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CHAPTER 15

DESIGN SCIENCE RESEARCH AND DESIGN THINKING: TOWARD METHODOLOGICAL RIGOR IN EDUCATIONAL INNOVATION

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ABSTRACT

This chapter discusses the articulation between *Design Science Research* (DSR) and *Design Thinking* as a methodological approach to educational innovation grounded in scientific rigor. It assumes that contemporary educational challenges constitute complex, situated, and sociotechnical problems, requiring research methods capable of integrating theory, practice, and artifact development. Based on a narrative literature review, the discussion engages key DSR authors such as Simon, Hevner, and Dresch, Lacerda, and Antunes Júnior, as well as foundational contributions to *Design Thinking*, particularly by Brown and Kolko. The chapter argues that, when understood as an epistemological approach rather than an instrumental technique, *Design Thinking* can strengthen DSR stages related to problem understanding, ideation, and iterative evaluation. It concludes that integrating DSR and *Design Thinking* enhances the

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relevance, validity, and scientific legitimacy of applied research in education, provided that this integration is guided by methodological rigor, systematic documentation, and solid theoretical grounding.

Keywords: *Design Science Research*; *Design Thinking*; Educational innovation; Methodological rigor; Applied research.

INTRODUCTION

Educational innovation has frequently been associated with the introduction of new technologies, digital platforms, and automated solutions, often presented as immediate responses to complex teaching and learning problems. However, the uncritical adoption of these solutions has revealed a recurring paradox: the more innovation is invoked, the more we observe the weakening of methodological rigor that should sustain the production of scientific knowledge in the educational field.

In this context, design-based methodologies have gained traction for promising to bring theory and practice, research and intervention closer together. Yet, when used without a clear epistemological foundation, such approaches run the risk of reducing educational innovation to isolated experiences, poorly systematized and hardly transferable to other contexts. The proliferation of projects based solely on creative intuitions or on off-the-shelf technological solutions highlights the need for methods that combine practical relevance, scientific rigor, and academic validity.

It is in this scenario that Design Science Research (DSR) is situated, a methodological approach oriented toward the construction and evaluation of artifacts as a legitimate form of scientific production. Unlike purely descriptive or exploratory research, DSR starts from real problems and seeks to solve them through artifacts designed systematically, documented, and validated. In the educational field, this approach has proven particularly promising by enabling the development of technological solutions aligned with concrete institutional demands, without relinquishing theoretical and methodological rigor.

In parallel, Design Thinking has been widely incorporated into education as a human-centered approach grounded in empathy and creativity. Although it offers important contributions to the development of innovative pedagogical practices, Design Thinking, when applied in isolation, tends to lack formal criteria for scientific validation, which limits its acceptance in more demanding academic contexts.

Against this backdrop, this chapter aims to discuss the contributions of articulating Design Science Research and Design Thinking to strengthen methodological rigor in educational innovation. It argues that integrating these approaches makes it possible to reconcile pedagogical sensitivity, creativity, and empathy with scientific criteria of validation, systematization, and replicability, offering a robust methodological pathway for applied research in education—especially in contexts involving digital technologies and artificial intelligence.

EDUCATIONAL INNOVATION AND THE PROBLEM OF METHODOLOGICAL RIGOR

Educational innovation is a concept widely mobilized in recent decades, often associated with the modernization of pedagogical practices and the incorporation of digital technologies into teaching and learning processes. However, the recurrent linkage between innovation and technology has contributed to

a reductionist understanding of the term, in which the mere adoption of digital tools is taken as synonymous with pedagogical transformation.

This technosolutionist logic tends to shift the focus of pedagogical reflection to the technological artifact itself, obscuring central issues such as educational intentionality, institutional context, teacher mediation, and the assessment of the real impacts of implemented solutions. As a consequence, we see the multiplication of innovative initiatives with little theoretical support, lacking methodological documentation and clear validation criteria.

In the field of educational research, this scenario reveals a historical tension between the need to respond to concrete problems of practice and the demand to produce rigorous scientific knowledge. Overly theoretical research, on the one hand, becomes distanced from school reality; on the other, innovative practices detached from scientific foundations undermine their academic legitimacy. This tension underscores the urgency of methodologies capable of articulating practical intervention and knowledge production.

Educational innovation, therefore, cannot be understood merely as instrumental novelty, but as a systematic process of investigation, design, implementation, and evaluation of solutions oriented by real problems. In this sense, methodological rigor does not appear as an obstacle to innovation, but as a condition for it to produce transferable, sustainable, and socially relevant knowledge.

It is at this point that design-based methodologies, such as Design Science Research, assume a strategic role by offering a theoretical-methodological framework capable of sustaining educational innovation as a legitimate scientific practice.

DESIGN SCIENCE RESEARCH: EPISTEMOLOGICAL AND METHODOLOGICAL FOUNDATIONS

Design Science Research (DSR) emerges as a methodological approach oriented toward solving complex problems through the systematic design, development, and evaluation of artifacts. Its origin is linked to applied sciences, especially Computer Science, Engineering, and Information Systems—fields in which knowledge production occurs not only by describing reality but by planned intervention in it. Unlike traditional positivist approaches, DSR recognizes that building solutions is, in itself, a legitimate form of scientific inquiry.

Epistemologically, DSR is grounded in a pragmatic perspective of knowledge, in which scientific validity is associated with utility, relevance, and the ability to solve real problems. Hevner et al. (2004) argue that design science produces knowledge by creating innovative artifacts and evaluating their effects in authentic contexts. This conception moves applied research from a secondary position to the center of scientific production, especially in areas where practice and theory constantly feed into each other.

In the educational field, this approach is particularly relevant, since the problems faced by schools, teacher education programs, and higher education institutions are mostly situated, complex, and traversed by multiple social, pedagogical, and technological variables. DSR enables dealing with this complexity by assuming that educational solutions cannot be abstractly generalized, but need to be designed, tested, and refined in specific contexts, based on explicit scientific criteria.

Dresch, Lacerda, and Antunes Júnior (2015) systematize DSR as a method structured in iterative cycles that articulate problem diagnosis, objective definition, artifact development, demonstration, evaluation, and communication of results. This structure ensures that innovation is not the product of improvisation, but of a rigorous process that is documented and open to critical analysis. The artifact—whether a model, system, framework, or technological platform—is not understood as an end product, but as a means of investigation and knowledge generation.

One of DSR's central elements is the distinction between rigor and relevance. While rigor refers to consistent theoretical grounding and the systematic application of scientific methods, relevance concerns the artifact's ability to respond to concrete demands in the investigated context. In education, this dual requirement becomes especially significant, as it prevents both the production of technically sophisticated yet pedagogically irrelevant solutions and the implementation of innovative practices without theoretical support.

Moreover, DSR requires formal processes for evaluating the artifact developed. This evaluation may take different forms—usability testing, functional analyses, expert validation, application in real contexts—provided it aligns with the research objectives defined. In educational contexts, this implies assessing not only the solution's technical efficiency but also its pedagogical, ethical, and institutional impacts.

Another relevant aspect of DSR is its commitment to scientific communicability. Research results are not limited to the artifact itself; they include explicit articulation of design principles, methodological decisions, and the learning generated throughout the process. This movement contributes to building transferable knowledge, enabling other researchers to adapt, replicate, or critique the proposed solutions.

When incorporated into educational research, Design Science Research helps overcome traditional dichotomies between theory and practice, research and intervention, innovation and rigor. It offers a methodological pathway capable of sustaining the production of innovative educational artifacts—including those involving digital technologies and artificial intelligence—without abandoning the criteria of scientificity required in the academic field. This characteristic renders DSR particularly powerful for responding to contemporary challenges in educational innovation.

DESIGN THINKING IN EDUCATION: CONTRIBUTIONS, POTENTIALITIES, AND LIMITS

The theoretical basis of Design Thinking adopted in this chapter is anchored mainly in the formulation proposed by Tim Brown, who conceives Design Thinking as a systematic approach to solving complex, human-centered problems, articulating empathy, experimentation, and continuous iteration. For Brown (2009), Design Thinking is not reduced to a set of creative techniques; it constitutes a structured innovation process that integrates human desirability, technical feasibility, and organizational sustainability. According to the author, this approach enables confronting ill-defined (wicked) problems common in educational, social, and organizational contexts.

This conception directly dialogues with the epistemological tradition inaugurated by Herbert A. Simon, who understands design as part of the so-called "sciences of the artificial." Simon (1996) argues that design involves the deliberate creation of artifacts intended to transform existing situations into preferred ones, which grants design thinking its own scientific status. By affirming that designing is a legitimate form of knowledge production, Simon provides the theoretical support that enables understanding Design Thinking as a valid methodological approach for applied research, especially when articulated with methods such as Design Science Research.

Contemporary authors deepen this perspective by emphasizing the cognitive and social aspects of Design Thinking. Jon Kolko highlights that design thinking operates as a process of synthesis, in which qualitative data, human experiences, and empirical observations are organized to make sense of complex and ambiguous problems. For Kolko (2014), empathy is not a rhetorical resource but a central epistemological mechanism of Design Thinking, as it enables understanding the real needs of users and guiding contextualized solutions. This dimension is particularly relevant in education, where problems rarely admit linear or purely technical solutions.

In education and pedagogical innovation, various studies indicate that Design Thinking contributes to developing reflective, collaborative, and iterative practices, provided it is not applied in an instrumentalized manner. Brown (2009) warns that the uncritical use of Design Thinking can hollow out its formative potential, turning it into a mere brainstorming technique. Kolko (2014) reinforces this critique by asserting that reducing Design Thinking to tools disconnected from theoretical foundations compromises its capacity to generate meaningful knowledge.

Thus, this chapter adopts Design Thinking not as an isolated method or intuitive approach but as a theoretical-methodological frame which, when articulated with Design Science Research, contributes to the rigor, systematicity, and scientific legitimacy of educational innovation. This articulation finds support in Simon's (1996) understanding of design as knowledge production oriented toward problem solving and in Brown (2009), who argues that innovation requires structured processes, continuous reflection, and empirical validation.

DESIGN SCIENCE RESEARCH AND DESIGN THINKING: TOWARD METHODOLOGICAL RIGOR IN EDUCATIONAL INNOVATION

The articulation between Design Science Research (DSR) and Design Thinking has proven a promising path to strengthen methodological rigor in educational innovation without sacrificing creativity and sensitivity to human contexts. Although distinct in their origins and assumptions, both approaches share a commitment to solving complex problems and producing contextualized solutions.

While Design Thinking emphasizes empathetic understanding of the problem, collaborative ideation, and rapid prototyping, DSR provides a robust methodological structure capable of scientifically supporting these processes. DSR incorporates formal stages of problem definition, theoretical grounding, systematic artifact development, and rigorous evaluation, ensuring that innovation is documented, analyzed, and communicated as legitimate scientific production.

In education, this complementarity is particularly relevant. Design Thinking can serve as an initial strategy for exploring the problem, involving actors in the educational context to identify demands, challenges, and possibilities. Building on this movement, DSR assumes the role of methodologically structuring the investigation, transforming creative insights into educational artifacts that are grounded, assessable, and transferable.

This integration helps overcome one of the main weaknesses of innovative practices in education: the gap between pedagogical creativity and scientific rigor. By combining the exploratory openness of Design Thinking with DSR's systematic cycles, it becomes possible to produce educational innovation that is simultaneously sensitive to the experiences of subjects and committed to academic criteria of validity, reliability, and relevance.

Furthermore, the articulation between DSR and Design Thinking favors the explicit statement of the design principles guiding the construction of educational artifacts. When properly recorded and analyzed, these principles constitute a theoretically relevant contribution to the field of education, enabling other researchers to understand the methodological decisions adopted and adapt the solutions to new contexts.

In educational research involving digital technologies and artificial intelligence, this integration becomes even more strategic. The sociotechnical complexity of these artifacts demands both empathetic listening and experimentation, as well as critical analysis, ethical evaluation, and consistent theoretical grounding. In this respect, DSR offers the framework necessary to ensure that technological innovation does not overshadow pedagogical purposes.

Thus, advocating for the articulation between Design Science Research and Design Thinking means proposing a methodological path capable of responding to contemporary educational challenges: to

innovate without losing rigor, to create without forgoing critique, and to intervene in school reality with scientific, ethical, and pedagogical responsibility.

Chart 1 – Design Science Research and Design Thinking: Methodological Convergences and Distinctions

Analytical Axis	Design Science Research (DSR)	Design Thinking
Epistemological Foundation	Applied research oriented towards the production of scientific knowledge through artifacts.	Creative approach oriented towards solving complex human-centered problems.
Methodological Purpose	Rigorous development and validation of solutions with explicit theoretical contribution.	Exploration of innovative solutions based on empathy, ideation, and prototyping.
Degree of Formalization	High, with systematic steps, evaluation criteria, and consistent theoretical foundation.	Flexible, iterative, and adaptable to the context, with lower requirement for scientific formalization.
Role in Educational Research	Sustains methodological rigor and academic legitimacy of educational innovation.	Favors creativity, engagement, and deep understanding of educational contexts.
Main Limitation	Risk of excessive technicality if dissociated from human experience.	Risk of theoretical fragility if not articulated with a scientific method.

Source: Created by the authors, 2025.

DESIGN SCIENCE RESEARCH AND DESIGN THINKING AS AN INTEGRATED METHODOLOGICAL APPROACH

Comparative analysis shows that Design Science Research and Design Thinking do not operate in antagonistic methodological domains but in distinct and potentially complementary planes of educational inquiry. While DSR is anchored in the tradition of applied research oriented toward producing validable scientific knowledge, Design Thinking emerges as a heuristic approach aimed at a sensitive understanding of problems and generating creative solutions. Integrating these perspectives addresses one of the chief tensions in educational research: how to innovate without sacrificing methodological rigor.

Within DSR, as systematized by Dresch, Lacerda, and Antunes Júnior, research is structured in iterative cycles involving problem identification, artifact conception, development, evaluation, and the explicit statement of theoretical contribution. The focus is not solely on practical solutions, but on producing knowledge that can be transferred, debated, and validated by the scientific community. In educational contexts, this means understanding pedagogical innovation not as an isolated experiment, but as the outcome of a grounded, documented, and evaluable investigative process.

Design Thinking, in turn, decisively enhances the initial and intermediate stages of this process. Emphasis on empathy, listening to those involved, and deep understanding of educational contexts broadens the researcher's capacity to formulate relevant, situated problems. Rather than starting exclusively from abstract theoretical gaps, Design Thinking favors identifying real problems in educational practice experienced by teachers, students, and administrators. This closeness strengthens the social pertinence of research and prevents solutions that are technically sophisticated yet pedagogically disconnected.

The articulation between DSR and Design Thinking proves especially fruitful when recognizing that educational innovation simultaneously demands creativity and systematicity. Design Thinking amplifies the ideation and prototyping phase, enabling the exploration of multiple solution possibilities, rapid hypothesis testing, and progressive artifact refinement based on contextual feedback. DSR, in turn, provides the criteria for conducting this creative process with scientific intentionality, ensuring methodological coherence, decision traceability, and rigorous evaluation of results.

This integration also responds to recurring critiques of innovative research in education, often accused of theoretical fragility or excessive pragmatism. By incorporating Design Thinking as a strategy for understanding and creation—without relinquishing DSR's epistemological structure—the researcher constructs a methodological trajectory capable of sustaining both innovation and scientific validity. It is, therefore, a balancing movement between creative openness and methodological control, essential for research that proposes intervention in complex educational contexts.

In the educational field, marked by multiple human, institutional, and cultural variables, this hybrid approach makes it possible to address complexity without reductionism. The school is not a controlled laboratory, but a dynamic ecosystem of relationships, affects, discourses, and practices. Design Thinking helps make these dimensions visible, while DSR offers instruments to systematize them analytically, transforming singular experiences into communicable scientific knowledge.

Thus, advocating the articulation between Design Science Research and Design Thinking does not mean diluting methodological boundaries, but recognizing that educational innovation requires methods capable of dialoguing with concrete reality without renouncing the production of rigorous knowledge. This perspective reaffirms educational research as a scientific practice committed to the qualified transformation of pedagogical practices, anchored in solid theoretical foundations and guided by ethical and formative principles.

METHODOLOGICAL RIGOR AND SCIENTIFIC LEGITIMACY IN EDUCATIONAL INNOVATION

One of the main challenges faced by research that proposes innovation in the educational field lies in the tension between pedagogical creativity and methodological rigor. Innovative initiatives—especially those involving technologies, active methodologies, or the development of educational artifacts—are often questioned regarding their scientific validity, sometimes being classified as experience reports or interventions of a merely instrumental nature. In this context, Design Science Research provides an epistemological framework that grants academic legitimacy to innovation by structuring research as a systematic process of knowledge production oriented toward solving complex problems.

Rigor in DSR is not established by strict replication of procedures, as in traditional experimental models, but by the internal coherence of the investigative process. This coherence involves clear problem explication, consistent theoretical grounding, justification of design decisions, documentation of iterations, and careful evaluation of the developed artifact. By making the methodological trajectory visible, DSR enables other researchers to understand, critique, and reuse the principles and learnings generated—even when the artifact itself is contextual and situated.

Integration with Design Thinking does not weaken this rigor; on the contrary, it helps qualify it. The empathy stage, for example, when conducted systematically, can be understood as a qualitative investigation procedure involving observation, active listening, context analysis, and identification of real needs. When such processes are properly recorded and analyzed, they become relevant research data, strengthening the validity of the formulated problem and the proposed solutions.

Furthermore, the iterative logic shared by both approaches reinforces the notion of rigor as a continuous process, not as a final stage. In DSR, the artifact is continuously evaluated and refined, allowing identification of limitations, unforeseen effects, and possibilities for improvement. This epistemological stance recognizes the complexity of educational phenomena and moves away from pretensions of neutrality or absolute control, without, however, relinquishing scientific systematicity.

In the realm of educational innovation, this understanding of rigor is particularly relevant. Schools and formative contexts are traversed by historical, social, cultural, and institutional factors that render linear cause–effect models unfeasible. Thus, methodologies that recognize the situated nature of knowledge—such as DSR articulated with Design Thinking—prove more suitable for producing applicable, reflective, and socially relevant knowledge. Rigor, in this case, manifests in the capacity to make decisions explicit, dialogue with theory, and critically evaluate results, rather than in the uncritical standardization of procedures.

Another central aspect of scientific legitimacy concerns the research's theoretical contribution. In DSR, artifact development is not an end in itself, but a means to generate knowledge. Analysis of the

design process, choices made, challenges faced, and solutions constructed enables the formulation of principles, models, or guidelines that transcend the immediate context of the investigation. When articulated with Design Thinking, this movement is enriched by incorporating human, ethical, and pedagogical perspectives, broadening the research's interpretive reach.

Thus, educational innovation is no longer understood as the simple application of methodological or technological novelties, but as a rigorous investigative practice oriented by real problems and sustained by solid theoretical foundations. The articulation between Design Science Research and Design Thinking therefore helps consolidate a methodological paradigm capable of responding to contemporary demands in educational research: innovating with scientific responsibility, pedagogical sensitivity, and formative commitment.

DESIGN SCIENCE RESEARCH APPLIED TO EDUCATION: PRACTICE-ORIENTED KNOWLEDGE PRODUCTION

The application of Design Science Research in the educational field has been consolidated as a methodological response to the limitations of traditional approaches in the face of complex, contextualized, and dynamic problems. Unlike research restricted to describing or explaining phenomena, DSR starts from the recognition that many educational challenges require intervention, proposition, and construction of solutions. In this sense, research not only observes reality but acts upon it in a systematic, reflective, and theoretically grounded manner.

In educational contexts, the problems that motivate DSR investigations often involve issues such as curricular innovation, pedagogical mediation with technologies, formative assessment, knowledge management, teacher education, and inclusion. Such problems cannot be fully understood through isolated variables, as they emerge from institutional ecosystems marked by multiple actors, values, and constraints. DSR therefore offers a suitable methodological pathway for dealing with this complexity, by articulating diagnosis, theoretical grounding, artifact development, and iterative evaluation.

A central element of DSR applied to education is the notion of artifact. Unlike a restricted understanding of artifacts as technological objects, the educational artifact can take multiple forms: pedagogical models, virtual environments, decision-support systems, conceptual frameworks, teaching methodologies, or assessment instruments. The scientific value of the artifact lies not only in its functionality, but in its capacity to materialize theoretical knowledge in a concrete solution that can be analyzed, tested, and improved.

In this process, theoretical grounding plays a structuring role. Artifact construction does not occur intuitively or improvisationally; it is guided by consolidated references from Education, the Human Sciences, and—when pertinent—Computer Science and Information Science. This articulation between

theory and practice ensures that the artifact is not an ad hoc response, but a proposition situated within a broader field of scientific debate. Thus, DSR helps reduce the historical distance between academic production and educational practice.

Evaluation constitutes another fundamental axis of DSR in education. Unlike exclusively quantitative or experimental evaluative models, evaluation in DSR is formative and iterative. The artifact is analyzed in relation to criteria such as utility, contextual adequacy, pedagogical coherence, formative potential, and ethical alignment. This evaluation may involve varied strategies—document analysis, observation, user feedback, case studies, or data triangulation—always respecting the qualitative and situated nature of the investigated problem.

When articulated with Design Thinking, this evaluative process is enriched by the active listening of those involved. Teachers, students, administrators, and other participants cease to be merely data sources and become co-evaluators of the proposed solution. This participation helps refine the artifact and, at the same time, strengthens its pedagogical legitimacy, insofar as it considers the real experiences, expectations, and needs of the educational context.

Another relevant aspect concerns knowledge production arising from the design process. In DSR, knowledge emerges not only from final results, but from the entire investigative trajectory. Decisions taken, challenges faced, adaptations made, and criteria used in artifact evaluation constitute relevant analytical data. Systematizing this trajectory allows identifying design principles, pedagogical guidelines, and conceptual models that can guide future research and other initiatives in educational innovation.

Thus, Design Science Research applied to education reaffirms research as an intellectual practice committed to qualified transformation of reality. By articulating methodological rigor, conscious intervention, and theoretical reflection, DSR offers the educational field a paradigm of investigation capable of responding to contemporary demands for innovation without abandoning scientific consistency and ethical commitment. This approach proves especially powerful when integrated with Design Thinking, as it combines investigative systematicity and sensitivity to the human dimensions of the educational process.

INTEGRATION BETWEEN DESIGN SCIENCE RESEARCH AND DESIGN THINKING IN EDUCATIONAL INNOVATION

The articulation between Design Science Research and Design Thinking constitutes a promising methodological movement for contemporary educational research, especially when the goal is to produce innovation with scientific rigor and social relevance. Although they have distinct origins, both approaches share the understanding that complex problems require iterative investigative processes that are context-

sensitive and solution-oriented. Integrating them does not imply uncritical fusion, but epistemological and methodological complementarity.

Design Thinking contributes to DSR by introducing an investigative stance centered on subjects and lived experiences in educational contexts. By emphasizing empathy, active listening, and co-creation, this approach broadens the understanding of the research problem beyond its technical or functional dimensions, incorporating cultural, emotional, and institutional aspects. In educational environments—where values, beliefs, and human relationships are central—this sensitivity is indispensable to avoid solutions detached from pedagogical reality.

For its part, Design Science Research offers Design Thinking a methodological structure capable of ensuring scientific rigor, process systematization, and transferable knowledge production. While Design Thinking tends to privilege creative problem-solving for specific issues, DSR requires that proposed solutions be anchored in solid theoretical foundations, carefully evaluated, and explicated as scientific contributions. This requirement prevents educational innovation from being reduced to isolated practices or methodological fads.

In education, this integration addresses a recurring challenge of applied research: the difficulty of reconciling practical relevance and scientific validity. From the perspective of DSR, the construction of pedagogical artifacts—whether models, systems, methodologies, or learning environments—comes to be understood as a legitimate investigative process, provided it is accompanied by theoretical analysis, methodological justification, and rigorous evaluation. Design Thinking, in turn, ensures that these artifacts respond to real needs and are conceived in dialogue with the subjects who will use them.

Another point of convergence between the approaches lies in iterative logic. Both DSR and Design Thinking reject linear models of research and intervention, recognizing that problem understanding deepens over the course of the process. In education, this logic is particularly relevant, since pedagogical practices and institutional contexts are dynamic, demanding continuous adjustments. Iteration enables the educational artifact to be constantly refined, incorporating feedback, empirical evidence, and new theoretical interpretations.

Evaluation plays a strategic role in this integration. In DSR, artifact evaluation is not limited to verifying functionality; it involves analyzing theoretical contribution, pedagogical adequacy, and formative impact. Design Thinking adds to this evaluation the users' perspective, valuing experiences, perceptions, and meanings attributed to the solution. Thus, evaluation ceases to be a final stage and becomes a continuous process of investigative learning, strengthening both artifact quality and analytical density of the research.

This articulation also helps redefine the role of the educational researcher. Rather than a distant observer or applier of predefined methods, the researcher adopts a reflective, authorial stance, acting as a

designer of theoretically grounded educational solutions. This position demands high ethical responsibility, since it entails intervening in real contexts with direct impacts on pedagogical practices, formative trajectories, and institutional policies. Methodological rigor, in this sense, is not opposed to creativity; it functions as a condition for socially responsible innovation.

Finally, integrating Design Science Research and Design Thinking reaffirms educational research as a space for producing situated knowledge committed to qualified transformation of reality. By combining empathy, creativity, theoretical grounding, and rigorous evaluation, this hybrid approach offers a consistent methodological pathway for confronting contemporary challenges in education. In times marked by demands for innovation, technology, and evidence, such integration enables progress toward investigative practices that are simultaneously scientific, human, and socially relevant.

FINAL CONSIDERATIONS

This chapter discussed the articulation between Design Science Research and Design Thinking as a consistent methodological pathway for educational innovation, maintaining that the production of pedagogical solutions simultaneously requires sensitivity to context, project-based creativity, and scientific rigor. It started from the assumption that contemporary educational challenges are complex, sociotechnical, and multifactorial, and cannot be adequately addressed by linear or exclusively descriptive methodological approaches.

Throughout the discussion, it became evident that Design Thinking helps broaden understanding of educational problems through empathy, qualified listening, and co-creation with the subjects involved. This perspective strengthens the practical relevance of research, preventing artificial solutions detached from institutional and pedagogical realities. However, it was also emphasized that, when taken in isolation, Design Thinking may lack methodological systematization and explicit statement of scientific contributions generated in the process.

In this sense, Design Science Research presents itself as a methodological structure capable of conferring rigor, validity, and theoretical density to educational innovation. By recognizing the artifact as a legitimate research result, DSR requires conceptual grounding, methodological justification, well-defined iterative cycles, and careful evaluation, contributing to the production of knowledge that is transferable and accumulative in the educational field. The integration between DSR and Design Thinking, therefore, is not a superposition of methods but an epistemological complementarity.

Another central aspect addressed was the iterative logic shared by both approaches, which is especially well-suited to education. The possibility of reformulating problems, refining solutions, and re-evaluating artifacts throughout the investigative process allows greater adherence to school dynamics, pedagogical timelines, and institutional transformations. This characteristic reinforces the understanding

of educational research as a continuous reflective process, rather than the mechanical application of pre-established models.

From an epistemological standpoint, articulating Design Science Research and Design Thinking helps reposition educational research within the field of applied sciences, without abandoning solid theoretical foundations. The researcher assumes the role of designer-investigator, responsible for conceiving, justifying, evaluating, and critically reflecting on educational solutions. Such a stance demands ethical commitment, methodological clarity, and social responsibility, especially when artifacts impact pedagogical practices, institutional policies, and formative trajectories.

It is concluded that integrating Design Science Research and Design Thinking offers a robust methodological pathway for educational innovation, capable of balancing creativity with rigor, practical relevance with scientific validity. In contexts marked by demands for pedagogical transformation, use of technologies, and production of evidence, this hybrid approach stands out as a consistent alternative for strengthening educational research and qualifying innovation processes committed to human formation, educational justice, and the effective improvement of teaching and learning practices.

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