipo que ele próprio tinha dezenas de recursos que me demoraram meses e meses a fazer, que deixei de fazer isso. Quer dizer, eu posso rapidamente fazer uma pesquisa na internet, desde que saiba onde vou procurar, que encontro os materiais, os objetos de aprendizagem, os recursos abertos todos que eu preciso, por isso, por norma vou à procura do que já existe.

**Certo. O professor tem o hábito de partilhar estes materiais com os alunos ou**

**outros professores?**

Dou aos alunos. Tudo que eu apresento aos alunos nas minhas aulas, ofereço-lhes.

**Perfeito. E o professor utiliza alguma licença aberta ao partilhar estes materiais?**

São recursos que já são abertos, que eu ao partilhar-lhos com meus alunos, o que estou a fazer é exatamente aquilo que é pedido, que é difundir aqueles materiais que já são de licença aberta, não é?

**O professor usa o creative commons, alguma licença específica?**

Não tenho muito esse cuidado para ser sincero.

**Tá bem. E o professor acha que os Recursos Educacionais Abertos são interessantes ou relevantes para o seu contexto de ensino e aprendizagem?**

Sim, são muito relevantes, muito importantes e este hábito é um hábito que eu aprendi há muito tempo que é de utilizar, difundir aquilo que são os bons recursos que existem e depois partilhar com os alunos esses recursos. Acho que já não tem sentido absolutamente nenhum eu obter recursos que são fechados, que são meus, que eu os mostro aos alunos e depois não os deixo utilizar. Por isso, todos os materiais eu coloco nas plataformas que utilizo nas minhas aulas e os alunos utilizam depois. Quanto mais eles forem visualizados e alterados, melhor. Quer dizer, que tiveram um propósito e serviram a esse propósito.

**Então o professor acredita que esses princípios dos Recursos Educacionais Abertos são praticáveis?**

São, claro, sem dúvida.

## **Conclusão**

**Então, para finalizar, gostava de agradecer ao professor mais uma vez pela disponibilidade e perguntar se o professor tem algum comentário adicional.**

Eu queria só pedir-lhe desculpa porque eu fui, primeiro esqueci-me do seu e-mail, depois marquei e numa altura e depois não estava cá eu no dia em que tinha marcado consigo.

**Não se preocupe, professor. Já deu tudo certo.**

Não estava no país tampouco e eu estive fora, depois resolvi ficar mais uns dias e nem me lembrei e peço desculpa por isso. E dar-lhe os parabéns por ter essa preocupação porque o design-based research e essas metodologias de desenvolvimento são algo que eu abraço com muito carinho. Acho que resolvem grande parte dos desenhos de investigação que se fazem em educação. Se a Lorena tiver a oportunidade de alguns destes, daquilo que estou a ver aqui em texto poder ajudar, talvez com quizzes... Ou se um aluno, por exemplo, tiver esta, esta e este problema qual é o caminho que eu posso seguir, provavelmente teria aqui um recurso fantástico para os alunos estudarem e utilizarem nas aulas de metodologias de investigação, nos mestrados e nos doutoramentos. Se conseguir que não seja só “existe isto, isto e isto”, mas “se eu tiver esta preocupação, o melhor caminho é, em vez de buscar isto tudo, é esta ou este?”, “Mas se a preocupação, fora esta, é esta ou este? Mas se a preocupação é com esta, o ideal é este”. Se tiver aqui alguns caminhos que se possam indicar, acho que vai ter muito mais gente a querer utilizar este recurso. E vou lhe pedir se me deixa utilizá-lo com meus alunos também mesmo no formato em que está.

**Claro. Não é a versão final, mas se o professor acha que esta versão já é suficiente e apropriada, com certeza pode reutilizá-la. E levaremos em consideração os comentários e sugestões para que o protótipo seja melhorado. E em breve teremos uma versão final que será partilhada.**

Até posso fazer isso que é, não sei qual é a urgência do que tem, eu vou para Timor daqui a bocadinho e só venho no final do mês, mas eu posso com os meus alunos que estão a fazer investigação comigo, e eu tenho 13 alunos de doutoramento, e posso trabalhar nisso o que que achavam que fazia falta, “olha, se isso tivesse isso poderia ser útil” e depois dar

feedback a Lorena sobre isso.

**Sim, professor, qualquer sugestão de melhoria será bem-vinda.**

Fica combinado então.

**Tá bem. Agradeço mais uma vez a disponibilidade e as sugestões e desejo-lhe um bom fim de semana e uma boa viagem.**

Tá. Obrigado, Lorena. Fique bem.

**Obrigada, professor.**

## Appendix K

Answers from the open-ended questions: Cycle 2, first H5P workshop

	<b>What did you like the most about this resource? List the most positive aspect(s):</b>	<b>What did you like the least about this resource? List the most negative aspect(s):</b>	<b>What are your desirable additions or modifications to this resource? Write here your suggestions for improvements:</b>
1	clear structure, clear objectives	very much text-based	Further additions of multimedia allowing different levels to perceive the DBR learning content
2	It is something I didn't expected. So intuitive and easy to use and it allows me to apply IT tools in the classroom. For me it is a really interesting tool.	-	-
3	Easy to use. Lots of possibilities. Easy to share (not sure yet if easy to integrate in other tools but it seems yes)	I didn't know how to share the link (at the end, it was just copy and paste). I couldn't find other sources easily because I always found the space to create but not the other resources published.	I would like to see the versions other users create from mine version to see how they modified, what do they include, etc... I would like to add comments in other resources, Is it possible in the forum? I would like to see the summary of all the responses users submitted to my activities or information about the usage, etc....
4	-	-	-
5	The contents are well organized and easy to navigate.	The table is not displayed properly on the small screen.	The content type is mixed between information and assessment.
6	-	-	-

## Appendix L

Answers from the open-ended questions: Cycle 2, second H5P workshop

	<b>What did you like the most about this resource? List the most positive aspect(s):</b>	<b>What did you like the least about this resource? List the most negative aspect(s):</b>	<b>What are your desirable additions or modifications to this resource? Write here your suggestions for improvements:</b>
1	It is very complete and the diagrams, figures, and colors make it more attractive and engaging.	it would be very nice to type answers directly	I would add videos where people quickly present their DBR studies (e.g., tell your PhD in 3-minutes competition). I would add more examples of RQs
2	Interactive elements	Need more feedback after the exercises, still spelling errors around. Need for interactive elements on reflection exercises.	Need more feedback after the exercises, still spelling errors around. Need for interactive elements on reflection exercises.

## Appendix M

### Answers from the open-ended questions: Cycle 3, DBR workshops

	What did you like the most about this resource? List the most positive aspect(s):	What did you like the least about this resource? List the most negative aspect(s):	What are your desirable additions or modifications to this resource? Write here your suggestions for improvements:
1	-	-	-
2	É prático, temos de aplicar os conceitos que lemos e entramos em contacto.	-	-
3	The Web design and way of teaching!	Complicated Theme!	-
4	Interesse para os professores	Algo complicado para perceber	-
5	Simplicity. Straightforward.	Could be more dynamic.	Sounds. Video. Motion Graphic.
6	-	-	-
7	-	-	-
8	I liked the interactive aspect	A bit confusing to navigate	Perhaps the option to have it in different languages so that it's more accessible to more people
9	-	-	-
10	o facto de ser interativo	o facto de estar só em inglês	daria a opção de se ler em português
11	It makes learning easy. The gamification aspect of it extremely motivates its usage.	-	-
12	Online resource	Graphic layout	Visual aspect
13	Good Website.	Complicated Theme!	
14	-	-	-
15	The questions and examples help understanding the subject.	Could be more user-friendly written.	Make the explanations written in a more systematic and practical way.
16	Its very helpful Easy to use Organized	-	It could be more attractive
17	A interatividade com o conteúdo	Devia dar para avançar e voltar pelas setas do teclado ou a fazer swipe	Talvez o posicionamento do índice
18	Overall it produces well structured information about DBR.	-	-
19	-	-	-
20	-	-	-
21	Easy and simple to learn. Comprehensive	The overall layout of the resource.	-
22	-	-	-
23	bem organizado e intuitivo	-	-

24	Straight to the point; Fast and Clear	As a personal point of view: Not super interesting (the theme of the workshop). But nothing negative about the person who presented.	None whatsoever
25	How easy it is to learn	It's not a negative aspect but it can become really dull and boring at times.	
26	All of it, especially the ease of use and the interactiveness of it	There's nothing I didn't like	I have no suggestions to give :(
27	A aprendizagem por passos; A orientação de progresso pela barra superior; O feedback nos exercícios e as soluções apresentadas; Organização do conteúdo.	A interface poderia ser mais amigável e atual e ser mais navegável e qualquer sítio da página e do scroll.	Acho que é eficiente no objetivo que pretende atingir.
28	-	-	-
29	Gostei da interação que podemos ter.	Não há nada que não tenha gostado.	Não tenho nada a acrescentar, gostei de tudo.
30	Easy to use and understand Has all the information compiled	The titles in index get cut which doesn't let you read what it is	-
31	Design focused in the development	-	Give more attention to the user
32	-	-	-
33	-	-	-
34	Informative and well organized. A good tool to clarify and revise information about DBR.	Aesthetic. Looks like an old site with very basic interactivity. Perhaps it helps to keep information clear and organized but doesn't make me want to use it.	The practical exercises could be more interesting, either visually and/or mechanically.
35	Information is organized Explains very clear the subject Even has little exercises, where if we chose the wrong answer, the same explains why that is the wrong answer	I have the habit to open in different tabs the information, and in this website I can't right click and open in a new tab	-
36	The organization of information.	-	-
37	I liked the accessibility of the knowledge resource. Moreover, the activities using H5p was very useful in informing my research design.	Nothing really.	A couple more activities and a detailed research plan at the end. Give 15/20 minutes then a discussion session to give feedback to improve.
38	- Explicação clara e ilustrada - Sessão interativa - Tempo indicado	-	- indicar aos participantes para trazerem um desenho do seu projeto para verificar quais os efeitos que a formação teve no seu projeto



39	I liked that the "exercises" come after the informative sections. I also liked the way that feedback of the answers was given.	Its a little messy that the "math exercises" start each sentence with a undercase letter. It looks like the word selected to start the sentence will be part of the sentence, but its not.	I would start the "options" with uppercase. ie. in Match the research function to the correct exemplary research question: _____ what is the achievement of Chinese grade 8 pupils in mathematics?; what barriers do students experience in the learning of mathematical modelling?  i would write it like: _____ What is the achievement of Chinese grade 8 pupils in mathematics?; What barriers do students experience in the learning of mathematical modelling?
40	It was a way to compile very valuable information in one place, while still having access to the references.	It could be more aesthetically pleasing, with more color	For the multiple choice questions, it could be more obvious which answers that were not selected/checked were the right one (because they only appear with a check mark in grey background, so they don't stand out)
41	The process of the methodology.	-	-
42	The language is very clear and direct; The interactive exercises.	A lot of text in the slides. I think it will be more interesting to split more the information and use more graphs.	Transform text in images.
43	Easy to use. Sequential	-	-
44	Explanatory Scores	Linear	dynamic contents
45	I think it's very useful for future researchers and students.	-	-
46	A interatividade aliada à fundamentação teórica. O design dos gráficos. Muito boa ferramenta para compreender o DBR	Alguns dos links são muito lentos a abrir. Futuramente vou explorar o recurso e voltar a preencher o questionário.	Lentidão.
47	Ajudou-me a colocar as minhas ideias em ordem. Até hoje ainda não tinha conseguido... todos os passos ajudaram-me a ordenar o que pretendo fazer no meu projeto.	Estranhei no início a organização das páginas, mas tudo ficou resolvido quando explorei individualmente	Talvez incluir (não sei se é possível) alguns meios audiovisuais (vídeos, podcasts, algo mais interativo... ). Acho que ficaria mais interessante
48	-	-	-