The Methodology of Pedagogical Action Research in Higher Education

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Abstract: Objectives: This study examines pedagogical action research (PedAR) methodology in higher education contexts, seeking to establish its operational definition while emphasizing both its pedagogical significance and the indispensable role of methodological adaptability in evidence-based educational inquiry. **Prior Work**: The investigation builds upon established educational research scholarship and PedAR's epistemological traditions, while engaging with current discussions concerning methodological rigor. It specifically analyzes how structured professional training experiences can be effectively institutionalized within academic practice. **Approach**: The study conducts a theoretical analysis of how pedagogical action research (PedAR) literature conceptualizes qualitative, quantitative, and mixed-method approaches in higher education research. A critical review methodology underpins the development of a unified conceptual framework for PedAR. **Results**: The research proposes a reconceptualized PedAR model featuring systematic data triangulation, iterative analytical cycles, and hermeneutic interpretation. These components facilitate reflective academic practice and enable context-responsive refinement of pedagogical strategies across institutional environments. **Implications**: The findings provide actionable approaches for incorporating PedAR into faculty development programs and institutional research policies, empowering academic leaders and educators to foster enduring research-informed cultures. **Value**: Through its integrative and context-sensitive PedAR model, this study both consolidates the methodology's foundations and validates its dual utility as a scholarly research approach and pedagogical enhancement tool in higher education.

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1. Introduction

Pedagogical Action Research (PedAR) has become a foundational approach in higher education, providing educators with a structured, reflective framework to develop students' investigative skills, enhance teaching practices, and improve learning outcomes. Rooted in the principles of participatory and collaborative inquiry, PedAR equips educators with the tools to explore the formative and innovative potential of their teaching contexts, identify areas for improvement, and implement evidence-based changes in the educational process. Unlike traditional educational research, which focuses on generating universal theories, PedAR emphasizes the importance of context-specific insights, making it particularly relevant for addressing the unique challenges and opportunities within the higher education environment. According to Norton (2018), PedAR is particularly effective in bridging the gap between theory and practice, as it encourages educators to reflect on their teaching methods and adapt them to meet the needs of their students.

However, despite its increasing adoption, PedAR continues to face challenges related to methodological heterogeneity. These include variations in the integration of qualitative, quantitative, and mixed-method approaches, lack of consistent protocols for iterative cycles (planning, acting, observing, reflecting), and difficulties in scaling practices across institutions. Such issues can limit both the scholarly rigor and practical effectiveness of PedAR, highlighting the need for more cohesive frameworks to support evidence-based pedagogical innovation.

In this context, our research seeks to elucidate the scientific significance of PedAR methodology by differentiating it from conventional research methods, while also emphasizing its relevance in cultivating students' investigative competencies.

For both theoretical and practical reasons, the PedAR methodology integrates qualitative, quantitative, and mixed approaches, each offering distinct advantages in exploring the complexity of educational phenomena. Qualitative methods, such as *ethnography* and *narrative inquiry,* provide deep, contextual understandings of the social and cultural dynamics within classrooms, while quantitative methods, including *experimental and descriptive research*, offer measurable data that can inform broader educational policies and practices. The mixed methods approach, which combines these two paradigms, allows for a more holistic exploration of research questions, enhancing the validity and applicability of findings. For instance,

a study by Bryman (2006) highlights the strengths of mixed methods in educational research, noting that it enables researchers to capture both the depth of individual experiences and the breadth of generalizable trends. This flexibility makes PedAR particularly suited to addressing the multifaceted nature of teaching and learning in higher education.

The methodological framework of PedAR highlights the primary components of the research process: *research design, data collection methods, data analysis techniques, sampling, validity and reliability,* and *ethical considerations*. By engaging in the reflective process of action research, educators can develop a deeper understanding of their teaching practices and make informed decisions that positively impact student learning. As Kemmis and McTaggart (2005) emphasize, the cyclical nature of action research fosters a culture of continuous improvement, enabling educators to respond dynamically to the evolving needs of their students and institutions.

In the context of higher education, where the demands for teaching excellence and innovation are ever-increasing, PedAR offers a practical and impactful way for educators to contribute to the advancement of educational theory and practice. By adopting PedAR, educators not only enhance their own professional development but also contribute to the broader discourse on effective teaching strategies, benefiting students and the academic community (Carr & Kemmis, 2003).

2. Defining Methodology within Research Contexts

Methodology is a systematic and structured framework that guides researchers through the research process, integrating principles, procedures, and techniques for collecting, analyzing, and interpreting data to ensure accuracy, reliability, and consistency with research objectives, while addressing ethical considerations, mitigating potential biases, acknowledging limitations, and upholding transparency, rigor, and credibility to yield scientifically valid and meaningful outcomes. Often confused with the term *methods*, the term *methodology*, according to Harvey et al. (2023), is the broader concept of the two; it (a) is the overall approach to the research and includes a justification of this approach (Denicolo & Becker, 2017); (b) derives from the research philosophy (Dillon & Wals, 2006); and (c) is a way of producing knowledge (Clark et al., 2021). Additionally, Bryman (2008) points out that social scientists often feel ambivalent about research methods and methodology, echoing Becker's (1977) assertion that "Methodology is too important to be left to methodologists," highlighting the necessity for broader engagement with these

concepts. Methodology is the study of the methods that are employed and is concerned with uncovering the practices and assumptions of those who use methods of different kinds (Bryman, 2008). Waring (2021) states that a researcher's methodological assumptions reflect the ontological questions about the form and nature of the social world, as well as epistemological inquiries regarding the knowability of what we assume to exist. On the other hand, methods are tools or instruments used for data generation or collection (for example, questionnaires, audio-taped interviews, focus groups or texts from chatroom exchanges), or data analysis (frequency counts, thematic coding, inferences, and so forth) (Dillon & Wals, 2006, p. 551).

According to Harvey et al. (2023), a methodology identifies the philosophy of an approach the researcher adheres to; it considers how new knowledge could be gained (Denicolo & Becker, 2017) and guides and informs the research (Creswell, 1998). They also specify the key differences between the terms *methodology* and *methods* as described in Table 1.

Table 1. Key Differences Between Methodology and Methods (Harvey et al., 2023, p. 98)

Methodology	**Methods**
The approach to doing research considers the appropriateness of a method to address the research question.	Tools to answer the research question
Research conceptualisation stage	Research execution stage
Technique(s) suggesting how to conduct research in your research area/topic	Actual tools/techniques or steps taken to conduct research in your research area/topic
Explain and justify the methods you used	Explain how the method is applied in a particular study: how you conducted surveys, interviews, in-person observations, focus groups, or medical tests or using existing datasets for secondary analysis.
Find ways to efficiently solve a research problem	Practical solutions to the research questions.

A research methodology does not directly provide solutions; instead, it establishes the theoretical framework that enables researchers to identify and apply the most appropriate methods within a specific context, ensuring a systematic approach to the investigation process. Based on our analysis, *the main components of research methodology* comprise research design, data collection methods, data analysis techniques, sampling, validity and reliability, and ethical considerations (see Table 2).

Table 2. Primary Components of Research Methodology

Component	Main Characteristics
Research Design	• Provides a structured plan for the research process. • Ensures that methods are consistent with the researcher's worldview and study objectives.
Data Collection Methods	• Uses systematic techniques such as surveys, interviews, and observations. • Ensures relevant and reliable information is gathered.
Data Analysis Techniques	• Processes and interprets data systematically. • Uses methods like statistical, thematic, or content analysis.
Sampling	• Selects a subset of individuals or units to represent the whole. • Uses probability-based or non-probability-based methods.
Validity & Reliability	• Ensures accuracy in measuring intended constructs. • Maintains consistency in data collection and analysis.
Ethical Considerations	• Maintains transparency in research practices. • Respects participant rights and prevents exploitation. • Complies with ethical guidelines and principles.

A *research design* is a structured plan that guides the entire research process, encompassing broad assumptions, strategies of inquiry, and specific methods for data collection, analysis, and interpretation, all informed by the researcher's worldview, the nature of the research problem, personal experiences, and the intended audience (Creswell, 2009). *Data collection methods* refer to the techniques researchers use to gather information, including instruments such as questionnaires, interviews, and observations, as well as analytical tools like statistical techniques or thematic extraction from unstructured data, and broader research processes like sampling (Bryman, 2008, p. 160). *Data analysis techniques* are the methods used to process and interpret data, such as statistical analysis, thematic analysis, or content analysis (Miles, Huberman & Saldaña, 2018). *Sampling* is the process of selecting a subset of individuals or units from a population to represent the whole. Sampling methods can be probability-based (e.g., random sampling) or non-probability-based (e.g., purposive sampling) (Cochran, 1977). *Research validity*, which refers to the accuracy of a measure in ensuring that an instrument assesses what it is intended to, encompasses internal, external, content, and criterion validity in quantitative research, focusing on the soundness of research design and the generalizability of findings, while in qualitative research, it is conceptualized through trustworthiness, dependability, and credibility, acknowledging multiple perspectives rather than a

single objective truth, and similarly, *reliability*, which denotes the consistency of a measure, is understood in quantitative research as the stability of results across repeated tests, whereas in qualitative research, it is framed through notions of dependability and trustworthiness due to the inherent subjectivity of data collection and analysis (Vu, 2021). *Ethical considerations* in research are deeply tied to values, as ethical inquiry requires transparency in addressing moral responsibilities, with positivist approaches relying on external ethical codes while qualitative and participatory methods emphasize intrinsic ethics, process ethics, and co-operative inquiry, ensuring that participants actively contribute to research design and decision-making to prevent disenfranchisement, misrepresentation, and exploitation while promoting shared knowledge generation and respect for participants' rights (Given, 2008, p. 55). In essence, research methodology provides a comprehensive framework that guides the entire investigative process, ensuring the systematic use of appropriate methods, ethical practices, and thorough examination while fostering the production of valid, reliable, and meaningful knowledge applicable to real-world contexts.

3. Effective Methodologies in Pedagogical Action Research

Goswami, Lewis, Rutherford and Waff (2009, as cited in LeJeune et al., 2010) argue that since there is no single "right" way to conduct action research, selecting among various methodologies suitable to a specific context can be challenging. PedAR creates a cycle of continuous improvement in higher education institutions, and thus choosing the correct research methodology becomes imperative for the validity and reliability of the research findings. Ben Kei and Harlan (2017) noted that, as methodology tends to be a contested field, a constant lack of agreement between methodologists can be seen as disabling, and generally frustrating for a novice researcher needing clarity and guidance. One person's "model" is another's "paradigm," and the two terms are (or are not) compatible (Ben Kei & Harlan, 2017).

3.1. Qualitative Research Methods in Pedagogical Action Research

Qualitative research is a situated activity that locates the observer in the world, involving the studied use and collection of a variety of empirical materials, such as personal experience, introspection, life story, interview, artifacts, and cultural texts, along with observational, historical, interactional, and visual texts, that describe routine and problematic moments and meanings in individuals' lives (Denzin &

Lincoln, 2018, p. 43). Relying on detailed verbal descriptions of phenomena and focusing on understanding the *why* and *how* of issues without necessarily using numbers or percentages, qualitative methods often involve small sample sizes to allow in-depth analysis (Creswell, 2013). Qualitative research is inductive, with researchers exploring meanings and insights within specific contexts (Strauss & Corbin, 2008; Levitt et al., 2017, as cited in Mohajan, 2018), and each interpretive practice provides a distinct way of understanding, contributing to a broader comprehension of the subject matter (Denzin & Lincoln, 2018). The most common qualitative methods used in pedagogical action research are *ethnography, grounded theory, phenomenology, narrative inquiry, and case study.*

Ethnography is a prominent method in qualitative research that emphasizes the observation of communities to gain insight into their behaviors and interactions (Wertz et al., 2011, p. 9; Risku, 2022). In educational contexts, ethnographic research focuses on the cultural and social life of schools, universities, classrooms, and communities (Efron & Ravid, 2019, p. 47). Data is primarily collected through participant or non-participant observations (Lodico et al., 2010; Cohen et al., 2018), alongside informal conversations, interviews, and cultural artifacts (Cohen et al., 2018; Risku, 2022). Ethnographic action research enables researchers to gain a nuanced understanding of a group's daily interactions by becoming active participants, fostering impactful, community-driven change, blending practical insights with theory, and encouraging methodological innovation through an 'impact turn' in ethnographic practice (Vincett, 2024).

Grounded theory involves generating a theory that is firmly rooted in empirical data (James et al., 2012, p. 105; Leavy, 2014, p. 171). Researchers use an inductive approach (Leavy, 2014, p. 171), collecting data through interviews, observations, and document analysis, while continuously comparing data to refine theoretical categories (Lapan, 2007, p. 7), enhancing research rigor and reliability by ensuring that findings emerge directly from the studied phenomena.

Phenomenology focuses on understanding individuals' experiences of specific phenomena (James et al., 2012, p. 104; Lapan et al., 2007, p. 22; Leavy, 2014, p. 270). This method emphasizes the richness of human experience and involves extensive data collection through observations and in-depth interviews (Lapan et al., 2007, p. 22; Leavy, 2014, p. 270). By prioritizing participants' perspectives (James et al., 2012, p. 102), phenomenology enriches the researcher's understanding of lived experiences, thereby bolstering the validity of research findings by ensuring they reflect the complexities of participants' realities.

Narrative inquiry explores life experiences as storied phenomena (Lapan, 2007, p. 104; Wertz et al., 2011, p. 541; Yin, 2018), allowing researchers to study individual experiences in context. This method uses interviews, field notes, photographs, and conversations (Wertz et al., 2011, p. 542; Lapan, 2007, p. 104) to capture the richness of participants' narratives. The use of narrative complements the desire to recapture past experiences and to describe the teacher's professional and personal self within the context of his or her practice (Efron & Ravid, 2019, p. 48), thus enhancing the credibility of research.

Case study is a type of research that sheds light on a phenomenon through an in-depth examination of a single case exemplar (Given, 2008). While it typically focuses on one entity (e.g., an individual, a class, or a program), it may also involve two or more cases for comparison (Efron & Ravid, 2019, p. 46). Researchers use methods such as interviews, direct observation, and document analysis (Yin, 2011) to provide a rich description of events relevant to the study.

Qualitative methods, with their open-ended questions and narrative style, help researchers connect with the complexities of human experiences. In PedAR, these methods allow researchers to depict the progressive nature of learning environments, where insights from participants' perspectives facilitate the creation of practical solutions based on their educational needs. The following strengths of qualitative methodology, derived from foundational insights of Yauch and Steudel (2003), Creswell (2014), and Conger (1998) as cited in Mohajan (2018), have been reformulated to underscore their relevance within the context of PedAR: flexible questioning encourages the exploration of unanticipated phenomena leading to the emergence of new ideas throughout the research process; the incorporation of a wide range of viewpoints enables a deeper understanding of how pedagogical interventions affect different student groups; qualitative methodology provides a comprehensive view of social phenomena, detailing the impact of educational practices on students' learning and social experiences; the use of qualitative methods actively engages both students and educators in the research process, empowering them and ensuring that their experiences are authentically reflected; and the close involvement of the researcher provides an insider view, revealing educational issues and student experiences that may be overlooked in more quantitative approaches. Despite these advantages, the following limitations of qualitative methodology are particularly relevant in the context of PedAR: data is typically gathered from small samples, making it difficult to generalize findings to larger populations; the large volume of qualitative data makes interpretation and analysis lengthy, especially in complex educational contexts; the researcher's close involvement in data collection

can lead to unintended biases, potentially influencing responses or data interpretation; due to its contextual nature, qualitative research is challenging to replicate, making it difficult to verify findings or apply them in different educational settings; and the quality of qualitative research is heavily dependent on the researcher's skills, which may lead to inconsistencies if personal biases affect the analysis. These limitations are based on studies conducted by Silverman (2010), Yauch and Steudel (2003), Bowen (2006), and Richards and Richards (1994) as cited in Mohajan (2018), who highlight some of the major challenges of qualitative research. Table 3 illustrates the advantages and limitations of qualitative methodology in PedAR.

Table 3. Advantages and Limitations of Qualitative Methodology in Pedagogical Action Research

Advantages	**Limitations**
✓ Open-ended inquiry and exploration ✓ Rich and contextualized insights ✓ Comprehensive and holistic analysis ✓ Active participant involvement and empowerment ✓ Flexibility and real-time adaptability ✓ Development of grounded and empirical theories	✓ Limited generalizability of findings ✓ Time-intensive data analysis ✓ Difficulties in study replication ✓ Potential researcher and participant bias ✓ Challenges in maintaining scientific rigor ✓ Reduced influence on policy decisions

3.2. Quantitative Research Methods in Pedagogical Action Research

Quantitative research studies behavior under controlled conditions, collecting qualitative data (i.e., numerical data) based on precise measurements using structured and validated data collection instruments (Johnson & Christensen, 2016). The most common quantitative methods used in PedAR are *descriptive research, experimental research, comparative research,* and *causal-comparative research.*

Quantitative descriptive research is used to systematically collect and analyze numerical data to describe or summarize a population or phenomenon; it focuses on the objective measurement and statistical analysis of data to provide a clear and concise summary of the research topic (Unimrkt, 2023) by identifying patterns in data to answer questions about *who*, the "gold standard" for *what*, *where*, *when*, and to *what extent* (Loeb et al., 2017). By using surveys/questionnaires, existing datasets, and interviews, the quantitative descriptive method provides a clear description of the behaviors or attitudes of a particular population or phenomenon; relies on the

collection of quantitative data, which can be measured and analyzed objectively; helps in identifying patterns, relationships, or trends; provides baseline information about a population or phenomenon; is typically less time-consuming and more cost-effective compared to other research methods; and helps in decision-making processes in various domains (Unimrkt, 2023).

Experimental research is a structured, hypothesis-driven study conducted in a controlled environment, allowing researchers to manipulate variables, measure outcomes, and test whether the results support or reject the initial hypothesis (Singh, 2021). The concept of experiment in action research denotes practices aimed at generating new insights and knowledge based on novel organizational arrangements and activities, with the researcher unable to fully control or determine the environment and processes involved (Styhre & Sundgren, 2005, p. 58). The experimental method's objective is to investigate relationships between variables, specifically to establish cause and effect (Crowther & Lancaster, 2012, p. 127). According to Bielska (2011), experimental studies in action research enable teachers to make, evaluate, or justify instructional choices by testing hypotheses related to the contextualized application of pedagogical methods. Bielska concluded that many experimental studies within the action research framework are designed to test methodological innovations, such as the use of new teaching techniques, materials, coursebooks, software packages, or course modules (p. 88).

Causal-comparative research, also known as **ex post facto research**, is a non-experimental approach used to investigate possible cause-and-effect relationships by examining existing conditions and comparing groups with or without a certain variable to identify differences in outcomes. However, it cannot definitively prove causation due to limited control over variables (Llego, 2021). Causal-comparative research is divided into two main types: (1) *Retrospective comparative research,* which investigates questions after the effects have already occurred, aiming to determine if a specific variable might influence another, and (2) *Prospective correlational research*, also known as *associational research*, is a method that examines the relationships among two or more quantitative variables from the same group of subjects without manipulating any variables, employing a series of computations to determine if there is a relationship (or covariance) between the variables. It focuses on assessing the covariance among naturally occurring variables rather than the differences between their means (Asamoah, 2014). Correlational studies differ from comparative studies in that the evaluator does not control the allocation of subjects into comparison groups or assign the intervention to specific groups. Instead, the evaluator defines a set of variables, including an outcome of

interest, and then tests for hypothesized relations among these variables (Lau, 2017). In correlational research, there are two forms of variables: the predictor variable (independent variable), which is believed to predict the outcome, and the criterion variable (dependent variable or output variable), which is the variable to be predicted (Asamoah, 2014).

In PedAR, quantitative methodology is not commonly used because it is believed that it results in isolated factors associated with specified outcomes. By the time data is made available, it is often too late to make informed decisions that could make a difference in the educational process. Qualitative inquiry remains the dominant research methodology for articles published in higher education journals (Ben Kei & Harland, 2017). The limitations of quantitative research in the context of PedAR, adapted from Rahman (2016), can be summarized as follows: the positivist paradigm of quantitative research often omits the common meanings of social phenomena, leading to an incomplete understanding of educational contexts (Denzin & Lincoln, 1998); quantitative research frequently fails to delve into the deeper meanings and explanations underlying observed outcomes; quantitative approaches do not account for how social realities are constructed or maintained, nor do they consider how individuals interpret their own and others' actions (Blaikie, 2007); quantitative studies tend to focus narrowly on measuring skills and proficiency, without addressing the underlying reasons behind student performance and engagement; the quantitative research paradigm often neglects the experiences and perspectives of respondents in controlled settings (Ary et al., 2013). Despite these limitations, quantitative methods provide objective data and insights into educational practices. Drawing on Rahman's paper, *The Advantages and Disadvantages of Using Qualitative and Quantitative Approaches and Methods in Language Testing and Assessment*, we emphasize the importance of quantitative methods for pedagogical action research: quantitative research facilitates the generalization of findings to broader populations (Carr, 1994); grounded in the positivist paradigm, quantitative research emphasizes measurable variables, providing a clear framework for assessing specific educational factors and their influences on student learning; through the categorization of variables, quantitative research yields concrete recommendations for improving student performance and instructional strategies (Carroll & Bailey, 2016; Préfontaine, Kormos & Johnson, 2016). Table 4. illustrates the advantages and limitations of quantitative methodology in PedAR.

Table 4. Advantages and Limitations of Quantitative Methodology in Pedagogical Action Research

Advantages	Limitations
✓ High generalizability ✓ Efficient data collection and analysis ✓ Structured and systematic approach ✓ Precise measurement of variables ✓ Objective and reproducible analysis ✓ Broad applicability and relevance	✓ Neglect of complex social phenomena ✓ Limited exploration of meaning and context ✓ Superficial assessment of learning processes ✓ Snapshot perspective on dynamic educational practices ✓ Challenges in measuring deep educational impact ✓ Overlooking individual and participant perspectives

According to Gay et al. (2012), quantitative research in education relies on numerical data and hypothesis testing to predict and control variables, based on the premise of a stable and measurable reality. Conversely, qualitative research focuses on collecting narrative data through methods such as observations and interviews in natural settings, which allows for a nuanced understanding of various perspectives. While quantitative approaches emphasize statistical significance and controlled environments, qualitative methods are more concerned with capturing the complexities of real-world educational experiences (Gay et al., 2012). Gay et al. (2012) present the characteristics of quantitative and qualitative research during each step of the research process based on the work of Creswell (2012) (see Table 5).

Table 5. Defining Characteristics of Quantitative and Qualitative Research (Gay et al. 2012)

Characteristics of quantitative and qualitative research		
Quantitative Characteristics	**Steps in the Process of Research**	**Qualitative Characteristics**
Description and explanation-oriented	Identifying a Research Problem	Exploratory and understanding-oriented
Major role Justification for the research problem and specification for the need for the study	Reviewing the Literature	Minor role Justification for the research problem
Specific and narrow Measurable, observable data	Selecting Participants/Sample	General and broad Participants' experiences
Predetermined instruments Numeric (numbered) data Large number of individuals	Collecting Data	Emerging protocols Text or image data Small number of individuals or sites
Statistical analysis Description of trends, comparison of groups, or relationships among variables A comparison of results with predictions and past studies	Analyzing and Interpreting Data	Text analysis Description, analysis, and thematic development The larger meaning of findings
Standard and fixed Objective and unbiased	Reporting and Evaluating Research	Flexible and emerging Reflexive and biased

3.3. Mixed Methods Approach to Pedagogical Action Research

The growth of empirical mixed methods studies is supported by the emergence of numerous books and methodological articles devoted to conceptual and procedural issues of mixed methods research (Ivankova, 2015, p. 14). The mixed methods approach has been defined by Tashakkori and Teddlie (2003) as "a type of research design in which qualitative and quantitative approaches are used in types of questions, research methods, data collection and analysis procedures, and/or inferences" (as cited in Teddlie & Tashakkori, 2009, p. 7). It involves collecting and analyzing both numerical and non-numerical data to gain insights into a particular phenomenon or issue (Chandrakumar & Vivek, 2023, p. 243). Tashakkori and Teddlie (2009) describe mixed methodologies as an alternative to the qualitative and quantitative traditions by advocating the use of whatever methodological tools are required to answer the research questions under study (p. 7). The importance of mixed methods research lies in its capacity to overcome the drawbacks of utilizing a

single research method (Sakata, 2022, as cited in Chandrakumar & Vivek, 2023, p. 243). Common mixed methods in pedagogical action research include e*mbedded-design research, concurrent triangulation,* and *two-phase research.*

Embedded-Design Research is a mixed-method design in which the study is mainly based on one data type, and the other data set has a secondary role. This model assumes that a single set of data is not sufficient, that different questions need to be answered, and that different data types are necessary for each type of question (Nagpal, Kornerup & Gibson, 2021, p. 12). It has a primary method that guides the project and a secondary method that provides a supporting role in the procedures (Efron & Ravid, 2019).

Concurrent triangulation is an approach in which the researcher collects both quantitative and qualitative data concurrently and then compares the two databases to determine if there is convergence, differences, or some combination (Creswell, 2009).

Two-phase research addresses different questions within the research problem in a two-phase study. The qualitative and quantitative methods are employed separately, simultaneously, or sequentially, without much mixing, to investigate each of these questions (Efron & Ravid, 2019).

According to Ivankova (2015), mixed methods research has specific methodological characteristics related to design and implementation procedures that distinguish it from purely quantitative or qualitative approaches. Building on the works of Creswell and Plano Clark (2011) and Teddlie and Tashakkori (2009), Ivankova identifies the characteristics of mixed methods research: (1) the number of quantitative and qualitative strands, (2) the sequence of quantitative and qualitative data collection and analysis procedures, (3) the emphasis given to either or both of quantitative and qualitative methods, and (4) the process of integration of the quantitative and qualitative methods used in the study. Table 6 presents the advantages and limitations of using the mixed methods approach in pedagogical action research.

Table 6. The Advantages and Limitations of Using the Mixed Methods Approach in Pedagogical Action Research

Advantages	Limitations
✓ Comprehensive and holistic understanding	✓ Uncertainty in sequencing research phases
✓ Triangulation for enhanced reliability	✓ Requirement for expertise in multiple methodologies
✓ Flexibility in research design and application	✓ Complexity in integrating different data types
✓ Capacity to address diverse research questions	✓ Ambiguity in research design and structure
✓ Enhanced validity through data integration	✓ Increased demands on time and resources
✓ Increased methodological rigor and reliability	

Given that mixed research involves combining the complementary strengths and non-overlapping weaknesses of quantitative and qualitative research methods, assessing the validity of findings can be particularly complex, yielding a problem of integration (Onwuegbuzie & Johnson, 2006, p. 60). Alternatively, Mills (2011) indicated that, despite qualitative methods seeming to fit action research efforts more appropriately, research questions may necessitate the use of both quantitative and qualitative data sources, particularly when teacher-researchers need to include student achievement data to complement classroom observations and qualitative narratives (as cited in Ivankova, 2015, p. 51). Christ (2009, 2010) argues that action research should be seen as "a form of mixed research" because it shares similar philosophies, methodologies, and design characteristics with mixed methods research (as cited in Ivankova, 2015, p. 51). The researcher, therefore, must decide (a) whether the study will involve one method (quantitative or qualitative), (b) if the study will include one phase or multiple phases, (c) how the mixing of quantitative and qualitative methods will occur, and (d) whether the mixing of methods will occur across all stages of the study (Graff, 2014, p. 51). The methodological flexibility provided by the mixed research approach to pedagogical action research complements the dynamic nature of action research, enabling a more comprehensive exploration of complex educational phenomena.

Table 7. A Framework for Pedagogical Action Research Methodology

Component	Qualitative approach	Quantitative approach	Mixed methods approach
Research design	Explores underlying reasons and meanings behind phenomena.	Measures and analyzes numerical data to identify patterns and relationships.	Integrates qualitative and quantitative approaches for a comprehensive understanding.
Data collection	Ethnography, grounded theory, phenomenology, narrative inquiry, case study.	Descriptive research, experimental research, causal-comparative research, correlational research.	Embedded-design, concurrent triangulation, two-phase research.
Data analysis	Thematic analysis, content analysis, narrative analysis.	Statistical analysis, descriptive statistics, inferential statistics.	Integration of data, triangulation.
Sampling	Purposive sampling, snowball sampling.	Random sampling, stratified sampling.	Sequential sampling, concurrent sampling.
Validity & reliability	Validity: credibility, transferability. Reliability: dependability, consistency.	Validity: internal validity, external validity. Reliability: consistency, replicability.	Validity: integration validity. Reliability: consistency across methods.
Ethical considerations	Transparency, participant rights, avoid exploitation.	Transparency, participant rights, avoid exploitation.	Transparency, participant rights, avoid exploitation.
Iterative process	Plan, act, observe, reflect, replan.	Plan, act, observe, reflect, replan.	Plan, act, observe, reflect, replan.

Table 7 presents a comprehensive methodological framework for PedAR, illustrating how components such as research design, data collection and analysis, strategic sampling, and the assessment of validity, reliability, and ethical considerations can be adapted to qualitative, quantitative, or mixed approaches in accordance with the research questions and educational context. By incorporating an iterative cycle of planning, acting, observing, reflecting, and replanning, the framework provides a flexible and systematic structure that generates valid and contextually relevant outcomes to inform pedagogical practice.

4. Conclusion

The shift in both fundamental and applied pedagogical research toward deepening the understanding and resolution of concrete educational issues underscores the necessity of adopting the PedAR methodology in higher education. The epistemological status of PedAR holds significant socio-professional relevance, providing a robust and flexible framework that enables educators to systematically investigate and enhance their teaching practices. Rooted in intradisciplinary and interdisciplinary approaches and enriched by the integration of qualitative, quantitative, and mixed methods, PedAR ensures a comprehensive understanding of complex educational phenomena, adapting them with their dynamic nature and specific contextual realities. On the one hand, qualitative methods, such as *ethnography* and *narrative inquiry*, provide contextual analytical perspectives on the lived experiences of students and educators, facilitating a deeper understanding of the social and cultural dynamics within educational environments. These methods allow researchers to explore the "why" and "how" behind educational practices, offering rich, nuanced insights that are essential for addressing complex educational phenomena. On the other hand, quantitative methods, including *descriptive and experimental research*, generate measurable and generalizable data, which can inform evidence-based decision-making and contribute to the development of educational policies. These methods enable researchers to identify patterns, trends, and relationships within educational practices, providing empirical evidence that supports broader conclusions. The mixed-methods approach, which integrates the strengths of both qualitative and quantitative research, is particularly valuable for pedagogical action research. By combining numerical data with rich contextual narratives, this approach enables data triangulation, enhancing the validity and reliability of findings while addressing diverse research questions. This methodological integration ensures a more comprehensive understanding of educational phenomena, synchronizing research outcomes with the dynamic and context-specific nature of teaching and learning. The openness of university teachers to addressing practical and concrete pedagogical issues identifiable within open contexts, such as teaching processes, activities, and specific situations, relies on the refinement of instructional design and the optimal utilization of pedagogical resources (informational, human, didactic-material, and financial), fostering the development of a culture of research and innovation in higher education, which is contingent on educators' methodological flexibility, essential for adopting a

multifaceted approach to educational practices and ensuring that research outcomes are both theoretically grounded and practically validated.

From an axiomatic perspective, pedagogical research emerges as a distinct object of study in university education, serving as the foundation for the continuous self-regulation of pedagogical activities across all levels of the teaching process through a methodology that emphasizes meticulous research design, systematic data collection, thorough analysis, strategic sampling, and strict adherence to ethical norms, tailored to the specific needs of the research context. The iterative cycle of planning, action, observation, reflection, and replanning ensures that pedagogical action PedAR remains a dynamic and evolving process of continuous improvement, serving as an indispensable tool for university teachers to critically reflect on their practices, engage in collaborative inquiry, and implement evidence-based changes that yield long-term benefits for the educational process.

Given these considerations, future research should investigate how longitudinal, cross-institutional collaborations can strengthen the methodological rigor of pedagogical action research by developing shared protocols for multi-site data collection that preserve local contextual specificity while enabling meta-analyses of teaching innovations, thereby creating a more robust evidence base for pedagogical decision-making that balances the need for both generalizable findings and situated understanding of educational processes across diverse higher education settings.

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