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Metapesquisa: um caminho para o reconhecimento da importância das animações instrucionais no ensino de língua portuguesa

Metaresearch: a path to recognizing the importance of instructional animations in portuguese language teaching

Metainvestigación: un camino para reconocer la importancia de las animaciones instruccionales en la enseñanza de la lengua portuguesa

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Abstract

This article is part of a dissertation, which had the general objective of contributing to teacher training, regarding the construction of digital teaching materials, considering the growing presence of digital information and communication technologies (TDICs) in the school environment. Therefore, this study aims to map studies on instructional animation in order to organize the main results on the topic. The corpus is composed of the path followed in search of a theoretical framework for the investigation, as well as the definition of metaresearch (research on research) as a research strategy, based on studies by Mainardes (2018). The analysis procedures consist of exploratory reading of the articles and observation of their theoretical foundations. With the diagnosis produced, the recurrence of cognitive load theories (SWELLER, 2003) and multimedia learning theory (MAYER, 2005) was noticed as a basis for the use of instructional animations in education. Furthermore, it was noted that there is still room for studies on this topic, applied to teaching Portuguese language content for the final years of medle school. It is considered, then, that metaresearch is an important instrument for understanding the context of academic production in the area of study of the topic in question.

Keywords: Metasearch; Instructional animation; Digital information and communication technology; Teacher training.

Resumo

Este artigo é parte de uma dissertação, que teve como objetivo geral contribuir para a formação docente, quanto à construção de materiais didáticos digitais, considerando a crescente presença das tecnologias digitais da informação e comunicação (TDICs) no ambiente escolar. Dessa forma, este estudo tem por objetivo mapear estudos sobre animação instrucional a fim de organizar os principais resultados sobre o tema. O *corpus* é composto pelo percurso seguido em busca de arcabouço teórico para a investigação, bem como a definição de metapesquisa (pesquisa sobre pesquisa) como estratégia de pesquisa, com base nos estudos de Mainardes (2018). Os procedimentos de análise se compõem de leitura exploratória dos artigos e observação de seus embasamentos teóricos. Com o diagnóstico produzido, percebeu-se a recorrência das teorias da carga cognitiva (SWELLER, 2003) e da teoria de aprendizagem multimídia (MAYER, 2005) como fundamentação para o uso de animações instrucionais na educação. Além disso, notou-se que ainda há espaço para estudos deste tema, aplicado ao ensino de conteúdos de língua portuguesa para os anos finais do

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ensino fundamental. Pondera-se, então, que a metapesquisa é um importante instrumento para a compreensão do contexto de produção acadêmica na área do estudo do tema em questão.

Palavras-chave: Metapesquisa; Animação instrucional; Tecnologia digital da informação e comunicação; Formação docente.

Resumen

Este artículo forma parte de una disertación, que tuvo como objetivo general contribuir a la formación docente, en torno a la construcción de materiales didácticos digitales, considerando la creciente presencia de las tecnologías digitales de la información y la comunicación (TDIC) en el ambiente escolar. Por lo tanto, este estudio tiene como objetivo mapear estudios sobre animación instruccional con el fin de organizar los principales resultados sobre el tema. El corpus se compone del camino seguido en busca de un marco teórico para la investigación, así como de la definición de metainvestigación (investigación sobre investigación) como estrategia de investigación, con base en estudios de Mainardes (2018). Los procedimientos de análisis consisten en la lectura exploratoria de los artículos y la observación de sus fundamentos teóricos. Con el diagnóstico elaborado, se advirtió la recurrencia de las teorías de la carga cognitiva (SWELLER, 2003) y la teoría del aprendizaje multimedia (MAYER, 2005) como base para el uso de animaciones instruccionales en educación. Además, se observó que todavía hay espacio para estudios sobre este tema, aplicado a la enseñanza de contenidos en lengua portuguesa para los últimos años de la escuela primaria. Se considera, entonces, que la metainvestigación es un instrumento importante para comprender el contexto de la producción académica en el área de estudio del tema en cuestión.

Palabras clave: Metabuscador; Animación instruccional; Tecnologías de la información y las comunicaciones digitales; Formación docente.

Introduction

This article is part of a dissertation that aimed to contribute to teacher training by guiding teachers in the development of digital teaching materials. The study was motivated by the growing presence of digital information and communication technologies (DICTs) in society in general and, consequently, in the school environment. This presence was especially noticeable during the Coronavirus pandemic in th year of 2020, when teachers and students had to adapt to the new and sudden routine of non-face-to-face studies. Thus, many teachers needed to find ways to use DICTs in their daily practice in order to favor the teaching-learning process.

In this context, the researchers sought to answer the following question: how to produce instructional animations for teaching Portuguese to students in the final years of middle school? In their research, the researchers found it was necessary to summarize studies that fit the purpose of the study.

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Therefore, this article aimed to map studies on instructional animation[2] in order to summarize the main results on the topic. To this end, the analysis procedures consisted of an exploratory reading of the articles and observation of their theoretical foundations. After analyzing the results, it was noted that the theories of cognitive load (SWELLER, 2003) and multimedia learning (MAYER, 2005) were used to support the use of instructional animations in education in many articles, which was crucial for the foundation of the studies. In addition, it is noted that there is still room for studies on this topic, applied to the teaching of portuguese.

In this context, meta-research becomes an important tool for understanding the context of academic production regarding Portuguese language instructional animations and contributes to identifying their characteristics and weaknesses.

Thus, this article presents meta-research as a methodology, highlighting its characteristics and seeking to support those interested in carrying out this type of research.

Metasearch definitions

The growing number of academic papers in various areas of study leads us to question a way to systematically synthesize the range of knowledge. Metaresearch is a methodology that helps researchers in this regard, in order to condense research on the topic and find a consistent theoretical basis for their investigations.

In this sense, Mainardes (2018) carried out a comprehensive study on the conceptualization and epistemology regarding metaresearch, which fits well within the present scope. In a later publication (2021), he distinguishes the term metaresearch from meta-study and metasynthesis:

> a - Meta-research: aims primarily to evaluate a set of research studies, with the aim of improving them, that is, to help the progress of science and scientific practices and contribute to the theoretical development of a field, area or discipline.
> b - Meta-study: aims to synthesize results (meta-synthesis) through the analysis of research results (data meta-analysis), analysis of methods

[2] We could use the term educational animation here, since we are dealing with an animation specially created for educational purposes (MATTAR, 2014). However, although the term instructional is more linked to a more rigid mode and more concerned with the transmission of content, we chose to use it here, because some tasks within education can be instructional, although the focus continues to be on active and autonomous learning and not mere repetition. Therefore, instructional animation can be one of the forms of educational animation. (ALVES, 2018)

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> (metamethod) and analysis of theoretical and analytical frameworks (metatheory). (MAINARDES, 2021, p.22)

Mainardes (2021) considers meta-research to be synonymous with meta-study. According to the author, both are seen as a comprehensive strategy, which can encompass: metatheory, when analyzing the theories employed; data meta-analysis, when analyzing a set of already completed research; and metamethod, when evaluating the methods employed.

Thus, meta-research is a type of bibliographic research that aims to synthesize previous studies in a given area, reflecting on the theoretical foundations and their relevance for the development of such field (MAINARDES, 2018). It can also analyze themes, theories, research methods or a combination of these and other aspects (PAIVA, 2019). From the results obtained, a general conclusion can be drawn about the similarities and differences between the findings, in order to contribute to future studies. In this regard, in his study, Mainardes (2018) differentiates this method from literature review, systematic review, state of the art, state of knowledge:

> Metaresearch is discipline-oriented (area or field) and is engaged with research advances in the discipline (area or field). Review studies (literature review, systematic review, state of knowledge, state of the art) are oriented towards research projects [...]. Generally, literature review works are more concerned with synthesizing the results of a set of research, paying less attention to the theoretical foundations of the reviewed research. Metaresearch, in turn, seeks to analyze, especially, the theoretical foundations of the research and their significance in the theoretical development of the field of which the research is part. (MAINARDES, 2018, p. 306)

Thus, in the present investigation, the authors compared the theoretical basis of the findings and concluded which theory would best answer the research question of their dissertation, believing that they were building a basis for the proposed studies.

How to do a metaseartch

According to Mainardes (2018, p. 308, citing ZHAO, 1991), “meta-studies begin by examining problems found in primary studies (primary data) and end with the indication of proposals to solve these problems”.

In this sense, he presents a methodological proposal for meta-research that can be adapted according to the purpose of each study. The suggestion supports the analysis of the theoretical-epistemological characteristics of the research, assuming a double dimension: a)

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reflective, which takes the scientific production of the area as an object of study, reflection and analysis; b) theoretical-analytical, whose considerations lead to the belief that the topic in question can be restudied. Based on these formulations, Mainardes (2021) highlights that meta-research can be developed in the following stages[3]:

1st) Selection of a set of texts: articles, theses, dissertations or other publications, which vary according to the objectives of the research;

2nd) Organization and cataloging of findings in a spreadsheet, which may consist of: complete reference, summary, keywords, or whatever else is considered in the analysis;

3rd) Systematic reading, seeking to find data from the analysis, such as: theme and type of research, epistemological view, theoretical framework, research problem, objectives, hypotheses and arguments, citations…

It is worth noting that the classification adopted in meta-research is subjective, since it depends on the objectives of each researcher. It is also worth noting that the intention of this summary is not to judge the works analyzed, but to seek to elucidate the way in which studies have been developing in the area in question.

In this regard, cataloged publications were analyzed with a view to finding consistent theoretical foundations to support the investigative work.

The metasearch in question

Considering the steps proposed by Mainardes (2021) and the motivation for the investigation that supported the meta-research work to be described in this article, a series of searches were carried out in academic digital databases. The works found were read in search of theoretical basis. This process is described below.

The search started with a bibliographical search in the databases of the Sucupira platform, in the CAPES journal portal and in the Google Scholar search portal. Despite the importance of the good use of DICTs by teachers, after a search for the exact terms “instructional animation” in the area of education assessment, in the last three four-year periods, between 2010 and 2020, no journals were found on the Sucupira platform. Using the Google Scholar tool, after exploring the terms “instructional animation for the Portuguese language” in the last ten years, nothing was found either. Then, the terms “for Portuguese

[3] This stages can be found in more datailes in MAINARDES, Jefferson. Metapesquisa no campo da política educacional: elementos conceituais e metodológicos. **Educar em revista**, v. 34, p. 303-319, 2018.

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language" were removed and "instructional animation" was searched for in the same period, finding nine articles, which are organized in Table 1.

Table 1 - Articles about instructional animation in Google Scholar

Título do artigo	Assunto	Autores
Cconsiderations on the visualization of animated procedural pictorial sequences on mobile interaction devices	Presentation of possible limitations in viewing the presentation of instructional material on mobile interaction devices, considering the change in the way content is viewed in relation to fixed and hybrid equipment.	Festas, 2015
Educational animation for Circadian Rhythm Disorders due to time zone changes	Creation of an animation to help understand and raise awareness about circadian rhythm disorder due to time zone change, aimed at people who travel by plane over long distances.	Barros et al, 2014.
Technologies in learning Human Anatomy: possible contributions to medical teaching.	Use of technological objects as facilitators in learning about human anatomy.	Trotta e Spinillo, 2014
The approach to emotions in the design of multimedia educational materials	Study of the influence of emotions on learning and their consequent consideration in the design of multimedia educational materials.	Pinto e Pizzato, 2016
Digital technologies for teaching school geography	Use of instructional animations for teaching Geography.	Silva e Nunes, 2017
Animated Pictorial Sequence of Procedures (SPPA) on Medication Use: Proposal for a Digital Guide for Developers	Creation of a digital interactive guide for the design of animations on the preparation and use of medicines, developed based on design and usability principles and guidelines.	Spinillo, Gomes e
Innovation for promoting hearing health: Development of an experiential and instructional resource for the use of personal stereos	Development of an experiential and instructional resource as an innovative strategy for promoting hearing health.	Barboza et al, 2020
Pedagogical Escape Room as a Learning Strategy for the Development of Educational Skills and Triggering of Flow.	Contributions of the Pedagogical Escape Room in relation to the development of educational skills.	Pscheidt, das Graças e Cleophas, 2021.

Source: the authors

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This survey shows studies that address the use of instructional animations in learning in various areas, but not in teaching Portuguese. The one that came closest to the present scope was Trotta and Spinillo (2014), whose journal was classified on the Sucupira platform as qualis A2, in the 2017-2020 four-year period. Their motivation was to find out whether technology facilitates the learning of content, based on the theory of cognitive load and multimedia instruction. As a result, the authors created a diagram in which they illustrated the connections of the principles for learning with the use of technological instruments, related to cognitive load. They considered that learning needs to be structured according to the information, presentation and content to be taught. However, it was intended for the area of anatomy.

On the CAPES journal portal, searching for the exact terms “instructional animation” did not find anything in the last ten years. We then searched for articles that contained these words, and not the exact expression, since 2013. Seven publications were found, which are shown in Table 2 below.

Quadro 2 - Artigos que contém os termos animação instrucional no Portal de periódicos da CAPES

Título do artigo	Assunto	Autores
Interactive Simulations in Teaching Electromagnetism Concepts	Development of a hyperdocument to support the teaching and learning of Electromagnetism concepts in High School.	Pedroso e Araújo, 2013
Teaching Computing with SCRATCH in Medle School – A Case Study	Teaching computational thinking and programming in middle school, using the visual programming language Scratch	von Wangenheim, Nunes e Santos, 2014
Development of a course in the Virtual Learning Environment about CIPE	Evaluation and development of a course on the Moodle platform, in the nursing area, using, among other resources, animations.	Avelino et all, 2016
Representação gráfica para a inserção de elementos da narrativa na animação educacional	Graphic representation for the insertion of narrative elements in educational animation	Alves, Battaiola e Cezarotto, 2016
Cytology for deaf students: a potentially significant teaching unit	Construction of a Potentially Significant Teaching Unit for teaching a Biology component to deaf high school students in	Tavares, Anic e Neto, 2018

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	inclusive schools.	
Educational or instructional designer: the new pedagogue of the digital age	Historical summary on the occupation of educational designer and its importance in the teaching-learning process.	Sciarra e Lourenção, 2019
Virtual animations on DNA replication and cognitive theory of multimedia learning	Analysis of virtual animations related to DNA replication, based on principles of Mayer's Cognitive Theory of Multimedia Learning (2005).	Maia, 2020

Fonte: the authors

The studies cited demonstrated the significant contribution of the use of digital educational objects in teaching practices and student learning. Even so, there is room for research into the use of specific animations for teaching Portuguese.

It was noted that the studies found considered the principles of the Cognitive Load Theory, as well as the Multimedia Learning Theory, supporting the use of instructional animations in the teaching-learning process.

Considering this incidence and understanding that such theories would lead to the answer to the research question, a search was then carried out for the exact terms “cognitive load theory” on the CAPES journal portal, where the studies published from 2013 to 2023 were found, listed in table 3. All of them demonstrated the positive association of the aforementioned theory with the use of visual resources in the teaching process, in different areas.

Then, searching for the exact terms “multimedia learning” on the same portal, restricting ourselves to articles in Portuguese, published from 2013 to 2023, twenty investigations were found, of which we chose to detail, also in table 3, the first results, as they are the most recent.

Table 3 - Articles on “cognitive load theory” and “multimedia learning” in the CAPES Journal Portal

Título do artigo	Assunto	Autores
Contextualized learning: analysis of its foundations and pedagogical practices	Contextualized approach to theories of critical pedagogy and situated learning	Festas, 2015
An exploratory study to evaluate the difficulty of problems in physics teaching	Exploratory study on the type of navigation of students in a hypermedia, focused on the	De Oliveira e Moreira, 2016.

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using the cognitive load theory with the aid of hypermedia	Cognitive Load Theory.	
Design Concept Maps: A Tool for Designing Meaningful Learning Objects	It presents a methodology for designing meaningful learning objects, through a Conceptual Design Map, based on the Theory of Meaningful Learning and the Theory of Cognitive Load.	Canto, Lima e Tarouco, 2017.
BOOK REVIEW: Multimedia Learning	BOOK REVIEW: Multimedia Learning (Mayer, 2009)	Silva, 2017
Assessment of Learning Objects (LO) on Biological Evolution (BE) based on the Cognitive Load Theory (CLT)	Use of Cognitive Load Theory (CLT) to guide the evaluation and development of better teaching resources that deal with biological evolution.	Portela e De Oliveira, 2020.
An analysis of methodological procedures implemented in a Mathematics course in Postgraduate Studies during the COVID-19 pandemic	Analysis of the methodology used in Mathematics during the Special Home Exercise Regime in the COVID-19 pandemic, using audiovisual resources, in light of the Cognitive Load Theory.	Fajardo e Zimmermann, 2020.
Analysis of Illustrations of Biology Teaching in the National High School Exam in Light of the Cognitivist Theory of Multimedia Learning	Analysis based on the Cognitivist Theory of Multimedia Learning (TCAM), of Biology illustrations in ENEM questions.	Silva et al, 2020
Systematic Analysis of Digital Astronomy Games Through the Theoretical Lens of Multimedia Cognitive Learning Theory	Analysis focused on the Cognitivist Theory of Multimedia Learning, of digital games of astronomy dissertations.	De Oliveira et al, 2021
Analysis of the Types of Engagement in Videos Produced for Teaching Chemistry on YouTube in 2021	Analysis of engagement in Chemistry teaching videos on YouTube, identifying the principles of multimedia learning	Neto e Leite, 2021
Image analysis of the Cnidaria Phylum in Biology Textbooks based on the Cognitivist Theory of Multimedia Learning (TCAM)	Image analysis of High School Biology Textbooks based on the Cognitivist Theory of Multimedia Learning	Dos Santos et all, 2022

Fonte: as autoras

These studies, most of which cite the theory of cognitive load and the theory of multimedia learning, indicate positive results in the use of audiovisual materials in the teaching-learning process.

After comparing the articles found through this meta-research, it was possible to construct the theoretical foundation that would be the basis for the investigation, also allowing us to observe that there is still room for studies on the subject.

Final considerations

In this article, we argue that meta-research is an important means of understanding the knowledge that has been produced about animations aimed at education in the last ten years. Mainly, it serves as a framework to support studies in the area, presenting its characteristics and weaknesses. Based on this diagnosis, consolidated by the meta-research procedure, it was possible to identify that there is still room for studies on the production of institutional animations aimed at teaching the Portuguese language for the final years of middle school.

We also understand that meta-research should be seen as an instrument for a consistent diagnosis that supports the theoretical foundation of a study

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