ACTA SCIENTIAE

ISSN: 2178-7727
DOI: 10.64856/acta.scientiae.8449

Educational Design Research: An Aligned Approach to Contemporary Educational Challenges

Raquel Tusi Tamiosso [a]
Susan McKenney [b]
Aline Grohe Schirmer Pigatto [a]

[a] Universidade Franciscana, Santa Maria, Brasil
[b] University of Twente, Enschede, The Netherlands

ABSTRACT

Background: Historical evidences underscore the synergistic evolution of society and educational paradigms, highlighting their mutual influence and the transformative impact of novel scenarios on both domains. The interconnected evolution of societal dynamics and educational paradigms necessitates a departure from traditional linear pedagogical approaches to accommodate the continuous adaptation in teaching, learning, and research methodologies. **Objective:** In this sense, this paper focuses on identifying and discussing the synergies between Educational Design Research (EDR) and contemporary educational challenges. **Methodological aspects:** Through a theoretical essay on the historical aspects, uniqueness, and potential of EDR, this study illuminates how EDR contributes to the development of effective, innovative, and contextually relevant educational strategies, enriching the educational field, promoting better learning outcomes, and contributing to contemporary education. **Results:** EDR stands as an aligned approach to contemporary educational challenges, integrating theory and practice to develop and refine innovative strategies that are responsive to the evolving landscape of learning, teaching, and technological advancements. **Conclusions:** EDR emerges as a potential approach that bridges educational field with contemporary challenges, fostering innovative, contextually adaptive strategies to enhance teaching, learning, and research outcomes in an ever-evolving societal landscape.

Keywords: Design-based Research; Teaching; Learning; Educational Research.

Pesquisa em Design Educacional: Uma Abordagem Alinhada aos Desafios Educacionais Contemporâneos

RESUMO

Contexto: Evidências históricas sublinham a evolução sinérgica da sociedade e dos paradigmas educativos, destacando a sua influência mútua e o impacto transformador de novos cenários em ambos os domínios. A evolução

Corresponding author: Raquel Tusi Tamiosso.
Email: raquel.tamiosso@prof.ufn.edu.br

interligada da dinâmica social e dos paradigmas educacionais exige um afastamento das abordagens pedagógicas lineares tradicionais para acomodar a adaptação contínua nas metodologias de ensino, aprendizagem e pesquisa. **Objetivo:** Nesse sentido, este artigo tem como foco identificar e discutir as sinergias entre a Pesquisa em Design Educacional (PDE) e os desafios educacionais contemporâneos. **Aspectos metodológicos:** Através de um ensaio teórico sobre os aspectos históricos, a singularidade e o potencial da PDE, este estudo ilumina como a PDE contribui para o desenvolvimento de estratégias educacionais eficazes, inovadoras e contextualmente relevantes, de forma a enriquecer o campo educacional, promover melhores resultados de aprendizagem e contribuir para a educação contemporânea. **Resultados:** Tem-se que a PDE representa uma abordagem alinhada aos desafios educacionais contemporâneos, integrando a teoria e a prática para desenvolver e refinar estratégias inovadoras que sejam responsivas ao cenário em evolução da aprendizagem, do ensino e dos avanços tecnológicos. **Conclusões:** A PDE surge como uma abordagem promissora que conecta o campo educacional aos desafios contemporâneos, promovendo estratégias inovadoras e contextualmente adaptáveis para aprimorar os resultados de ensino, aprendizagem e pesquisa em um cenário social em constante evolução.

Palavras-chave: Pesquisa baseada em design; Ensino; Aprendizado; Pesquisa educacional.

INTRODUCTION

Historical analyses have systematically documented the reciprocal interactions between society and its constituent dimensions, including social, educational, political, economic, ideological, technological, and cultural domains. Observations indicate that the evolution of novel movements, ideologies, and outlooks precipitates societal transformation. This, in effect, catalyses alterations within these enumerated domains. Concentrating on the educational sector, scholarly sources such as Bittar (2009) delineate the temporal evolution of educational paradigms, demonstrating their congruence and integration with societal shifts.

An evident fact throughout history is the constant occurrence of changes, bringing forth new demands. "Since there is a circuit between school and society - one produces the other - any intervention that modifies one of its terms tends to cause a change in the other one" (Morin, 2003, p. 100-101, our translation[1]). Consequently, alterations within societal structures invariably precipitate modifications in educational methodologies. Generally, the nature

[1] *"Como existe um circuito entre a escola e a sociedade - uma produz a outra - qualquer intervenção que modifique um de seus termos tende a provocar uma modificação na outra"* (Morin, 2003, p. 100-101).

of these modifications is characterized by unpredictability. Morin (2000) posits that an acknowledgment of the future's inherent uncertainty is essential. He states that

> A new awareness begins to emerge: the man, confronted on all sides by uncertainties, is taken on a new adventure. It is necessary to learn how to face uncertainty, as we live in a time of changes where values are ambivalent, and everything is interconnected. That is why the education of the future must address the uncertainties linked to knowledge [...] (Morin, 2000, p. 84, our translation[2]).

Morin (2000) states that the end of the 20th century was fundamental to understanding the irremediable uncertainty of human history. He argues that "The 20th century discovered the loss of the future, namely, its unpredictability […] A great achievement of intelligence would be to finally be able to free oneself from the illusion of predicting human destiny. The future remains open and unpredictable" (Morin, 2000, p. 79, our translation[3]).

In face of this scenario, Santos (2017, p. 22, our translation) points out a challenge for education professionals: "The great challenge for education professionals has been to know how to deal with the multifaceted uncertainties inherent to the teaching activity, variables that hardly can be isolated from these dynamic contexts without mischaracterizing them". Indeed, to effectively navigate emerging challenges, educators must engage in ongoing professional development and training. Their roles extend beyond traditional teaching responsibilities, encompassing the duties of researchers who continuously adapt and enhance their skills. A significant number of educators pursue further education through postgraduate studies, including specialization programs, master's, and doctoral degrees. This advanced education enables teaching professionals to investigate the practical dilemmas they encounter and adopt a researcher's approach to their work. Optimal professional practice dictates that research activities should be continuous and

---

[2] *"Nova consciência começa a surgir: o homem, confrontado de todos os lados às incertezas, é levado em nova aventura. É preciso aprender a enfrentar a incerteza, já que vivemos em uma época de mudanças em que os valores são ambivalentes, em que tudo é ligado. É por isso que a educação do futuro deve se voltar para as incertezas ligadas ao conhecimento [...]"* (Morin, 2000, p. 84).

[3] *"O século XX descobriu a perda do futuro, ou seja, sua imprevisibilidade [...] Grande conquista da inteligência seria poder enfim se libertar da ilusão de prever o destino humano. O futuro permanece aberto e imprevisível."* (Morin, 2000, p. 79).

enduring, persisting even beyond the conclusion of formal educational programs.

Lüdke and Cruz (2005) emphasize the need for and importance of strengthening the boundaries between schools and universities. The authors raise the following question in their research: "How can education research be brought up closer to the two realities that concern it: the university, where it is usually developed, and the basic education school, where it is required to address the most vital problems?" (Lüdke & Cruz, 2005, p. 105, our translation[4]). They summarize their findings by suggesting that a "potential indicator" for this convergence might be the adoption of hybrid projects. These are endeavors collaboratively developed through partnerships involving primary and secondary education teachers, alongside students and faculty members from higher education institutions, for instance.

From this perspective, investigations into educational issues must take into account all variables pertinent to the context of their occurrence (Brown, 1992). Individuals who are not directly engaged with educational challenges, or who lack firsthand interaction with the environments where these issues manifest, often possess limited understanding of the actual conditions. Consequently, a disconnect between individuals immersed in the educational contexts facing challenges and those conducting research aimed at enhancing pedagogical practices within these settings may result in the proposed solutions being deemed inadequate. John Dewey apud McKenney and Reeves (2019, p. 90) highlight: "A problem well stated is a problem half solved." Thus, it is a "win-win" relationship, in which the collaboration among professors, researchers, and teachers can promote mutual and enriching support for both sides.

According to McKenney and Reeves (2020, p. 82) "Solutionism is the all-too-common human propensity to jump to a solution before adequately understanding the nature of a problem. Solutionism has long been prevalent in efforts to improve education at all levels […]". Therefore, it is crucial for researchers engaged in exploratory efforts aimed at enhancing pedagogical methods to ensure the inclusion and comprehensive examination of issues as they genuinely occur within their specific contexts.

---

[4] *Como aproximar a pesquisa em educação das duas realidades que lhe dizem respeito: a da universidade, onde ela é habitualmente feita, e a da escola de educação básica, onde ela é requisitada para atender os problemas mais vitais?"* (Lüdke & Cruz, 2005, p. 105).

This concise summary of the educational landscape underscores its inherently dynamic and adaptable characteristics, which are perpetually evolving and shaped by multifaceted contextual factors (including social, cultural, temporal, political, and economic influences). Its human-centric essence, replete with diversity and humanity, alongside its collaborative dimension, underscores the imperative for sustained research within the fields of education and pedagogy. Such scholarly inquiry is essential to adeptly address arising needs and, mainly, to foster ongoing enhancements in educational practices.

Within this context, a cascading series of perpetual transformations is observable: societal dynamics evolve; educational paradigms shift; teaching, learning and research methodologies undergo modification; educational practitioners must adapt; and educational and research approaches are revised to facilitate these adaptations. Consequently, it becomes apparent that traditional and linear approaches are increasingly inadequate in addressing the contemporary demands of teaching and learning processes.

Ongoing inquiry and research methodologies that embody characteristics of dynamism, adaptability, real-world responsiveness, and collaborative engagement are essential. Within the array of available approaches, the research approach identified as Educational Design Research (EDR) has been selected, since it presents all these characteristics and has also gained space as a promising research genre to qualify teaching at both national (Ramo, Gianella & Struchiner, 2010; Bittencourt, 2014; Matta, Silva & Boaventura, 2014; Bittencourt & Struchiner, 2015; Barbosa & Oliveira, 2015; Mazzardo *et al.,* 2016; Kneubil & Pietrocola, 2017; Reis & Amiel, 2019; among others) and international levels (Brown, 1992; Collins, 1992; Reeves, 2000; Cobb *et al*., 2003; Design-based Research Collective, 2003; Sandoval & Bell, 2004; Reeves, Herrington & Oliver, 2005; Barab & Squire, 2004; Wang & Hannafin, 2005; Herrington *et al.,* 2007; Amiel & Reeves, 2008; Plomp, 2009; Herrington & Reeves, 2011; Reeves, McKenney & Herrington, 2011; Anderson & Shattuck, 2012; Bakker, 2018; McKenney & Reeves, 2019; McKenney & Reeves, 2020; among others).

Bakker (2018, p. 14) states that the EDR is a relatively new approach, compared to other approaches, and argues that

> [...] is worth knowing about, especially for students who will become teachers, teacher educators, or researchers in education: Design research is claimed to have the potential to bridge the gap between educational practice

> and theory, because it aims both to develop theories about domain-specific learning and the means that are designed to support that learning (Bakker, 2018, p. 14).

Corroborating with this idea, Chaves (2017, p. 18, our translation[5]) states that Design Research (the term adopted by the author) "[...] emerged as a methodological research approach at a time when the lack of relevance of educational research to daily practice was questioned, which, in general, was not useful for teachers and agents who formulate education policies". Therefore, the capacity of EDR to facilitate the application of theoretical concepts in practical settings, and conversely, to allow practical experiences to enrich theoretical frameworks, is underscored. Moreover, this research approach accentuates the importance of flexibility, dynamism, and the ability to respond adeptly to changing conditions. It also promotes dialogue and collaboration between researchers and educators, fostering a reciprocal exchange of knowledge and insights.

In the concluding remarks of this introduction, it is imperative to acknowledge the current educational landscape's inherent dynamism and the intricate interplay between methodological teaching approaches and evolving educational demands. The objective of this paper is to identify and discuss the synergies between Educational Design Research (EDR) and contemporary educational challenges. EDR's distinctiveness lies in its iterative, flexible, and participatory nature, characteristics that align closely with the demands of contemporary educational paradigms that require adaptability, responsiveness to real-world contexts, and the integration of theory with practice. This paper argues that EDR's methodological framework is not only well-suited to addressing the complexities of today's educational challenges but also plays a pivotal role in enhancing educational quality. Through a theoretical essay on the EDR's historical aspects, uniqueness and potential, this study illuminates how EDR contributes to the development of effective, innovative, and contextually relevant educational strategies, thereby enriching the educational field and fostering improved learning outcomes.

---

[5] "[...] despontou como abordagem metodológica de pesquisa em um momento em que se questionava a falta de relevância das pesquisas educacionais para a prática cotidiana, que, em geral, não tinham utilidade para professores e para os agentes que formulam as políticas de educação" (Chaves, 2017, p. 18).

HISTORICAL ASPECTS OF EDR

Reinking (2021) provides a backdrop to the historical events leading to the development of EDR, highlighting that the most influential figures and significant advancements in education emerged during the 19th and 20th centuries. The author notes that John Dewey argued that research and practice are intrinsically linked, both needing to progress in tandem to be meaningful. "Throughout his career, for Dewey, practice was research and research was practice″ (Reinking, 2021, p. 10).

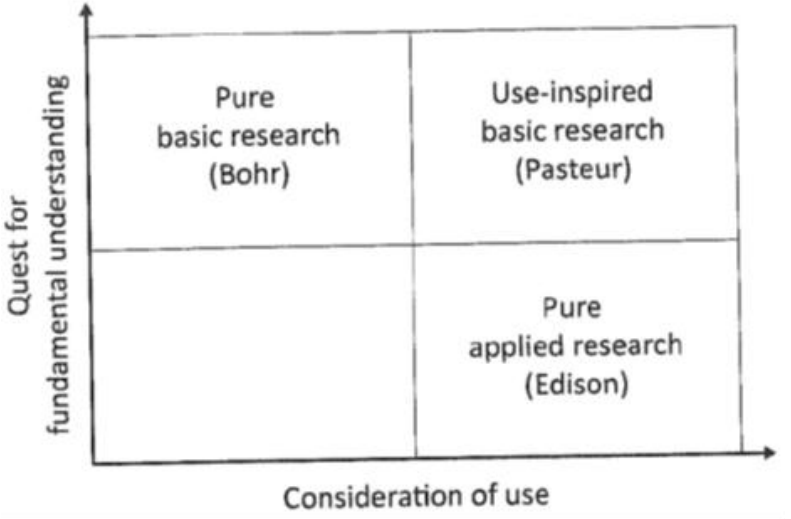
Reinking (2021) elaborates on the contrasting viewpoints between Edward L. Thorndike (1874-1949) and his contemporary, John Dewey, regarding educational research methodologies. Thorndike advocated for a research paradigm that prioritized empirical, laboratory-based studies under controlled conditions to produce quantitative data for statistical analysis, which would then inform educational practice. Reinking (2021) notes that for several decades, Thorndike's empirical approach was more influential than Dewey's, even within the doctoral program Reinking participated in during 1980. Nonetheless, Reinking observes that this program began to diverge from Thorndike's strict laboratory-based research model, incorporating studies conducted in more naturalistic settings such as schools and universities, thus indicating a shift towards methodologies that resonate more with Dewey's integrative approach between theory and practice.

McKenney and Reeves (2019) also argue on some historical aspects that led to the origin of EDR. They state that educational research is generally classified as basic or applied, and for about one hundred years, researchers from social sciences and research critics have struggled to define an appropriate relationship between the search for fundamental understandings (basic research) and the search for applied use (applied research). They quote some authors such as Hugo Münsterberg (1899) and John Dewey (1900), arguing that they thought in a connected science, linking theoretical and practical work.

McKenney and Reeves (2019) refer to the work of Donald Stokes (1997), who published a highly acclaimed book entitled "Pasteur's Quadrant: Basic Science and Technological Innovation”. In their book, McKenney and Reeves (2019, p. 8) present Stokes' quadrant (Figure 1) and explain what it means.

Figure 1

The Pasteur's Quadrant. (Strokes, 1997)



The upper left quadrant refers to pure basic research, such as the one conducted by Niels Bohr, resulting in fundamental knowledge about the structure of the atom. The lower right quadrant represents the pure applied research, which refers to the work developed by Thomas Edison, an American inventor focused on solving practical problems, without worrying about finding and/or disseminating scientific knowledge. The blank quadrant (lower left) is like a "sterile" quadrant, as it represents research that does not generate many contributions, neither practical nor theoretical. Finally, the upper right quadrant refers to use-inspired basic research, such as Louis Pasteur's research. Pasteur sought fundamental knowledge within the context of solving real-world problems, that is, he linked the search for theoretical knowledge and the search for practical solutions. Stokes claimed the importance of increasing research in this quadrant, i.e., use-inspired basic research (McKenney & Reeves, 2019).

Brown (1992) and Collins (1992) are acknowledged as the forerunners in the field of Educational Design Research, as highlighted by McKenney and Reeves (2019). McKenney and Reeves (2019) further elucidate that researchers within this domain have increasingly aligned their investigative efforts with the paradigm of Pasteur's Quadrant, which is characterized by use-inspired basic research. This approach underscores the

dual emphasis on generating foundational knowledge that has immediate practical applicability, thereby bridging the traditional divide between theoretical and applied research in education.

In her discourse on what was then termed Design Experiments, Brown (1992, p. 143) posited that

> This is intervention research designed to inform practice. For this to be true, we must operate always under the constraint that an effective intervention should be able to migrate from our experimental classroom to average classrooms operated by and for average students and teachers, supported by realistic technological and personal support.

Brown (1992, p. 143) articulates her objective of developing a theoretical framework for learning and instruction that is deeply anchored in empirical evidence, underscoring the critical interplay between theoretical constructs and practical application within educational research paradigms. Moreover, Brown (1992) underscores the importance of integrating theory with practice, particularly within the multifaceted context of educational settings. She advocates for a holistic approach to education, where the myriad elements within the learning environment are considered in concert rather than in isolation. According to Brown, effective educational strategies necessitate a comprehensive understanding and integration of various components, including pedagogy, curriculum development, assessment strategies, and teacher education. This perspective arises from her transition from conducting isolated studies of learning within laboratory settings to engaging with the complexities of classroom-based learning environments. Brown reflects on her journey, noting a shift in her research focus towards more integrative and applied methodologies that are capable of addressing the realities of educational practice. She emphasizes that experimental research in education should be designed in a manner that allows for its applicability within authentic learning contexts, thereby bridging the gap between theoretical research and practical implementation in educational settings.

Corroborating with these thoughts, Collins (1992, p. 14) states that

> Historically, some of the best minds in the world have addressed themselves to education; for example, Plato, Rousseau, Dewey, Bruner and Illich. But they have addressed education essentially as theorists, even where they have tried to design schools or curricula to implement their ideas. What

> is different today is that some of the best minds in the world are addressing themselves to education as experimentalists: their goal is to compare different designs to see what affects what.

Following the introduction of the concept referred to as Design Experiments by Brown (1992) and Collins (1992), there has been an evolution and diversification within this domain, leading to the creation of a family of approaches contributed by numerous scholars. This evolution has resulted in the emergence of a variety of terminologies within the academic literature that extend beyond the original term of "Design Experiments".

In his seminal work, "Design approaches and tools in education and training," Van den Akker (1999) dedicates a chapter to "Principles and Methods of Development Research," wherein he proposes the term 'Development Research' as an "umbrella term" which refers to various kinds of research approaches that are related to the design and development work. The author quotes the following terms adopted by several authors to refer to these approaches: "design studies"; "design experiments"; "design research"; "development/developmental research"; "formative research"; "formative inquiry"; "formative experiments"; "formative evaluation"; "action research"; "engineering research" (Van den Akker, 1999, p. 3). He states that "Clearly, we are dealing with an emerging trend, characterized by a proliferation of terminology and a lack of consensus on definitions" (Van den Akker, 1999, p. 3).

The author emphasizes that these kinds of research approaches have different emphases and aims, but they are under the main umbrella of Development Research. He states that a general principle that can include, at an abstract level, all the types mentioned refers to the intention of reducing uncertainties in decision making when planning and developing educational interventions. Furthermore, he divides this general goal into two more specific goals: "a) providing ideas (suggestions, directions) for optimizing the quality of the intervention to be developed; (b) generating, articulating and testing design principles" (Van den Akker, 1999, p. 5). Van den Akker (1999) explains that design principles can have a 'substantive' nature when referring to the characteristics that an intervention must assume, or a 'procedural' nature, when referring to how that intervention should be developed. Regarding the two specific goals mentioned, the author explains that

> The goals differ in their relative contribution to 'practice' and 'science'. While the first one (optimization of intervention) is

> especially oriented towards practical ends in a given situation, the last aim (design principles) more strongly reflects scientific or scholarly aspirations, since it is more explicitly oriented towards production of knowledge of a generalizable nature (Van den Akker, 1999, p. 5).

Furthermore, Van Den Akker (1999) identifies an additional objective, which refers to the professional growth and development of the individuals participating in these research endeavors. Wang and Hannafin (2005, p. 6) introduce the term "Design-based Research (DBR)" as a descriptor for a research paradigm that is acknowledged under various terminologies within scholarly discourse. They delineate the specific terminologies these authors adopt, attributing each to its respective originators:

> [...] design experiments (Brown, 1992; Collins, 1992), design research (Cobb, 2001; Collins, Joseph, & Bielaczyc, 2004; Edelson, 2002), development research (van den Akker, 1999), developmental research (Richey, Klein, & Nelson, 2003; Richey & Nelson, 1996), and formative research (Reigeluth & Frick, 1999; Walker, 1992).

The authors state that these terms have slightly different focuses, but similar objectives and approaches. In the 2006 publication "Introducing Educational Design Research," Van den Akker et al. (2006) delineate their preference for the term "Design Research" as a descriptor for a collective of approaches that, while related, display distinct objectives and features. They acknowledge the existence of alternative terminologies within scholarly discourse, similar to those previously identified by Van den Akker in 1999. Despite the diversity in nomenclature, the authors articulate that it is feasible to identify several attributes commonly present across most design research endeavors. These attributes are characterized as follows: “Interventionist; Iterative; Process-oriented; Utility-oriented; Theory-oriented” (Van den Akker et al, 2006, p. 4).

More recently, McKenney and Reeves (2012; 2019) defined the term Educational Design Research - EDR as a "Family of approaches that strive toward the dual goals of developing theoretical understanding that can be used to others while also designing and implementing interventions to address problems in practice" (McKenney & Reeves, 2019, p. 18). McKenney and Reeves (2019) point out that there are some varieties, which have different names to refer to EDR, and quote some of them along with the authors who

adopt them. They explain that all terms are not synonymous, and that there are authors who try to clarify these terms.

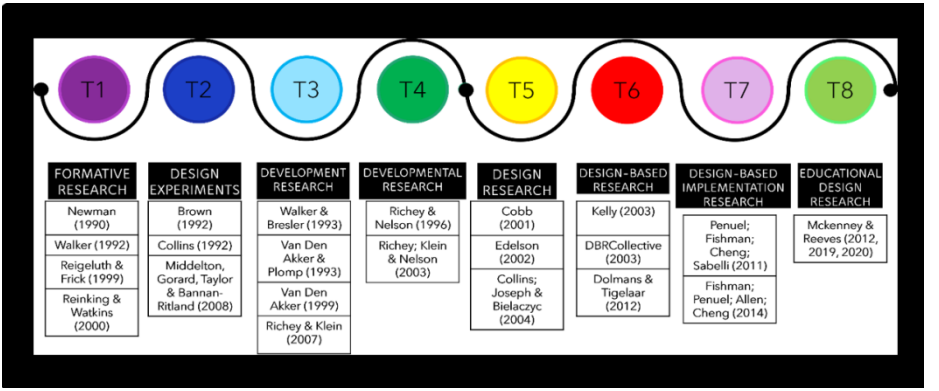
McKenney and Reeves (2020) include a table that delineates the objectives and principal attributes of various terminologies identified within academic literature. They elucidate that the purpose of this tabulation is to delineate the distinct features that set Educational Design Research (EDR) apart from alternative research methodologies: "[…] the pursuit of theoretical understanding through the (iterative) development of solutions to problems in practice" (McKenney & Reeves, 2020, p. 84).

To illustrate the diversity present within the field and to synthesize an overview of the predominant terminologies alongside their proponents, Figure 2 has been constructed (Tamiosso, 2024). This figure draws upon data sourced from seminal works by Van Den Akker (1999), Wang and Hannafin (2005), and McKenney and Reeves (2020). These scholars have undertaken comprehensive efforts to catalog various terminologies within the domain, pinpointing their originators, and delineating their primary aims and attributes. Consequently, the objective herein was to consolidate and organize this accumulated knowledge, with a particular focus on the terminologies and the scholars who employ them. The figure presents a compilation of eight distinct terms, each associated with specific authors who have contributed to their development and application.

This endeavor aims to provide a structured representation of the landscape of terms utilized within the field.Through this systematic organization of terms and their respective proponents, the figure shows the rich diversity of thought and approach that characterizes EDR approaches.

Figure 2

Eight terms found in the literature and their respective key references. Elaborated by Tamiosso (2024) based on Van Den Akker (1999), Wang and Hannafin (2005) and McKenney and Reeves (2020) data.



In more detail, the objectives and characteristics that define each of the terms can be found in the publications that mapped these terms - Van den Akker (1999), Wang and Hannafin (2005) and McKenney and Reeves (2020) - and/or in the original references - cited in those publications - where the terms were mentioned. In the context of this paper, it is crucial to note that while we have chosen to utilize the term Educational Design Research (EDR) in alignment with the terminology proposed by McKenney and Reeves (2019), we will ensure that the specific terminology used by individual authors is accurately preserved when presenting both direct and indirect citations.

Sandoval (2014) observes that in the span of over twenty years since its inception, EDR has progressively solidified its standing as a recognized research paradigm within the educational research community. Abdallah and Wegerif (2014, p. 4) argue that

> Quite recently, the nature of education as a complex and situated human activity that requires continuous refinements and improvements has called for a research paradigm that can provide contextualized knowledge and take into account complex interactions. Therefore, DBR has been embraced with enthusiasm as a flexible approach enabling researchers to relate theory to practice, philosophy to reality, and abstract ideas to real contexts. In this sense, it is a never-ending

> virtuous circle linking theory to practice and practice to theory through implementing theory in practices which are then tested in interventions leading to insights that refine the theory so leading to improved designs and to improved practices.

Through this concise historical overview, it becomes apparent that the genesis of EDR as a distinctive research genre was primarily driven by two fundamental imperatives within the educational field: the imperative to synergize research (theoretical inquiry) with educational practice, thereby facilitating their concurrent development and mutual enrichment; and the imperative to conduct research within authentic learning environments, thereby embracing and addressing the inherent complexities of educational settings.

Furthermore, the evolutionary trajectory of EDR can be traced back to the cumulative contributions of various scholars. Despite the diversity in terminology, which reflects the unique perspectives and emphases of different authors, there exists a core set of shared principles and objectives that unify these approaches. Chief among these is the dual aim of generating both theoretical insights and practical solutions to address real-world educational challenges. This convergence on a common set of goals underscores the collective endeavor of the EDR community to advance educational research in a manner that is both intellectually rigorous and practically relevant, thereby bridging the gap between theory and practice in the pursuit of enhancing educational outcomes.

In the following section, this research genre will be characterized, and discussions will be presented to elucidate the uniqueness and potential of EDR.

UNIQUENESS AND POTENTIAL OF EDR

In the conceptualization of McKenney and Reeves' (2019, p. 18), which says that EDR is a “Family of approaches that strive toward the dual goals of developing theoretical understanding that can be used to others while also designing and implementing interventions to address problems in practice”, it is articulated that EDR constitutes a conglomerate of methodologies aimed at achieving a bifurcated objective: firstly, to enhance theoretical comprehension that possesses applicability across various contexts, and secondly, to formulate and execute strategies aimed at mitigating real-world issues. This delineation underscores the dual imperative

of EDR: to contribute to the corpus of theoretical insights while simultaneously fostering the creation of pragmatic interventions.

According to Plomp (2009, p. 13), EDR is characterized by the

> […] systematic study of designing, developing and evaluating educational interventions (such as programs, teaching-learning strategies and materials, products and systems) as solutions for complex problems in educational practice, which also aims at advancing our knowledge about the characteristics of these interventions and the processes of designing and developing them.

The author delineates three anticipated outcomes deriving from the application of this research approach: firstly, practical contributions, encompassing the generation of solutions and the execution of interventions; secondly, theoretical contributions, referred to as design principles; and thirdly, the professional advancement of the involved participants (Plomp, 2009). This framework highlights the multifaceted impact of the approach, spanning the creation of tangible solutions, the advancement of theoretical knowledge, and the enhancement of professional capabilities. Reis and Amiel (2019) state that considering the research spheres of educational research (improving practice and developing theoretical knowledge), there is a relationship between them, namely: "[…] it is expected that the generation of new knowledge (theories, methodologies, methods) may have some impact on teaching practices" (Reis & Amiel, 2019, p. 299).

Corroborating with this idea, Kneubil and Pietrocola (2017, p. 2, our translation[6]) state that the DBR approach (term adopted by the authors) aims to "[...] combine theoretical aspects of research with practice". Consequently, those involved in this process (professionals, professors, teachers, researchers) will enhance their training when they experience the process. Abdallah and Wegerif (2014, p. 3-4) state that "Unlike experimental research, DBR does not target the mere implementation of theories, designs, and models in a controlled fashion. Rather, it seeks to improve both theory and the educational context itself which is seen as a messy reality that should be studied as it is".

According to Bittencourt and Struchiner (2015), Design-Based Research (term adopted by the authors) is an interdisciplinary approach with applied nature. They also state that, for this approach,

---

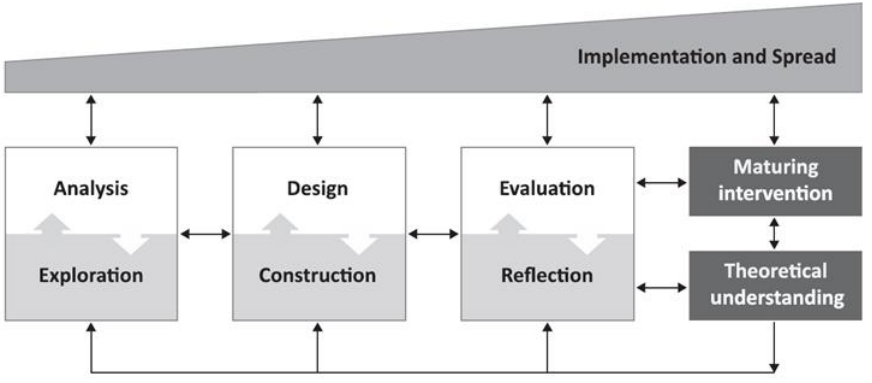
[6] *"[...] aliar aspectos teóricos da pesquisa com a prática"* (Kneubil & Pietrocola, 2017, p. 2).

> [...] phenomena such as learning, cognition and knowledge cannot be treated as isolated processes from the context and the subjects in which they develop. In this way, it proposes to combine research and innovative pedagogical practices, enhancing knowledge about the teaching-learning process and contributing to its improvement, through the partnership between researchers in education, teachers and students in real learning contexts (Bittencourt & Struchiner, 2015, p. 161, our translation[7]).

It merits emphasis that the interventions conceptualized through this methodology are implemented within authentic learning settings. McKenney and Reeves (2019) have formulated a model (Figure 3) delineating phases for the conduction of EDR, which will subsequently be elucidated in accordance with the definitions provided by the authors. This underscores the practical application of the approach in real-world educational contexts, guided by a structured procedural framework.

Figure 3

McKenney and Reeves model (McKenney & Reeves, 2019, p. 83)



[7] *"[...] fenômenos como aprendizagem, cognição e conhecimento não podem ser tratados como processos isolados do contexto e dos sujeitos em que se desenvolvem. Desta forma, propõe aliar pesquisa e práticas pedagógicas inovadoras, potencializando o conhecimento sobre o processo ensino -aprendizagem e contribuindo para a sua melhoria, por meio da parceria entre pesquisadores em educação, professores e estudantes em contextos reais de aprendizagem"* (Bittencourt & Struchiner, 2015, p. 161).

The first phase is characterized by the analysis and exploration of an issue identified within an actual learning setting, undertaken collaboratively by educators, professionals, and/or participants. Additionally, while the identification of the problem may originate from literature review, it is recommended empirical investigation within the specific research context to confirm its genuine presence and relevance to the intended study area. This phase is pivotal for the progression of such research approach. The overall quality and integrity of the research are significantly influenced by the thorough execution of this phase, as it is during this period that comprehensive insights regarding the problem, its surrounding context, and the stakeholders involved are meticulously gathered and analyzed.

Building upon the preliminary data acquired concerning the issue, its context, and the involved parties, a continuous process of literature review is initiated, which, by its nature, may persist throughout the entirety of the research endeavor to assimilate additional pertinent information regarding the problem at hand. This review is crucial for comprehending the scope of the problem as previously explored and delineated by other scholars. It facilitates the learning process from preceding works, enabling the identification of studies that have tackled analogous issues or related dimensions, as well as their outcomes and methodological approaches. Furthermore, this stage allows for the discovery of theoretical frameworks that could enrich the research. Concurrently, field investigations are undertaken to collect data directly from the environment where the issue manifests and from the individuals directly affected, thereby accumulating essential information. This involves employing diverse strategies, methodologies, and tools for the systematic collection and analysis of data.

Consequently, an integrative understanding of the problem, its context, and the stakeholders is achieved through a comprehensive review of relevant literature, alongside an empirical investigation aimed at grasping the intricacies of the problem, the setting in which it occurs, and the needs and preferences of the involved individuals. The attention to these dimensions serves well-defined, rational, and justifiable objectives: to pinpoint aspects of the issue that are amenable to intervention within the given context and by the involved parties; and to ascertain which aspects of the problem warrant immediate attention. Often, the essence of the problem may not be fully comprehended, leading to premature considerations of solutions. To circumvent such precipitance, the importance of the analysis and exploration

of the problem is advocated, guiding researchers towards the identification of critical, addressable, and prioritized elements of the issue at hand.

All the information collected during this phase serves as a theoretical foundation for the next phase (design and construction). This allows the identification of potential characteristics, which must be considered to address the problem, namely, the partial design requirements, as well as the potential actions that must be adopted, referring to the initial design propositions. While these can be modified, refined, and added during all phases of the research, most of them have been originated from the analysis and exploration phase, based on the information obtained about the problem, context, and participants. According to McKenney and Reeves (2019, p. 116) design requirements are "[…] relate to specific information about the problem, setting, or stakeholders that must be taken into consideration when developing solutions. Design requirements translate such information into operational criteria that must be met" (McKenney & Reeves, 2019, p. 116).

Furthermore, they point out that

> Design requirements are important because they prompt design and construction teams to reflect on the boundary conditions in a given context, and to articulate and check their understanding of the freedoms and constraints within which they can operate. The more the team understands these boundaries, the better they will be able to think productively about realistic design alternatives. In addition, explicit attention to these boundaries can help to mitigate the risk of premature closure on solutions (McKenney & Reeves, 2019, p. 116)

The authors explain that design propositions, in turn, refer to the central ideas that support the design, and they are used as input (entry, starting point) for the design and intervention (McKenney & Reeves, 2019). Some authors adopt other terms to refer to design requirements and propositions, such as design principles (Herrington & Reeves, 2011), heuristic statements (Plomp, 2009) or conjectures. Plomp (2009, p. 20) states that

> Design principles are heuristic statements for which Van den Akker (1999) developed the following format: If you want to design intervention X for the purpose/function Y in context Z, then you are best advised to give that intervention the

characteristics A, B and C, and to do that via procedures K, L and M, because of arguments P, Q and R.

Irrespective of the terminological preferences, these elements serve as the foundational theoretical propositions that undergird the design process and are subsequently subjected to empirical validation through the designed solution. These propositions essentially act as both the start and final points, where their empirical scrutiny allows for their confirmation, rejection, or revision. Upon validation, they lay the groundwork for subsequent scholarly inquiries. This process is intrinsically linked to the bifurcated objectives of EDR: the concurrent development of theoretical knowledge and practical applications. The generation of theoretical insights is predominantly derived from the data gathered regarding the problem, which in turn informs the development of viable practical solutions. Both aspects undergo testing within the research framework. Consequently, if the theoretical underpinnings that guide the design and solution prototypes are not robust or coherent, the resulting practical implementations and interventions are also likely to fall short of expectations. This underscores the interdependency between theoretical frameworks and practical applications, as well as between research and design processes within the EDR paradigm. Furthermore, this highlights the seamless transition from the analysis and exploration phase to the subsequent design and construction phase, emphasizing the critical interplay and continuity between these stages.

The subsequent stage involves the design and construction of interventions aimed at addressing the identified issue, predicated on insights garnered from the initial phase of problem analysis and exploration. Utilizing this foundational knowledge, stakeholders collaboratively conceptualize a preliminary design solution poised to effectively mitigate the problem. This initial design is subject to iterative refinement and modification, reflecting both the collective input of the participants and any emergent insights related to the problem.

Following the design's conceptualization, the process advances to the construction phase, wherein tangible embodiments of the design are constructed in alignment with the established blueprint. This phase is characterized by its iterative nature, allowing for the progressive enhancement of the prototype through successive iterations. It necessitates a series of critical decisions by the design team, which must consistently align with the overarching aim of addressing the identified problem and fulfilling the research objectives.

McKenney and Reeves (2019) propose a variety of strategies to facilitate reflective processes within the design team, comprising researchers, educators, and other collaborators. These strategies are intended to support the team in making informed decisions during this phase. While the adoption of these strategies is not mandatory or exhaustive, McKenney and Reeves (2019) provide a framework from which the team can select the most pertinent and beneficial approaches tailored to their specific context.

The third phase is characterized by the deployment and critical assessment of prototypes through repetitive cycles of implementation and evaluation. This phase aims to elucidate the intricacies of the intervention, evaluate the degree to which its objectives have been met, and analyze the impact of its deployment. This evaluation extends to the evaluation of the design and prototype, as well as the validation of the initial design requirements and the partial design propositions that guided the design. Various dimensions, including the intervention's internal configuration, its practical application, and its outcomes, are subject to examination. McKenney and Reeves (2019) highlight several key areas of focus pertinent to this phase. The progression of the research facilitates a deeper theoretical comprehension (through the refinement and validation of design principles) and the evolution of the intervention (through practical enhancements).

The progression through these phases is dynamic and non-linear, allowing for flexibility in the sequence of phases based on the research requirements. This model underpins the EDR approach, offering a foundational framework for practitioners interested in employing this research genre. Moreover, other scholars, such as Plomp (2009), delineated similar phases in the conduction of EDR.

EDR has some aspects that justify its uniqueness and potential, such as: special focus on problem analysis; flexibility and iterativity; collaboration; and professional development. In the following subitems, all these aspects are described in more details.

Special focus on problem analysis

McKenney and Reeves (2020, p. 82) argue that “Solutionism is the all-too-common human propensity to jump to a solution before adequately understanding the nature of a problem. Solutionism has long been prevalent in efforts to improve education at all levels […]”. In contrast to this habit and pretension of human beings, McKenney and Reeves (2019) refer to Dewey

with a passage he wrote: “A problem well stated is a problem half solved” (McKenney & Reeves, 2019, p. 90).

In this sense, “Educational design research (EDR) is a genre of research that features the gaining of in-depth understanding of a problem before any prototype solution is designed and tested” (McKenney; Reeves, 2020, p. 82). The exploration and detailed examination of the problem are imperative to ascertain the focus required in a design to effectively address or contribute to the resolution of the issue. It necessitates a comprehensive analysis and information gathering about the problem, including its contextual occurrences, even when the problem appears to be straightforward.

Bakker (2018) posits that within numerous research methodologies, the processes of amending and comprehending a scenario are often disjointed. Nonetheless, he articulates that within the framework of Educational Design Research (EDR), these processes are interlinked such that altering a scenario is predicated on its comprehension, and conversely, understanding a scenario necessitates its modification.

It is advocated that a profound investigation and comprehension of a problem, grounded in empirical data, to identify the most suitable solutions, is more judicious than attempting to find resolutions without a deep understanding of the underlying issues. This introduces a dilemma: opting for a swift approach risks inefficacy due to a superficial understanding of the problem, lacking comprehensive knowledge of its root causes; alternatively, a more deliberate and thorough analysis may be slower but promises greater assertiveness, entailing an extended period of problem analysis and exploration before devising solutions. Despite the increased time investment, the latter approach is often more effective.

Simultaneous development of theoretical knowledge and practical solutions

According to McKenney and Reeves (2019), EDR is concerned with the development of usable knowledge, which is “[...] constructed during the research (e.g. insights among the participants involved) and shared with other researchers and practitioners (e.g. through conference presentations, journal articles, professional development workshops, and the spread of interventions that embody certain understandings) (McKenney & Reeves, 2019, p. 6). This usable knowledge will be useful for the development of effective practical solutions, as the latter will be grounded in previously researched, studied and well delimited usable knowledge. “It is different from other forms of

scientific inquiry because it is committed to the simultaneous development of both theoretical insights and practical solutions, together with stakeholders" (McKenney & Reeves, 2020, p. 82).

According to Bakker (2018, p. 4), in this approach "[...] design and research are intertwined: design is research based and the research is design based". This implies that the formulation of a design aimed at addressing a specific issue does not proceed from intuitive guesswork or suppositions; rather, it is predicated on a foundation of empirical research, analysis of the problem, exploration of the context, scholarly literature review, and field investigations. In essence, a theoretical understanding of the problem-situation is cultivated, and it is upon this foundation that an informed design process is undertaken. Concurrently, this approach facilitates and justifies the initiation of research predicated on the devised design, enabling an investigation that assesses the theoretical and practical outcomes engendered by the implemented interventions. The author adds that "[…] the theoretical basis and outcomes distinguish design research from studies that aim to design educational materials through iterative cycles and improving prototypes" (Bakker, 2018, p. 4). That is, it is more than just designing and refining materials intuitively; it is seeking a theoretical basis to guide this elaboration.

In conclusion, a foundational theoretical comprehension of the problem-situation is imperative to underpin the design process; the design thus formulated holds the capacity to influence practice and facilitate the resolution of the encountered issue. The outcomes derived from the practical implementations of the design (design applications) remain a focal point for ongoing research, enabling the validation, negation, and/or revision of the initial theoretical frameworks or principles delineated. This iterative process allows for the refinement of the design, enhancing its contribution to practical applications. Ultimately, this cycle generates both theoretical and practical knowledge, establishing a synergistic link between the two realms.

Ponte *et al.* (2016) state that this is one of the most salient traits of this type of research (in their article, they refer to EDR as IBD – Investigation Based on Design). They argue that the theory emerges as an important basis of support and, more than that, as a goal to be achieved. According to these authors, the research is focused on seeking a scientific basis for carrying out the actions.

McKenney and Reeves (2020, p. 83) emphasize that "Research that does not explicitly seek to contribute to both theory and practice by addressing real-world challenges can certainly be of great value, but it does

not constitute EDR". Thus, this aspect is strongly found in EDR, making it insightful and differentiated.

Flexibility and iterativeness

Education is characterized by its inherent dynamism and is subject to the modification of society's aspects. Consequently, pedagogical and learning methodologies, intrinsically impacted by societal transformations, necessitate adaptability, entailing a readiness for modification. In this context of unceasing global change, it is crucial and fitting to embrace methodologies that empower educators to respond adeptly to these shifts. Rigid planning frameworks, devoid of the capacity for adjustment, are vulnerable to obsolescence. McKenney and Reeves (2020, p. 83) state that "[…] the achieving of complex development goals is rarely feasible through simple, linear or predictable pathways […]".

EDR is flexible, allowing constant modifications during the process. Thus, it is also iterative (McKenney & Reeves, 2019; Matta, Silva & Boaventura, 2014; Wang & Hannafin, 2005) enabling iterative cycles, that is, interventions can be applied, tested, evaluated and refined in cycles, aiming to increase and improve.

It is imperative for the design team to continually endeavor towards identifying the most efficacious avenues for acquiring significant theoretical insights and crafting effective practical interventions for problem resolution. Nevertheless, immediate success is not a guaranteed outcome. Within this framework, certain decisions may not yield the optimal results initially; however, these instances can catalyze a reassessment of strategies, potentially streamlining future endeavors. Recognizing the process in its entirety as a learning way, with the flexibility to re-evaluate and alter courses as deemed necessary, is crucial for advancing the research.

Moreover, the adoption of iterative cycles within the research process enhances the adaptability of the participants, enabling them to address emergent realities in a timely manner. EDR supports the employment of a broad spectrum of strategies, methodologies, and tools, tailored dynamically to the evolving requirements identified by researchers during the process. This approach facilitates the modification of the initially planned process in response to new developments encountered during the research. The capacity for adaptation, flexibility, and responsiveness further underscores the value of EDR as a viable approach within the contemporary educational landscape.

Collaboration

Returning to the time of the Greeks, Aristotle said: "[...] one swallow does not a summer make [...]″ (Alves, 2014, p. 100, our translation[8]). This premise remains true – increasingly so. An individual's solitary efforts, despite being diligent and committed in their entrepreneurial endeavors, fall short of the collective achievements attainable by a collaborative group. The amalgamation of efforts, knowledge, and specialized skills culminates in significantly superior accomplishments. EDR is fundamentally collaborative in nature (McKenney & Reeves, 2019; Matta, Silva, & Boaventura, 2014; Wang & Hannafin, 2005), promoting an ongoing synergy among researchers, educators, and all relevant stakeholders. This collaborative ethos fosters a collective approach towards identifying and addressing educational challenges within authentic learning contexts. Consequently, this collaborative framework not only aims at devising solutions to these educational challenges but also facilitates the professional growth of all participants through the mutual exchange of knowledge and experiences throughout the process.

In today's era, characterized by an abundance of information, it becomes unfeasible to navigate this vast data landscape individually. Hence, collaboration, knowledge sharing, and collective growth emerge as not only necessary but also as a strategic approach. Teachers, immersed in the practical contexts where these challenges manifest, bring invaluable insights to an EDR team. Similarly, university researchers, with their profound engagement with research methodologies, contribute with their academic expertise. Additionally, other stakeholders (e.g., administrators, parents, collaborators) offer unique perspectives and knowledge. This confluence of diverse knowledge streams enriches the research endeavor and yields mutual benefits for all participants involved, enhancing the overall quality and impact of the research.

Professional development

Professional development is seen “[...] as a complex process in which the teacher`s role is understood as an active agent of change, autonomous and responsible, determined to reflect with colleagues to enhance their skills, both

[8] “[...] uma só andorinha não faz verão [...]” (Alves, 2014, p. 100).

in aspects related to teaching practice and in broader issues, such as school problems" (Herdeiro & Silva, 2008, p. 8, our translation[9]).

According to Marcelo (2009, p. 8, our translation[10]) "[...] being a teacher in the 21st century presupposes the assumption that knowledge and students (the raw materials with which they work) are transforming at a higher speed than we were used to [...]". The author adds that to continue the teaching and learning processes effectively, teachers need redoubled effort to learn constantly. "Instigated by the complex situation in which they find themselves, teachers need to change their professional posture, improve their practices, and reflect in groups, as their own professional experience may not be enough" (Marcelo, 2009, p. 13, our translation[11]).

Herdeiro e Silva (2008, p. 2, our translation[12]) emphasize that "The emergence of this new vision of the teacher as a professional in permanent development comes essentially from the constant changes in current society and educational and pedagogical theories". Thus, the constant professional development of professionals involved in education, such as teachers, researchers and managers, is necessary and indispensable in current times.

According to Plomp (2009), EDR is capable of yielding three distinct categories of outcomes: the advancement of theoretical knowledge, the creation of practical interventions, and the professional growth of the participants. The latter outcome is underpinned by several attributes of EDR previously discussed in this study. A summary and exemplification of these attributes are provided herein.

The initial attribute pertains to the collaborative nature inherent to the EDR process, which necessitates the amalgamation of various professional

---

[9] "[...] como um processo complexo em que o papel do professor é entendido como um agente ativo da mudança, autónomo e responsável, determinado a refletir com os colegas, de forma a melhorar as suas competências, quer em aspectos relativos à prática docente, quer em assuntos mais abrangentes, nomeadamente, problemas da escola" (Herdeiro & Silva, 2008, p. 8).

[10] "[...] para os docentes, ser professor no século XXI pressupõe assumir que o conhecimento e os alunos (as matérias primas com que trabalham) se transformam a uma velocidade maior à que estávamos habituados [...]" (Marcelo, 2009, p. 8).

[11] "Instigado pela situação complexa em que o colocam, o professor vê-se na necessidade de mudar a sua postura profissional, de aperfeiçoar as suas práticas e de refletir em grupo, porque a sua experiência profissional de docente pode não ser suficiente" (Marcelo, 2009, p. 13).

[12] "A emergência desta nova visão do professor como profissional em permanente desenvolvimento advém essencialmente das mudanças constantes da sociedade atual e das teorias educacionais e pedagógicas" (Herdeiro & Silva, 2008, p. 2)

expertise. This collaborative framework enables participants to engage in reciprocal exchanges of information and knowledge, thereby facilitating mutual professional enhancement.

The subsequent attribute relates to the inherently dynamic and adaptable essence of EDR. As delineated in the introductory section, the contemporary educational landscape necessitates that professionals and their methodologies remain agile and responsive to societal shifts. EDR aligns with this prerequisite by advocating for project flexibility and adaptability to the realities of specific contexts. Engaging in EDR, therefore, demands an openness to evolution, a readiness to confront emerging challenges, and a capacity to devise solutions responsive to new exigencies. This aspect significantly contributes to the professional development of those involved in EDR initiatives, preparing them to navigate and influence the evolving educational domain effectively.

An additional facet highlights the symbiosis between theoretical constructs and practical application as championed by EDR. Practitioners engaged in this research paradigm are tasked with bridging theoretical insights with pedagogical practices. This bridging capability signifies a dimension of professional advancement for those immersed in such endeavors.

It is underscored that the competencies for collaboration, adaptability to real-world contexts, and the synthesis of theory with practice are not present into all professional practice. As such, targeted professional development initiatives are imperative to equip professionals with the requisite skills for collaboration, responsiveness, and the connection of theoretical-practical synergies, among other competencies to the successful implementation of EDR. Therefore, the EDR conduction necessitates and fosters professional growth, tailored to its unique demands and concurrently enriching participants' expertise through their engagement.

FINAL CONSIDERATIONS

Taking into account the emphasized aspects, namely the analysis of problems, the concurrent cultivation of theoretical insights and pragmatic resolutions, the flexibility and iterative nature of the process, collaborative engagement, and the facilitation of professional growth, EDR is regarded as a research paradigm endowed with the capability to enhance the quality of teaching and learning processes both within Brazil and on a global scale. The aggregation of these aspects culminates in an undeniable potential.

This perspective is corroborated by other scholars in the field. For instance, Ponte et al. (2016) advocate for the utility of Inquiry-Based Development (IBD) — the terminology preferred by these authors—as a methodological approach in the sphere of educational research. They underscore the multifaceted potentialities inherent in adopting this approach, suggesting that

> This type of research is very attractive for researchers whose main interest is to find robust, effective, and feasible solutions to educational problems. In some way, it represents a development, in the sense of greater sophistication, in relation to other forms of scientific-based intervention used in education, such as the teaching experiences of the late twentieth century and action research projects (Ponte et al., 2016, p. 78, our translation[13])

The authors complement by stating that

> Furthermore, this type of research can be interesting for teachers committed to overcoming the learning difficulties of their pupils, it can be appealing to school administrators who want to improve the ways of working and the results of their institutions and can also be attractive to decision-makers and government officials seeking to develop research-based policies, feasible to implement and likely to lead education systems to better results (Ponte et al., 2016, p. 78, our translation).[14]

Barbosa and Oliveira (2015) argue that this type of research is attracting the attention of educational researchers. The authors quote works

---

[13] *"Este tipo de investigação é muito atrativo para os investigadores cujo principal interesse é encontrar soluções robustas, eficazes e praticáveis para os problemas educativos. De alguma forma, ela representa um desenvolvimento, no sentido de uma maior sofisticação, relativamente a outras formas de intervenção de base científica usadas em educação, como as experiências de ensino do fim do século XX e os projetos de investigação-ação"* (Ponte *et al*., 2016, p. 78).

[14] *"Para além disso, este tipo de investigação pode ser interessante para os professores empenhados em ultrapassar as dificuldades de aprendizagem dos seus alunos, pode ser apelativa para os administradores escolares que querem melhorar as formas de trabalho e os resultados das suas instituições e pode também ser atrativa para decisores e responsáveis governamentais que procuram desenvolver políticas baseadas na investigação, viáveis de pôr em prática e suscetíveis de conduzir os sistemas educativos a melhores resultados"* (Ponte *et al*., 2016, p. 78).

such as Anderson and Shattuck (2012) and Matta, Silva and Boaventura (2014) to emphasize confirmations related to this fact. They state that this modality is considered a counterpart to criticism stemming from educational research as if it does not present relevant results to educational problems (Barbosa; Oliveira, 2015). Abdallah and Wegerif (2014) argue that there is a growing interest in DBR (Design-based Research – term adopted by the authors) as a new approach to educational research and state that this approach can sustain itself as a paradigm.

Nobre et al. (2017, p. 130, our translation[15]) state that "DBR has been qualified as a bet in research that has practical purposes associated with theoretical production, producing mechanisms of educational innovation in the short and medium term". Matta, Silva and Boaventura (2014, p. 24, our translation[16]) state that "[...] Brazilian society lacks innovative and applied research in education, as, moreover, in other areas of science. This is a situation to be faced because school and education need transformations and applied knowledge".

As McKenney and Reeves (2020, p. 90) claim: “Educational design research is of course no panacea. However, it does put the metaphorical brakes on solutionism because of its heightened attention to clarifying the nature of the problem before an educational intervention or solution is conceived”. To articulate more precisely, EDR does not represent a panacea or the only approach capable of addressing every challenge within the educational field. Nonetheless, its attributes align with contemporary educational advocacy, enabling researchers to engage deeply with educational issues and intervene effectively, taking into account both theoretical frameworks and practical considerations.

Through this theoretical essay of EDR's historical aspects, uniqueness, and potential, this study illuminates how EDR contributes to the development of effective, innovative, and contextually relevant educational strategies, thereby enriching the educational field, fostering improved learning

---

[15] *“A DBR tem se qualificado como uma aposta nas pesquisas que possuem propósitos práticos associados à produção teórica, produzindo mecanismos de inovação educacional a curto e médio prazo”* (Nobre *et al*., 2017, p. 130).

[16] *“[...] a sociedade brasileira carece de pesquisas inovadoras e aplicadas em educação, como, aliás, em outras áreas da ciência. Essa é uma situação a enfrentar, pois a escola e a educação necessitam muito de transformações e conhecimento aplicado”* (Matta, Silva & Boaventura, 2014, p. 24).

outcomes, and contributing to contemporary education. Therefore, EDR stands as an aligned approach to contemporary educational challenges, integrating theory and practice to develop and refine innovative strategies that are responsive to the evolving landscape of learning, teaching, and technological advancements. This argumentation also demonstrates the importance of having more educational works, studies, and research involving this approach, to explore, use and disseminate its potentialities.

AKNOWLEDGMENTS

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

REFERENCES

Abdallah, M. M. S., & Wegerif, R. B. (2014). *Design-based research (DBR) in educational enquiry and technological studies: A version for PhD students targeting the integration of new technologies and literacies into educational contexts* (ERIC Document Reproduction Service No. ED546471). http://files.eric.ed.gov/fulltext/ED546471.pdf

Alves, M. A. (2014). Ética e educação: caráter virtuoso e vida feliz em Aristóteles. *Acta Scientiarum*, 36(1), 93-104.

Amiel, T., & Reeves, T. C. (2008). Design-based research and educational technology: Rethinking technology and the research agenda. *Educational Technology & Society*, 11(4), 29-40.

Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *Educational Researcher*, 41(1), 16-25.

Bakker, A. (2018). *Design Research in Education: A Practical Guide for Early Career Researchers*. New York: Routledge.

Barab, S., & Squire, K. (2004). Design-based research: Putting a stake in the ground. *The Journal of the Learning Sciences*, 13(1), 1-14.

Barbosa, J. C., & Oliveira, A. M. P. (2015). Por que a Pesquisa de Desenvolvimento na Educação Matemática? *Perspectivas da Educação Matemática, 8(n. temático)*, 526-546.

Bittar, M. (2009). *História da Educação: Da antiguidade à época contemporânea.* EdUFSCar.

Bittencourt, L. P. (2014). *A doação de sangue e o ensino de biologia: Promovendo a sua articulação através das Tecnologias de Informação e Comunicação a partir da abordagem Ciência, Tecnologia e Sociedade.* [Dissertação de mestrado, Universidade Federal do Rio de Janeiro]. Programa de pós-graduação em Educação em Ciências e Saúde.

Bittencourt, L. P., & Struchiner, M. (2015). A articulação da temática da doação de sangue e o ensino de biologia no Ensino Médio: Uma pesquisa baseada em design. *Ciência & Educação*, Bauru, 21(1), 159-176.

Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of the Learning Sciences*, 2(2), 141-178.

Chaves, R. S. (2017). *Como abordar tempo geológico na educação básica? Definindo diretrizes e desenvolvendo uma sequência didática.* [Dissertação de mestrado, Universidade Federal da Bahia e Universidade Federal de Feira de Santana]. Programa de Pós-graduação em Ensino, Filosofia e História das Ciências.

Cobb, P., et al. (2003). Design experiments in educational research. *Educational Researcher*, 32(1), 9-13.

Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O'Shea (Eds.), *New directions in educational technology*. Springer-Verlag.

Design-Based Research Collective. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher*, 32(1), 5-8.

Herdeiro, R., & Silva, A. M. (2008). Práticas reflexivas: uma estratégia de desenvolvimento profissional dos docentes. In *ANAIS (Actas) do IV Colóquio Luso-Brasileiro, VIII Colóquio sobre Questões Curriculares: Currículo, Teorias, Métodos* (pp. 1-14). Grupo de trabalho 11 – Currículo e Formação Docente, Universidade de Santa Catarina – Florianópolis.

Herrington, J. A., et al. (2007). Design-based research and doctoral students: Guidelines for preparing a dissertation proposal. In C. Montgomerie & J. Seale (Eds.), *Proceedings of EdMedia 2007: World Conference*

on Educational Multimedia, Hypermedia & Telecommunications (pp. 4089-4097). AACE.

Herrington, J., & Reeves, T. C. (2011). Using design principles to improve pedagogical practice and promote student engagement. In Ascilite 2011: *Changing demands, changing directions* (pp. 594-601).

Kneubil, F. B., & Pietrocola, M. (2017). A pesquisa baseada em Design: visão geral e contribuições para o ensino de ciências. *Revista Investigações em Ensino de Ciências*, 22(2), 1-16.

Lüdke, M., & Cruz, G. B. (2005). Aproximando universidade e escola de educação básica pela pesquisa. *Cadernos de Pesquisa*, 35(125), 81-109.

Marcelo, C. (2009). Desenvolvimento profissional docente: passado e futuro. *Revista de Ciências da Educação*, (8), 7-22.

Matta, A. E. R., Silva, F. P. S., & Boaventura, E. M. (2014). Design-based Research ou pesquisa de desenvolvimento: Metodologia para pesquisa aplicada de inovação em educação do século XXI. *Revista da FAEEBA – Educação e Contemporaneidade*, 23(42), 23-36.

Mazzardo, M. D., et al. (2016). Design-based research: desafios nos contextos escolares. In *Atas do V Congresso Iberoamericano em Investigação Qualitativa* (Vol. 1).

McKenney, S., & Reeves, T. C. (2019). *Conducting Educational Design Research* (2ª ed.). Routledge.

McKenney, S., & Reeves, T. C. (2020). *Educational design research: Portraying, conducting, and enhancing productive scholarship*. Medical Education, 55, 82-92.

Morin, E. (2000). *Os sete saberes necessários à educação do futuro* (2ª ed.). Cortez; UNESCO.

Morin, E. (2003). *A cabeça bem-feita: Repensar a reforma, reformar o pensamento* (8ª ed.). Bertrand Brasil.

Nobre, A. M. F., et al. (2017). Princípios teórico-metodológicos do Design-based Research (DBR) na pesquisa educacional tematizada por recursos educacionais abertos (REA). *Revista San Gregorio*, (16), edição especial, 128-141.

Plomp, T. (2009). Educational design research: An introduction. In T. Plomp & N. Nieveen (Orgs.), *An Introduction to Educational Design Research* (pp. 9-35). Enschede (Netherlands): Netzodruk.

Ponte, J. P., et al. (2016). Investigação baseada em design para compreender e melhorar as práticas educativas. *Revista Quadrante*, 25(2), 77-98.

Ramos, P., Giannella, T. R., & Struchiner, M. (2010). A pesquisa baseada em design em artigos científicos sobre o uso de ambientes de aprendizagem mediados pelas tecnologias da informação e comunicação no ensino de ciências. *ALEXANDRIA – Revista de Educação em Ciência e Tecnologia*, 3(1), 77-102.

Reeves, T. C. Socially Research Educational Technology Research. *Educational Technology*, p. 19-28, 2000.

Reeves, T. C. (2000). Socially research educational technology research. *Educational Technology*, 19-28.

Reeves, T. C., Herrington, J., & Oliver, R. (2005). Design research: A socially responsible approach to instructional technology research in higher education. *Journal of Computing in Higher Education*, 16(2), 97-116.

Reeves, T. C., McKenney, S., & Herrington, J. (2011). Publishing and perishing: The critical importance of educational design research. *Australasian Journal of Educational Technology*, 27(1), 55-65.

Reinking, D. (2021). Foreword. In: Philippakos, Z. A., Howell, E. & Pellegrino A. (Eds.), Design-based research in education: Theory and applications. The Guilford Press

Reis, D., & Amiel, T. (2019). Pesquisa Baseada em Design: Um mapeamento sistemático da Produção Acadêmica em Acesso Aberto em Língua Portuguesa. In *Anais do XXX Simpósio Brasileiro de Informática na Educação* (pp. 299-308). Sociedade Brasileira de Computação.

Sandoval, W. (2014). Conjecture mapping: An approach to systematic educational design research. *Journal of the Learning Sciences*, 23(1), 18-36. https://doi.org/10.1080/10508406.2013.778204

Sandoval, W. A., & Bell, P. (2004). Design-based research methods for studying learning in context: Introduction. *Educational Psychologist*, 39(4), 199-201.

Santos, J. M. (2017). *O ensino gravitacional universal de Newton através da história da ciência e da argumentação: Desenvolvimento e análise de uma sequência didática*. [Dissertação de mestrado, Universidade Federal da Bahia e Universidade Federal de Feira de Santana]. Programa de Pós-graduação em Ensino, Filosofia e História das Ciências.

Stokes, D. (1997). *Pasteur's quadrant: Basic Science and technological innovation:* Washington, DC: Brooking Instituition Press.

Tamiosso, R. T. (2024). *Pesquisa em design educacional: Contribuições para o desenvolvimento profissional de pesquisadore* [Tese de doutorado, Universidade Franciscana].

Van den Akker, J., et al. (1999). *Design approaches and tools in education and training*. Springer.

Van den Akker, J., et al. (2006). *Introducing educational design research*. Routledge.

Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development*, 53(4), 5-23.