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PRINCIPLES FOR INNOVATION: THE ROLE OF ACTION RESEARCH IN 21ST CENTURY PEDAGOGY

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The article explores scientific interpretations of innovation in education and examines current trends in clarifying the theoretical framework of pedagogical action research (PedAR) within the context of promoting an innovation culture in 21st-century pedagogy. PedAR represents a contemporary, transformative approach that involves systematic investigation and reflection by educators, contributing to the enhancement of educational practices. The study scientifically examines the distinctive characteristics of PedAR, differentiating it from traditional educational research by emphasizing the impact of iterative cycles of planning, action, observation, and reflection. PedAR enables educators to optimize teaching strategies, fostering innovation and adaptability across diverse contexts. The article analyzes the key principles of innovation within the context of PedAR, demonstrating how PedAR promotes professional development, engagement, and sustainable change. It emphasizes the relevance of PedAR as an innovative strategy for integrating theory with practice and driving meaningful transformations in educational quality through pedagogical action research.

Keywords*: innovation, pedagogical action research, principles for innovation, professional development, innovation culture.*

PRINCIPII PENTRU INOVAȚIE: ROLUL CERCETĂRII PRIN ACȚIUNE ÎN PEDAGOGIA SECOLULUI XXI

Articolul prezintă interpretări științifice ale inovației în educație și tendințe actuale de clarificare a conținutului teoretic al cercetării pedagogice acționale în contextul promovării culturii inovării în pedagogia secolului XXI. Cercetarea Pedagogică Acțională (CPA) este o abordare contemporană, transformatoare care presupune investigație sistematică și reflecție din partea cadrelor didactice ce contribuie la îmbunătățirea practicilor educației. În conținut sunt explorate științific caracteristicile PedAR, care o diferențiază de cercetarea educațională tradițională subliniind impactul ciclurilor iterative de planificare, acțiune, observație și reflexie. CPA permite cadrelor didactice să optimizeze strategiile de predare, promovând inovația și adaptabilitatea în contexte diverse. Articolul prezintă analiza principiilor inovării din perspectiva CPA, demonstrând cum CPA promovează dezvoltarea profesională, implicarea și schimbarea sustenabilă argumentând importanța CPA ca o strategie inovativă de integrare a teoriei cu practica și de impulsionare a transformării semnificative a calității educației prin CPA.

Cuvinte-cheie: *inovație, cercetare pedagogică acțională, principii pentru inovație, dezvoltare profesională, cultura inovării.*

Introduction

21st-century pedagogy reflects ongoing transformations in pedagogical thought, emphasizing the necessity of innovative practices to continuously enhance educational outcomes. Cristea (2021) states that in the postmodern historical era (the second half of the 20th century and the 21st century), scientific pedagogy, having attained full epistemological maturity, advances the curriculum paradigm as a means of resolving the conflict between the psychocentric and sociocentric paradigms of modern pedagogy. This resolution is achieved by centering education on its outcomes - such as the educational ideal, general goals, and specific operational objectives - which are constructed at the intersection of educational and learner requirements, encompassing psychological aspects (defined in terms of *competencies*) and social aspects (defined in terms of *core content* validated by society) [8].

In this context, the transition of educational institutions from the classical model of education to the innovative model of scientific education constitutes an innovative curricular approach resulting from the increased demands of the labor market regarding the need for creative teaching staff capable of asserting themselves in the educational environment through research and innovation competencies, while also being able to foster the development of innovative and entrepreneurial skills. The trend of developing the innovative potential of teaching staff to initiate research and innovation processes in education explains the need to describe the principles for innovation from PedAR perspective.

On a theoretical level, the epistemological foundations of the sciences of education, as noted by Cristea (2024), are grounded in the curriculum paradigm's model of education, which consolidates pedagogy through three categories of fundamental concepts: *denotative*, *normative*, and *methodological*, ensuring the stability of pedagogical science in the postmodern era (Cristea, 2021 as cited in [9]).

From a methodological perspective, PedAR distinguishes itself through contemporary approaches that highlight its significance and specific characteristics, providing teaching staff with a structured methodology for systematically investigating and refining their teaching strategies. Norton (2018) defines PedAR as a unique form of both pedagogical and action research that facilitates action-based learning in an educational context, particularly in higher education. At a normative level, PedAR, guided by specific principles, promotes innovation, cultivates an entrepreneurial mindset, and addresses current challenges in education. Action research prioritizes investigation shaped by contextual demands, actively engaging teaching staff in optimizing educational practices. Its participatory approach enables teachers to continuously adjust their teaching methods based on reflective feedback.

Another practical benefit of PedAR is that, through theoretical approaches and practical applications, it creates an environment conducive to continuous professional development, ensuring evidence-based decision-making grounded in sustainable educational practices. Given the complexities inherent in modern education, understanding and integrating PedAR is essential for educators committed to fostering equitable, responsive, and dynamic learning environments.

Research methodology

The aim of the research is to identify innovation principles from the perspective of PedAR. *The investigative process included theoretical research methods* such as analysis and synthesis of ideas from specialized literature, the hypothetico-deductive method, pedagogical modeling, and empirical methods like observation and pedagogical reflection.

Study Findings and Scientific Debates

From a normative perspective, the focus is on identifying the principles for promoting, developing and implementing pedagogical innovations through PedAR, in general and higher education.

The principles of educational innovation through PedAR refer to the courses of action aimed at transferring pedagogical innovations into educational practice, emphasize collaboration between higher education institutions (as producers of innovative knowledge) and schools to ensure the continuous professional development of teaching staff. Additionally, the research-teaching experience in higher education leads to the conclusion that integrating new scientific knowledge through curriculum development–such as introducing elective courses, developing course materials and methodological guides based on research findings, and planning and implementing institutional research projects–are strategies that drive innovation in the teaching and learning process.

Pedagogical action research

Scientific debates show that the aim of PedAR is to train teachers in research and innovation by guiding them towards the systematic investigation of their own teaching practices or by facilitating learning through research to improve theoretical knowledge for the benefit of students [27, p. 59]. PedAR stimulates innovation in education and promotes an entrepreneurial culture by integrating research into practice, ensuring the relevance of innovation transfer [1]. Unlike traditional educational research, which follows established

disciplinary frameworks and validation procedures [20], PedAR is characterized by unique features, as outlined by Efron & Ravid (2013):

a) *constructivist***:** researchers generate knowledge through their inquiries, using their findings to make informed decisions (Atweh, Kemmis, & Weeks, 1998; Cochran-Smith & Lytle, 1993, 2009; Hendricks, 2012; Jarvis, 1999; Pine, 2008);

b) *situational***:** the research focuses on understanding the specific context and participants involved (Baumfield, Hall, & Wall, 2008; Herr & Nihlen, 2007; Holly et al., 2009; Mertler, 2012);

c) *practical***:** the research addresses questions directly relevant to improving real-world educational practices (Altrichter et al., 2008; Bauer & Brazer, 2012; Dana & Yendol-Hoppey, 2009; Marzano, 2003);

d) *systematic***:** the approach follows a structured and methodical process to ensure reliable and meaningful outcomes (Burns, 2007; Burton, Brundelt, & Jones, 2008; McNiff & Whitehead, 2010; Stringer, 2007);

e) *cyclical***:** the research is iterative, with each cycle generating new questions that guide further investigation (Johnson, 2011; Mertler, 2012; Mills, 2011; Sagor, 2011; Stringer, 2008).

PedAR is presented by Riedy et al. (2023) as a means of fostering transformative change in educational settings. According to them, PedAR expands traditional epistemological frameworks by encouraging multidirectional knowledge exchange and promoting inclusivity and social justice in education (Ballard, 2005; Sharma et al., 2022). A central component of PedAR is its emphasis on critical reflexivity, which helps educators and learners reflect on power dynamics and engage in both personal and collective transformation [29]. Furthermore, Riedy et al. (2023) emphasize that the adaptable nature of PedAR allows educators to tailor their teaching practices to specific sociocultural contexts, integrating local knowledge to address the unique challenges of each community.

The characteristics of PedAR align with the key principles of action research, as articulated by McNiff & Whitehead (2002), emphasizing self-reflection, collaboration, and flexibility to enable educators to continuously improve their practices through inquiry and dialogue. They argue that pedagogical action research bridges theoretical knowledge with classroom application, shaped by social, political, and contextual factors, and stress the integration of *propositional knowledge* (“know that”), *procedural knowledge* (“know how”), and *personal (tacit) knowledge,* creating a holistic approach to teaching (Ryle, 1949; Polanyi, 1958, 1967). Additionally, they highlight the participatory and collaborative nature of action research, underscoring the importance of reflection and the integration of theory with practice. This participatory approach aligns with the *pedagogical action research model* which fully explores the characteristics of PedAR (see Fig. 1).

The theoretical model of pedagogical action research provides a complex, systematized, staged, and cyclical approach that involves the active participation of educators, collaboration, and reflection on the innovational, social, and cultural transfer in educational practice.

Examples of pedagogical action research that led to the improvement of educational processes

Netcoh et al. (2017) highlight PedAR’s effectiveness in supporting middle school educators in technology-rich environments. Based on their decade-long study, they identify key elements that contribute to successful action research projects: (1) appropriate scope, (2) a collaborative approach, (3) accountability, (4) various data sources, and (5) a clear link to practice. They illustrate these principles through concrete examples of action research projects:

- *iPads and Individualized Learning*: A special education teacher engaged students in selecting educational apps, fostering personalized instruction and increasing engagement.

- *Personal Device Use Policy*: A middle school principal collaborated with students to establish norms for technology use, significantly reducing policy violations.

- *Student Leadership Council*: Educators involved students in curriculum discussions, leading to adjustments in classroom technology integration.

Action research with these characteristics can help middle grades educators address emergent problems in 21st-century classrooms and respond to the evolving needs of young adolescents [25].

Esparza et al. (2022) highlight the role of action research in empowering educators by fostering ownership over professional development and encouraging innovative teaching practices. Traditional profession-

al development models often lack personalization and engagement, limiting their effectiveness. In contrast, action research provides a flexible, inquiry-based framework that allows teachers to critically assess and refine their instructional methods. Their study on a three-session Action Research Professional Development (ARPD) module for STEM educators demonstrated the benefits of this approach. Participants gained confidence in designing and implementing action research projects, which enhanced their pedagogical content knowledge, strengthened collaborative practices, and promoted a more reflective teaching process. This engagement cultivated a culture of continuous development and innovation within classrooms. However, the study also identified challenges, such as time constraints and limited institutional support, that may hinder long-term engagement with action research. Despite these barriers, the findings suggest that a scalable and inclusive action research model can serve as an effective mechanism for fostering high-quality teaching and learning in STEM education [14].

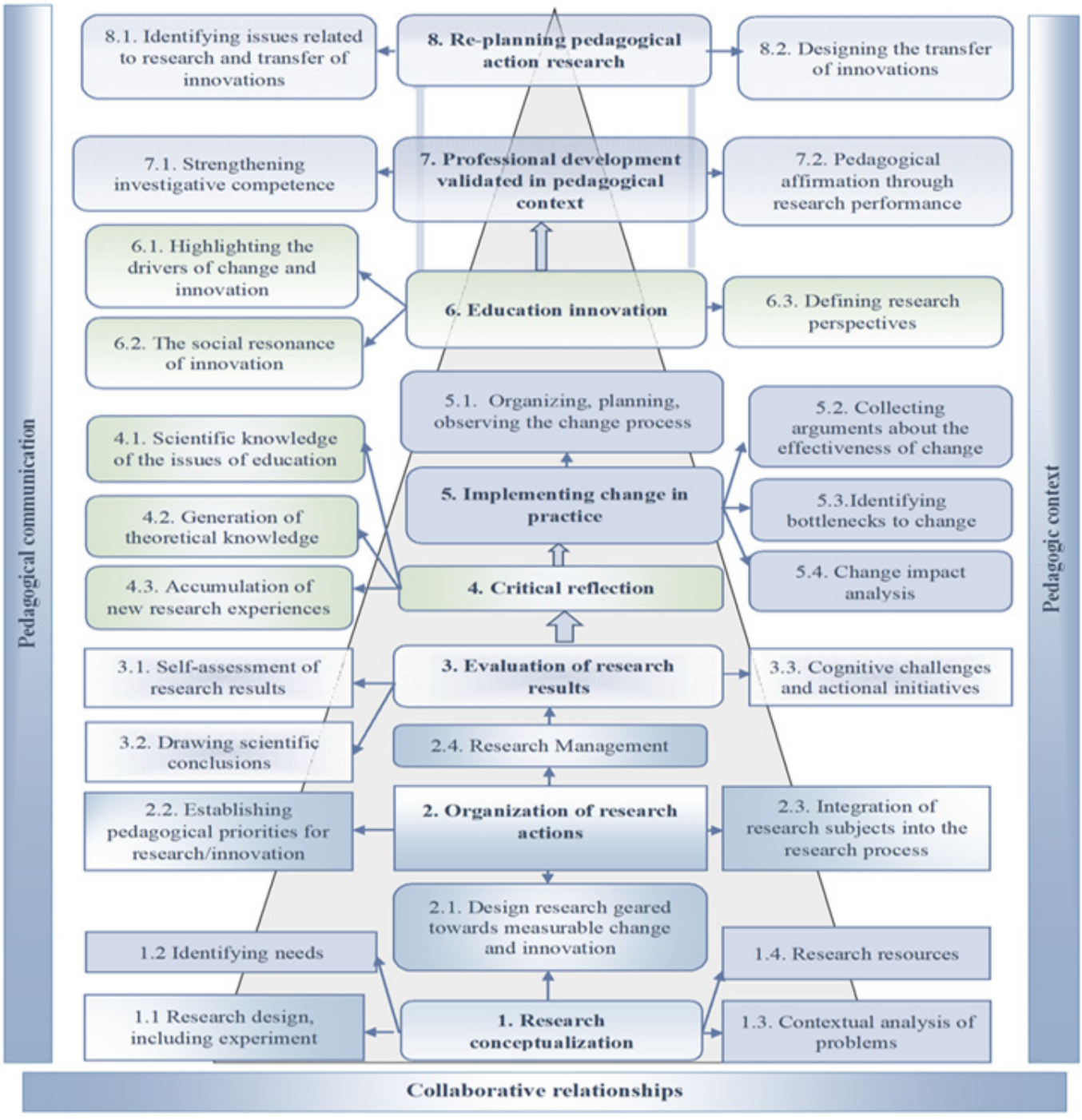

Figure 1. The theoretical model of pedagogical action research [1]

From these perspectives, Simmons et al. (2021) demonstrate how action research drives educational innovation through collaborative reflections and iterative refinements in teaching practices. By adapting curricula, integrating action research principles earlier, implementing cohort models, and responding to student needs, educators create more engaging, supportive, and inquiry-driven learning environments [31].

Principles for innovation through pedagogical action research

Principles are essential guidelines that define the expected approach for conducting pedagogical action research, ensuring consistency, rigor, and adherence to best practices in education. Innovation through pedagogical action research involves a systematic, reflective, and collaborative approach to improving teaching and learning practices. The principles of innovation in education, from the perspective of pedagogical action research, that guide innovative processes are illustrated in Figure 2.

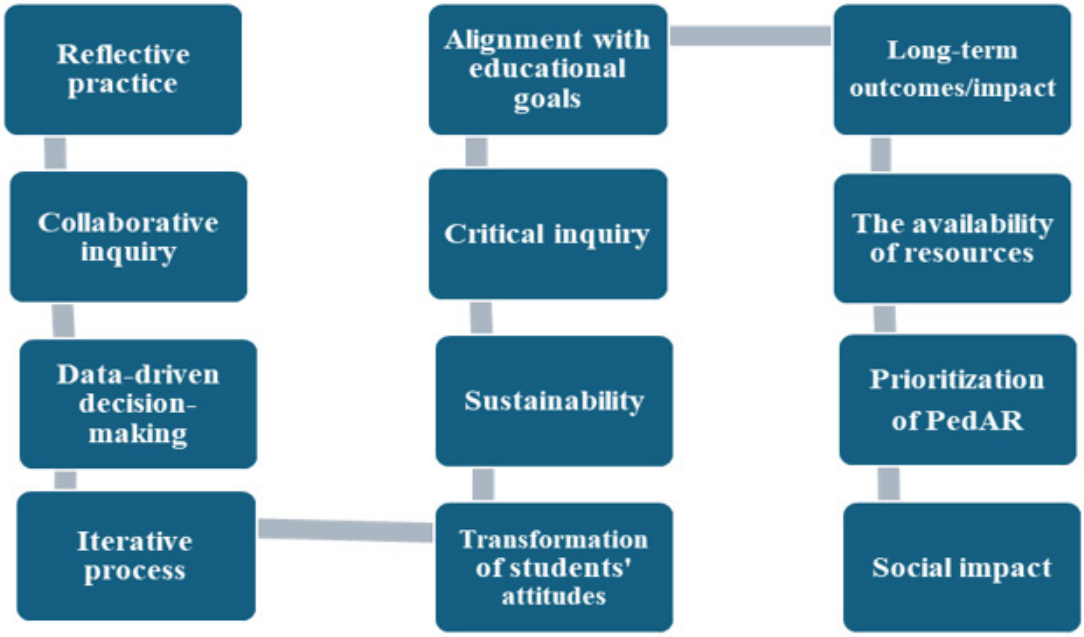

Figure 2. The principles of innovation in education through pedagogical action research

At the microstructural level, we highlight the normative value, followed by a brief presentation of the innovation principles from the perspective of pedagogical action research, which define the requirements of educational activity as normatively established by the theoretical model of PedAR developed by Antoci & Borozan (2024).

The principle of reflective practice. Due to the fact that action research is largely about examining one's own practice (McLean, 1995, as cited in [24]), reflection–defined as the act of critically exploring what you are doing, why you decided to do it, and what its effects have been [24] – is an integral part of the action research process. Reflective practice refers to teachers bringing their unique individual understandings, assumptions, beliefs, personal values, and different competencies to the classroom and analyzing and evaluating their pedagogical contributions in light of these understandings, values, beliefs, and assumptions to improve the teaching-learning process (Sellars, 2012, as cited in [6]). Developing reflective practitioners is identified as a strategy that empowers individual educators to enact change (Henderson et al., 2011, as cited in [22]). Bain et al. (2002, as cited in [22, p. 5]) created the 5R framework to support the development of pre-service teachers into reflective practitioners. The framework includes the following five steps: (1) *Reporting*, which involves considering a particular experience and the contextual factors surrounding it; (2) *Responding*, when individual practitioners verbalize their feelings, thoughts, and other reactions in response to the situation; (3) *Relating*, defined as teachers making connections between what occurred recently and their previously obtained knowledge and skill base; (4) *Reasoning*, which encourages practitioners to consider foundational concepts and theories, as well

as other significant factors, in an effort to understand why a certain outcome was achieved or observed; and (5) *Reconstructing*, when teachers use their explanations to guide future teaching methods, either to encourage a similar result or foster a different outcome.

The principle of collaborative inquiry. Quinn et al. (2019, as cited in [2]) describe collaborative inquiry as a systematic approach for educators to collectively define and resolve professional issues through shared inquiry, problem-solving, and active reflective processes. It empowers teachers to bridge the gap between theory and practice by engaging them as researchers within a community focused on addressing educational issues (Hannay, Wideman, & Seller, 2010; Kyei-Blankson, 2014, as cited in [5]). This approach fosters lifelong learning, improves teaching practices, and mobilizes knowledge through partnerships between schools, universities, and teachers (Gore & Gitlin, 2004; Gabriel et al., 2012, as cited in [5]). The development of trust, passion for teaching, and continuity of involvement enables participants to explore their transformative pedagogical experiences through the lens of an extended epistemology of experiential knowing that transcends the focus on solely cognitive knowing prevalent within academia (Coghlan & Brydon-Miller, 2014; Heron & Reason, 2006, as cited in [18]). By promoting communication, commitment, and continuity, collaborative inquiry creates a research culture that supports teachers in gaining agency and addressing critical educational challenges (Ponte, Beijard, & Ax, 2004; Kuntz et al., 2013, as cited in [5]).

The principle of data-driven decision-making. Mandinach (2012, p.71, as cited in [15]) defines data-driven decision-making (DBDM) as the systematic collection, analysis, examination, and interpretation of data to inform practice and policy. This process is widely implemented across both private and public sectors (Mandinach & Gummer, 2013a; Stone, 2017, as cited in [15]). In the educational context, DBDM involves using student data to support learner-centered instruction tailored to both individual and class academic needs (Prenger & Schildkamp, 2018, as cited in [2]). DBDM is further conceptualized as a structured approach to enhancing student achievement through three key processes: (a) analyzing data sources, (b) applying analytical insights to improve teaching, curricula, and school performance, and (c) evaluating the impact of these improvements (Schildkamp, 2019, as cited in [2]). According to Schildkamp et al. (2017, cited in [2]), three primary factors influence the effectiveness of DBDM: organizational characteristics, data user characteristics, and data characteristics. Organizational characteristics refer to institutional attributes that shape the operational environment, including leadership, institutional culture, support systems, collaboration, and resource availability. Data user characteristics encompass individual factors such as background, experience, data literacy, and self-efficacy, which influence how individuals engage with data. Lastly, data characteristics pertain to the reliability and accessibility of an organization's data, which affect perceptions of its practical utility [2].

The principle of iterative process. PedAR is distinguished by its cyclical, iterative nature, where a researcher or community identifies a need, develops a plan, implements actions, observes outcomes, reflects on findings, and refines the plan accordingly, initiating a new cycle (Hill, 2015, as cited in [28]). This dynamic process fosters continuous improvement and adaptation through systematic data collection, reflection, and analysis. Various frameworks within action research emphasize iterative cycles of reflection and action, focusing on key steps such as: defining a problem or issue for inquiry; identifying relevant stakeholder groups; collecting data from these stakeholders; analyzing the information to determine key concepts and perspectives, and developing and implementing action plans based on these insights [32]. Through its iterative nature, action research ensures that inquiry remains participatory, responsive, and directed toward practical solutions.

The principle of alignment with educational goals. The primary goal of educators is to facilitate students' development, which can be achieved through the application of established theories and critical reflection on the assumptions within an educational context aligned with specific learning objectives. In their capacity as researchers, teachers seek to contribute meaningfully to their field, advancing both knowledge and practice [17]. Innovation through action research serves as a means of integrating reflective inquiry with well-established theories, enabling educators to improve their teaching practices continually, while also addressing specific challenges in the classroom. By focusing on evidence-based solutions, action research ensures that educational innovations are aligned with educational goals, connecting research out-

comes to curriculum standards, institutional missions, and societal needs, thereby contributing to sustained improvements and enhancing the quality of educational experiences.

The principle of critical inquiry. In PedAR, critical inquiry fosters reflective practice, empowerment, and transformative learning. It provides a structured framework for educators to systematically investigate and refine their teaching practices [16]. Aligned with Freire's (1970) view of education as continuous renewal through praxis, this approach promotes equitable and accessible learning experiences [16]. A key element is *inquiry as practice*, which involves questioning existing methods, identifying areas for improvement, and exploring alternative approaches. Practitioners integrate research, theory, and expertise to develop solutions, systematically collecting and analyzing data to assess their effectiveness (CPED, n.d., as cited in [3, p. 296]). This process fosters a mindset of curiosity, openness to change, and a commitment to continuous improvement through innovation in education.

The principle of sustainability. Action research has become increasingly significant in teacher education due to its potential to drive transformative change, particularly in promoting sustainability [30]. Sustainability in education involves shifting from traditional, teacher-centered to student-centered, holistic approaches that focus on students' development and foster an interconnected understanding of learning. Integrating sustainability into action research incorporates principles such as environmental awareness, social responsibility, and long-term thinking. Action research addresses sustainability challenges, considers broader contexts, ensures lasting impact, and promotes efficient use of resources, all aimed at contributing to a sustainable future in education and beyond [30]. By emphasizing these principles, PedAR drives meaningful, lasting transformations in educational systems. Additionally, integrating sustainability into higher education through action research aims to reshape learners' attitudes and behaviors, cultivating responsible individuals who are equipped to lead sustainable change within their communities.

The principle of transformation of students' attitudes. In the context of PedAR, the transformation of students' attitudes becomes a process that involves reflection, action, and collaboration. Studies have shown that action research can lead to significant changes in students' perceptions of learning. For example, Díez-Palomar et al. (2020) found that structured action research activities can transform the attitudes of students who resist traditional schooling, especially in contexts where school practices are undervalued. Collaboration among educators and students fosters a community of inquiry that encourages positive changes in attitudes. Additionally, Ertuğrul Seçer & Çeliköz (2018) highlighted the importance of teacher and parent collaboration in improving kindergarteners' negative attitudes toward school through PedAR.

The principle of long-term outcomes/impact. Action research in education fosters long-term transformation, enabling teachers to evolve from passive recipients of established methodologies into reflective practitioners who actively refine and enhance their instructional approaches. A long-term study by Eilks & Markic (2011) found that teachers engaged in this process developed deeper subject knowledge, greater autonomy, and a more critical approach to their work. Their involvement also fostered collaboration and a willingness to experiment with new strategies, reinforcing a commitment to student-centered instruction. Beyond individual growth, action research strengthens teaching by encouraging reflective practice and collegial exchange [21]. Research has shown that pedagogical action research leads to a lasting positive impact on participants, suggesting that such initiatives can foster sustained improvements and meaningful change across educational settings.

The principle of the availability of resources. In pedagogical action research, success depends on strong professional collaboration/partnerships, technological and material support, institutional financing, and professional autonomy. Although action research is compatible with limited resources [3, p. 301], having access to essential resources - such as time, funding, expertise, tools, and data - advances the process of innovation by enabling collaboration, supporting ongoing investigation, encouraging risk-taking, ensuring long-term sustainability, and facilitating the dissemination of findings. Given its nature, pedagogical action research leads to the development of new knowledge, teaching materials, digital tools, and methodological guides, which, in turn, become valuable resources for future educational practices and research.

The principle of prioritizing pedagogical action research. Antoci & Borozan (2024) assert that the quality of contemporary education can be ensured through the continuous commitment of teachers to the

complex process of innovation within the teacher training system. This is achieved by generating innovative knowledge, prioritizing research activities among academic staff, and promoting professional development through research and competitiveness [1]. Prioritizing PedAR facilitates the iterative cycles of planning, acting, observing, and reflecting, acting as a catalyst for the development and implementation of innovative teaching methods and approaches in education.

The principle of social impact. Pedagogical action research benefits society by promoting evidence-based educational change through innovative practices that address real-world classroom challenges. It inspires systemic reform by disseminating findings through professional networks, conferences, and publications to influence policy decisions, bridging the gap between theory and practice to foster innovation, equity, and lifelong learning. This equips educators and students with the skills needed to tackle the complex challenges of the 21st century. Rather than merely generating theoretical knowledge, action research aims to drive meaningful social change, aligning with Lewin's assertion that research should lead to action rather than 'producing nothing but books' (Lewin, 1946, as cited in [19]). As a form of collective self-reflective inquiry, action research is undertaken by participants in social situations to improve the rationality and justice of their practices and understanding of the situations in which these practices occur (Kemmis & McTaggart, 1988, as cited in [23]). PedAR empowers educators and learners to become agents of change, enhancing educational practices and fostering greater social and environmental responsibility.

Key actions to support PedAR in education [4]:

1. We need more preservice teacher education programs, school administrator and leadership programs, and other graduate advanced degree programs teaching action research as a career-long approach to studying and improving one's professional work and the environment in which it occurs. More than any other group, professors can help us build action research into the educational process and into all educational systems.

2. We need a better method for connecting district and school educators and policymakers with individuals, groups, networks, and consortia that will provide support for conducting action research as a change process within organizations. There is a critical need for knowledgeable external support, while building local capacity.

3. We need better use of the experiences of others outside our setting and better use of the external knowledge base in education as a source of information.

4. As educators, we need to more carefully design work that tends agency and efficacy, while changing workplace norms.

5. It is important to systematically increase the use of action research in school districts – as part of professional development, as part of the operational routines in professional learning communities, as a study process in curriculum development, and as part of leadership development for administrators and teachers).

Conclusions

The authors' scientific focus on teacher training through PedAR, positioning educators as both carriers and creators of an innovation culture, involves understanding the principles of innovation through PedAR. This will contribute to the development of teachers who are open to innovation, committed to continuous self-actualization, and equipped to facilitate the implementation of innovations in response to the dynamic changes in the educational process of contemporary society. The introduction of innovation is not a simplistic or predetermined event; rather, it is an evolving and complex process. Innovative practices often begin with uncertainties and, to be successful, must be responsive to the local context at multiple levels. The Pedagogical Action Research Model advances educational practices by supporting educators' professional growth, fostering collaboration among stakeholders, and implementing an iterative cycle of planning, action, and reflection to drive continuous improvement. When institutionalized, this approach becomes a key factor in strengthening teachers' ability to innovate and sustain innovation, emphasizing the importance of embedding innovation within educational structures and fostering an ongoing commitment to improvement. The environment that fosters innovation is essential for establishing an entrepreneurial culture. Institutional processes for innovation succeed when innovation itself thrives, relying on the interaction of attitude, a shared strategic vision, careful management, and favorable conditions. Innovation is driven

by various participants, including individuals with ideas, small development teams, and their supporters. It succeeds when there is a culture that nurtures it - motivated individuals, open communication, participatory processes, and a creative atmosphere - and when organizational structures and processes are in place to support innovation, such as flat hierarchies, autonomous teams, team diversity, trust, and interdisciplinary collaboration. In essence, the importance of pedagogical action research stems *from the operational pedagogical research* (descriptive, empirical, applied, experimental), with the general aim of correcting and improving educational practice in the short and medium term. The epistemological and academic (social) stakes of pedagogical action research are reflected in the conscious engagement of teaching staff in innovation processes.

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