

# Data-Informed Teaching and Action Research in Improving Evidence-Based Instruction

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**ABSTRACT:** This explored the role of data-informed teaching and classroom action research in strengthening evidence-based instruction and improving student learning outcomes. The problem addressed centered on the persistent gap between the availability of educational data and its effective use in classroom decision-making, often resulting in less responsive and less effective teaching practices. The review aimed to synthesize existing literature on how teacher data literacy, action research, and continuous improvement models contributed to more systematic and evidence-driven instruction. It was hypothesized that integrating data-informed practices with iterative inquiry processes enhanced instructional quality and student achievement. Using a systematic review approach, relevant studies were analysed to identify key themes and relationships among data use, instructional strategies, and professional collaboration. The findings indicated that teacher data literacy was a critical foundation, enabling educators to interpret and apply data meaningfully. Classroom action research, particularly when conducted within Professional Learning Communities (PLCs), supported reflective practice and collaborative problem-solving. Evidence-based strategies such as explicit instruction, formative assessment, cooperative learning, metacognitive techniques, and timely feedback, were shown to be more effective when guided by data-driven insights. Furthermore, continuous improvement frameworks, especially the Plan-Do-Study-Act (PDSA) cycle, provided a structured process for refining instruction. The review concluded that the integration of data-informed teaching and action research fostered a culture of continuous improvement, professional growth, and accountability. Future studies should focus on the longitudinal impacts of these approaches, their scalability across diverse educational contexts, and the development of targeted interventions to strengthen teachers' data literacy skills.

**KEYWORDS:** Data-informed teaching; classroom action research; teacher data literacy; evidence-based instruction; continuous improvement; instructional outcomes; collaborative inquiry.

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## 1. Introduction

In recent years, educational research increasingly emphasized the importance of integrating systematic evidence into classroom practice to improve teaching and learning outcomes. This shift reflected a broader global movement toward evidence-based education, where instructional decisions were built not solely on intuition but also on reliable data and inquiry [1, 2]. Data-informed teaching involved the purposeful collection and interpretation of student performance data to guide instructional adjustments, curriculum pacing, and differentiated

support. Likewise, classroom action research enabled teachers to investigate problems of practice through cycles of planning, acting, observing, and reflecting, thereby generating context-specific evidence that informed instructional improvement. Together, these approaches supported evidence-based instruction by linking data use to teacher inquiry and reflective practice. The purpose of this literature review was therefore to synthesize current research on how data-informed teaching and action research jointly contributed to enhancing evidence-based instruction and to identify gaps that remained in the literature.

Many scholars underscored the centrality of data use and inquiry in contemporary teaching practice. Teacher data literacy was highlighted as essential for interpreting and acting on multiple sources of information, such as assessment scores, observations, and learning analytics [3, 4]. Buckman [5] described data-informed professional learning as a structured process that supported educators in integrating data into tiered instructional systems. Sagor [6] emphasized that data-informed practice enhanced teacher inquiry skills by linking analytics with reflective decision-making processes. Action research, as articulated by Crawford [7], anchored instructional decisions in systematic classroom inquiry, enabling teachers to implement and evaluate interventions based on evidence. Furthermore, Summers [8] noted that teachers' use of assessment data significantly improved instructional decisions when supported by continuous professional development. Together, these contributions illustrated a growing consensus that data use and reflective inquiry were fundamental to strengthening evidence-based teaching practices.

Despite the documented benefits of data-informed teaching and action research, gaps persisted in the literature. Although studies demonstrated that teachers collected data regularly, many educators still struggled to apply this information effectively to improve instruction [9, 10]. Research also indicated that while action research fostered reflective practice, its implementation varied widely and was often constrained by limited training and institutional support, thereby reducing its impact on sustained instructional improvement [11]. Moreover, much of the existing research focused on isolated elements of data use or action research in specific contexts without fully exploring how these processes interacted to produce long-term, evidence-based instructional change. This suggested a need for more integrated and longitudinal studies that examined how teacher inquiry and data use co-evolved in practice to support pedagogical improvement. The goal of this literature review was to clarify how data-informed teaching and classroom action research could be combined to strengthen evidence-based instruction and to propose a conceptual framework for future research and practice. By synthesizing current findings, this review aimed to outline key principles, effective practices, and persistent challenges associated with these approaches. The expected output was a comprehensive analysis that guided educators, researchers, and policymakers in designing professional development initiatives, instructional interventions, and research agendas that more effectively supported data use and inquiry-based improvement in classrooms. Ultimately, this study contributed to a deeper understanding of how evidence and inquiry meaningfully shaped instructional practice and improved student outcomes across educational contexts.

This literature review was anchored on the premise that effective instructional improvement occurred when teachers systematically used evidence to guide decision-making and reflect on their practices. The major theory underpinning this study was Data-Driven Decision-Making (DDDM) Theory, which posited that educational decisions should be grounded in systematically collected and analysed data to improve student outcomes [12].

Within this framework, data were not merely administrative records but meaningful sources of insight that informed instructional planning, differentiation, and intervention. In the context of this review, DDDM provided the foundational lens for understanding how data-informed teaching supported evidence-based instruction by transforming classroom information into actionable strategies. Supporting this framework was Reflective Practice Theory [13], which emphasized the importance of continuous reflection in professional practice. Reflective practitioners critically examined their actions, assessed outcomes, and adjusted their strategies to improve effectiveness. Classroom action research strongly aligned with this theory because it positioned teachers as researchers of their own practice. Through cycles of planning, acting, observing, and reflecting, educators generated context-specific evidence that informed instructional refinement.

Another supporting theory was the Plan–Do–Study–Act (PDSA) Cycle from Continuous Improvement Theory [14], which promoted systematic experimentation and iterative improvement. The PDSA model provided a structured process for implementing data-informed interventions, evaluating their impact, and refining instruction based on results. When applied to classroom settings, this theory reinforced the integration of data use and action research as ongoing improvement mechanisms rather than one-time initiatives. Table 1 presents the definitions and key characteristics of the core concepts that guided this review, including Data-Driven Decision-Making Theory, Reflective Practice Theory, and Continuous Improvement Theory (PDSA Cycle). These concepts collectively demonstrated how data use, reflective inquiry, and systematic improvement cycles supported evidence-based instructional practices and enhanced student learning outcomes.

**Table 1.** Definitions and key characteristics of core concepts.

Concept	Definition	Educational Focus	Reference
Data-Driven Decision-Making (DDDM) Theory	A theory that emphasizes the systematic collection and analysis of data to guide instructional decisions and improve student outcomes.	Using assessment and classroom data to inform instructional planning and evidence-based teaching.	[12]
Reflective Practice Theory	A theory that highlights the importance of critical reflection on professional actions to improve practice.	Encouraging teachers to engage in classroom action research and reflective inquiry for instructional improvement.	[13]
Continuous Improvement Theory (PDSA Cycle)	A cyclical model of planning, implementing, studying, and refining practices for sustained improvement.	Applying structured cycles of inquiry and intervention to enhance evidence-based instruction.	[14]

This review aimed to examine existing literature on data-informed teaching and its role in improving instructional practices. It also sought to analyse studies on classroom action research and its contribution to reflective and evidence-based instruction. Furthermore, the review synthesized research findings on how data-informed teaching and action research worked together to enhance instructional effectiveness. Finally, it identified gaps in the current literature and suggested directions for future research on evidence-based instructional improvement.

## 2. Materials and Methods

### 2.1. Research design.

This study employed a systematic literature review design to synthesize existing research on data-informed teaching and classroom action research in improving evidence-based instruction. The review followed the Preferred Reporting Items for Systematic Reviews and

Meta-Analyses (PRISMA) guidelines to ensure transparency, rigor, and replicability in the selection and reporting of studies. The PRISMA framework guided the identification, screening, eligibility assessment, and inclusion of relevant literature.

### 2.2. Database sources.

Relevant studies were retrieved from major academic databases, including ERIC, Scopus, Web of Science, and Google Scholar. These databases were selected to ensure comprehensive coverage of peer-reviewed educational research. The search focused primarily on studies published within the last 10–15 years, while also including seminal works foundational to the theoretical framework. Table 2 presents the database sources and data coverage used in this review, highlighting the research scope and publication years covered to ensure the inclusion of relevant, credible, and up-to-date literature related to data-informed teaching, action research, and evidence-based instruction.

**Table 2.** Sources and data coverage.

Database	Scope	Years Covered
ERIC	Education research, curriculum studies, teacher development	2010–2025
Scopus	Multidisciplinary peer-reviewed articles, educational research	2010–2025
Web of Science	High-impact journals in education and social sciences	2010–2025
Google Scholar	Broad search including grey literature and open-access journals	2010–2025

### 2.3. Inclusion and exclusion criteria.

To maintain quality and relevance, the review included peer-reviewed empirical studies, theoretical papers, and systematic reviews that addressed data-informed teaching, classroom action research, or evidence-based instruction in K–12 and higher education contexts. Studies published in English and accessible in full text were considered. Excluded materials included non-peer-reviewed articles, opinion papers without empirical grounding, conference abstracts, and studies focused solely on administrative or policy-level data without classroom application. Table 3 presents the inclusion and exclusion criteria used to guide the selection of relevant studies for the review. It specifies that included studies are peer-reviewed empirical research, theoretical works, or systematic reviews focusing on data-informed teaching, classroom action research, or evidence-based instruction within K–12 and higher education settings. Only English-language publications with accessible full text and published between 2010 and 2025 were considered. In contrast, excluded studies include non-peer-reviewed articles, opinion pieces, conference abstracts, policy-only papers without classroom application, studies outside the specified time frame, and non-English publications.

**Table 3.** Inclusion and exclusion criteria for study selection.

Criteria Type	Description
Inclusion	Peer-reviewed empirical studies, theoretical papers, or systematic reviews addressing data-informed teaching, classroom action research, or evidence-based instruction; K–12 and higher education contexts; English language; accessible full text; published 2010–2025.
Exclusion	Non-peer-reviewed articles, opinion pieces, conference abstracts, policy-only studies without classroom application, studies outside the time frame, and non-English publications.

### 2.4. Data analysis procedure.

Selected studies were analysed using thematic coding. Key concepts, patterns, and recurring findings were identified and categorized into major themes aligned with the objectives of the review. The synthesis approach involved comparing findings across studies to identify convergences, differences, and emerging trends related to instructional improvement. Table 4 presents the coding framework used in the thematic analysis of the selected studies. It organizes the analysis into key thematic categories that capture how data-informed teaching practices are conceptualized and implemented in educational settings. These include Data Collection, which refers to methods of gathering classroom or student information such as formative assessments and learning analytics; Teacher Data Literacy, which focuses on teachers' skills in interpreting and using data effectively; Action Research Cycle, which describes iterative processes of planning, acting, observing, and reflecting in instructional improvement; Evidence-Based Instruction, which highlights the use of research-supported teaching strategies such as differentiated instruction and formative assessment; and Instructional Outcomes, which refers to the measurable effects of interventions on teaching and learning, including student achievement and engagement.

**Table 4.** Coding framework used in thematic analysis.

Code	Description	Example Focus
Data Collection	Methods of gathering classroom or student data	Formative assessments, standardized tests, learning analytics
Teacher Data Literacy	Teachers' ability to interpret and use data effectively	Professional development in data analysis, interpretation skills
Action Research Cycle	Implementation of planning, acting, observing, reflecting	Lesson study, iterative instructional improvement
Evidence-Based Instruction	Application of research-supported strategies in teaching	Differentiated instruction, feedback, formative assessment
Instructional Outcomes	Measured impacts of interventions on teaching or learning	Student achievement gains, engagement, improved instructional strategies

### 3. Results and Discussion

#### 3.1. Types of Data Used in Classrooms

In modern classrooms, teachers relied on various types of data to understand student learning and improve their instructional practices. Classroom data came from multiple sources, including assessments, attendance records, observations, and digital learning platforms. The main goal of using these data sources was to provide teachers with meaningful insights that guided decision-making, supported student growth, and ensured evidence-based instruction [15, 16]. Instead of depending on a single source of information, effective teachers combined multiple data types to capture a more comprehensive picture of student needs and learning outcomes [17, 18].

One common form of classroom data was assessment data, which could be either formative or summative. Formative assessment data were collected continuously during instruction through quizzes, class discussions, observations, or exit tickets. These data allowed teachers to identify learning gaps early, adjust lessons in real time, and address misconceptions immediately. In contrast, summative assessment data, such as final examinations, projects, or standardized tests, provided a summary of student achievement at the end of a unit or course. While formative data were primarily used for day-to-day instructional adjustments, summative data were used to evaluate overall student progress and instructional effectiveness [19]. Both types of assessment data were essential; however, formative data were more flexible and

actionable on a daily basis, whereas summative data provided broader insights for long-term planning.

Another important type of data came from behavioral and attendance records, which provided insight into students' participation, engagement, and classroom presence. These data helped teachers understand factors beyond academic performance, such as motivation, classroom behavior, and external challenges that could affect learning [20]. In comparison, digital and process data, generated through learning management systems and educational software, showed how students interacted with learning materials over time. These data revealed patterns in engagement, learning pace, and content comprehension that were not always evident through traditional assessments. Unlike behavioral or attendance data, digital data were often more granular and immediate, offering teachers a detailed understanding of student learning processes [21].

By combining these data types—assessment, behavioral, and digital—teachers were able to make well-informed decisions that responded effectively to student needs. Formative assessments provided immediate instructional guidance, summative assessments evaluated overall outcomes, behavioral data informed engagement strategies, and digital data supported personalized learning. Together, these sources created a comprehensive framework for data-informed teaching, allowing educators to adapt instruction, monitor progress, and enhance the effectiveness of evidence-based practices in the classroom [22, 23].

Table 5 presents the major types of classroom data commonly used in educational settings and their corresponding instructional purposes. As shown in Table 5, formative assessment data were used to monitor ongoing student learning and support immediate instructional adjustments, while summative assessment data evaluated overall student achievement and instructional effectiveness. Behavioral and attendance data helped identify patterns of engagement and participation, whereas digital or process data provided detailed insights into student learning behaviors that supported personalized instruction and pacing adjustments.

**Table 5.** Types of classroom data and instructional uses.

<b>Data Type</b>	<b>Source</b>	<b>Instructional Purpose</b>
Formative Assessment Data	Quizzes, exit tickets, in-class tasks, teacher observations	Monitor ongoing learning, adjust lessons in real time, address misconceptions
Summative Assessment Data	Final exams, projects, standardized tests	Evaluate overall achievement, measure instructional effectiveness
Behavioral and Attendance Data	Attendance logs, classroom behavior records	Identify engagement, participation, and motivational needs
Digital/Process Data	Learning management systems, educational software logs	Understand learning behaviors, personalize instruction, refine pacing

### 3.2. Teacher data literacy.

Teacher data literacy referred to the knowledge, skills, and attitudes that educators needed to collect, interpret, and use various forms of data to inform instructional decisions and improve student learning. In recent educational research, data literacy emerged as a central component of effective teaching because it enabled teachers to transform raw data into meaningful insights for evidence-based instruction [24]. Rather than simply accessing data, data-literate teachers understood how to integrate assessment results, behavioral information, and classroom trends into their planning and instructional adjustments, thereby making informed decisions that

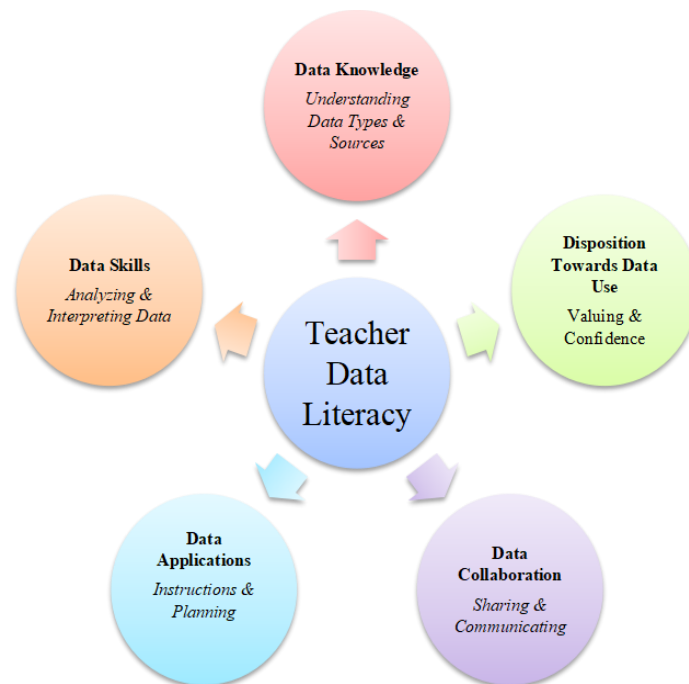
supported student achievement and curriculum effectiveness [25, 26]. Although definitions varied slightly, most scholars agreed that data literacy extended beyond technical skills to include reflective and collaborative practices that strengthened teaching quality and learning outcomes.

Research identified several core components of teacher data literacy. A systematic review [27] found that teacher data literacy included at least five interrelated dimensions: knowledge about data, skills in data use, dispositions toward data, application of data for multiple purposes, and data-related behaviors such as communication and collaboration with colleagues and stakeholders. These dimensions highlighted that data literacy was not solely about analysis but also about teachers' capacity to use data meaningfully across different instructional contexts. For example, teachers needed to understand what different types of data represented (knowledge), proficiently analyse and interpret them (skills), value data as a tool for improvement (disposition), apply findings to enhance teaching (application), and engage with peers to share insights or consult on data use (behavior).

Despite its importance, research consistently showed that many teachers still struggled with data literacy. Studies reported that even when teachers had access to digital data systems, they often lacked the confidence, time, or structured support needed to make effective instructional decisions based on data [28, 29]. Low data literacy could result in teachers misinterpreting information or relying on incomplete data sources, which undermined the potential of data-informed teaching to improve learning outcomes. Barriers such as limited professional development opportunities, insufficient training in data interpretation, and a lack of collaborative structures within schools further exacerbated these challenges, leaving many educators uncertain about how to translate data into actionable instructional practices.

To address these challenges, scholars emphasized the need for sustained and contextualized professional development that built both the technical skills and reflective capacities of teachers. Professional learning opportunities that focused on real classroom data, included collaborative data analysis with peers, and aligned with teachers' instructional goals were shown to be more effective in increasing data literacy than one-time training sessions [30–32]. When teachers participated in ongoing learning and received support from instructional leaders or data coaches, they became more confident in interpreting complex data and making instructional adjustments that enhanced student achievement.

As illustrated in Figure 1, teacher data literacy was conceptualized as an integrative framework consisting of five interrelated dimensions: Data Knowledge, Data Skills, Disposition Toward Data Use, Data Applications, and Data Collaboration. Figure 1 demonstrates how these components interacted dynamically to strengthen teachers' capacity to use data meaningfully in instructional decision-making. At the foundation of the framework was Data Knowledge, which referred to teachers' understanding of different data types and sources, such as formative assessments, standardized test results, behavioral records, and classroom observations. Complementing this was Data Skills, which involved the ability to analyse, interpret, and draw accurate conclusions from data. Together, these dimensions enabled teachers to move beyond surface-level interpretation toward deeper instructional insights. The framework also emphasized the importance of Disposition Toward Data Use, highlighting that valuing data and having confidence in its use were essential for effective implementation. Teachers who viewed data as a supportive instructional tool rather than a compliance requirement were more likely to engage in reflective and purposeful data practices.



**Figure 1.** Teacher data literacy is a product of (a); Data knowledge (b); Disposition toward data use (c); Data collaboration (d); Data applications (e), and Skills (f).

The final components—Data Applications and Data Collaboration—focused on action and shared practice. Data Applications involved using analysed data to inform instruction, planning, and intervention strategies. Data Collaboration underscored the importance of sharing findings, communicating insights, and engaging in collective inquiry with colleagues. Overall, Figure 1 conveyed that teacher data literacy represented a holistic and interactive construct. Effective data use in education required not only technical competence but also positive dispositions, practical application, and collaborative engagement to improve teaching quality and student learning outcomes.

### 3.3. Classroom action research and its cycle.

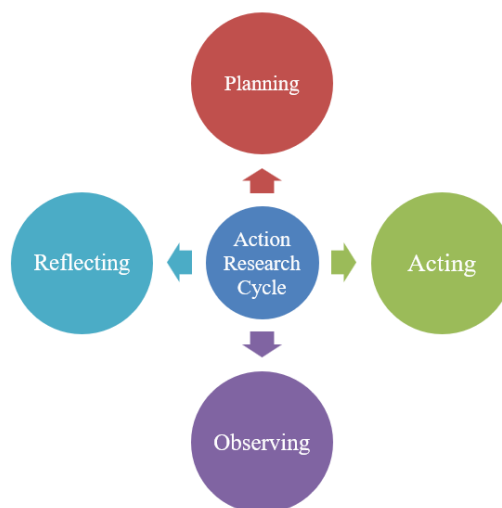
Classroom Action Research (CAR) is a systematic, teacher-led inquiry process designed to investigate problems of practice and improve teaching and learning in real-time classroom settings [33, 34]. Unlike traditional research that often emphasizes theory testing or generalizable findings, CAR is context-specific, focusing on understanding and enhancing practice within the unique dynamics of a classroom. Teachers act as researchers, identifying instructional challenges, implementing interventions, collecting data, and reflecting on outcomes to improve student learning [35].

Historically, action research emerged in the mid-20th century as a response to the perceived gap between educational theory and classroom practice. Kurt Lewin [36] is widely credited with introducing the concept of “action research” in social contexts, emphasizing participatory inquiry to solve practical problems. Over time, this methodology has been adapted to educational settings, providing teachers with a framework to iteratively refine teaching strategies and make evidence-based instructional decisions [37]. The development of CAR reflects a growing recognition that teachers, through structured inquiry, can contribute both to their professional growth and to improving learning outcomes for students.

A hallmark of classroom action research is its cyclical process, which structures inquiry into recurring stages of planning, acting, observing, and reflecting. The cycle begins with

planning, where teachers identify a specific problem or area for improvement and develop strategies or interventions to address it [38]. Next, in the acting stage, teachers implement the planned intervention within their classroom context, ensuring that changes are practical and relevant to students' needs. The observing stage involves systematic data collection, which can include student assessments, observations, surveys, or digital learning analytics, aligned with the research goals. Finally, reflecting allows teachers to analyse the outcomes, determine the effectiveness of their interventions, and plan for the next cycle [39].

This cyclical model supports iterative improvement: insights from one cycle inform subsequent cycles, allowing teachers to refine their strategies continually. Modern CAR often integrates data-informed teaching practices, linking classroom data with the action research cycle to ensure that interventions are evidence-based and responsive to student learning patterns [40, 41]. By combining inquiry with data, teachers can identify trends, adjust instruction in real-time, and generate actionable knowledge that is directly relevant to their classroom practice. Figure 2 depicts the cyclical process of classroom action research, which provides a structured framework for teachers to improve instruction and student learning continuously. The cycle begins with planning, where educators identify a specific classroom problem or area for improvement, set clear objectives, and design an intervention that is relevant and measurable. Next, in the acting stage, teachers implement the planned strategies and activities within the classroom to address the identified issue. During the observing stage, teachers systematically collect and analyse data on student performance, engagement, or behavior, using sources such as assessments, observations, surveys, or digital learning analytics. This data provides evidence of how the intervention is influencing learning outcomes. Finally, in the reflecting stage, teachers evaluate the results, determine what worked and what did not, and refine their strategies for the next cycle. This iterative process ensures that teaching practices are continually informed by evidence, making instruction more responsive to students' needs and fostering ongoing professional growth.



**Figure 2.** Action research cycle composes of (a): Planning (b); Acting (c); Observing (d); and Reflecting (e).

### 3.4. *Impact on teaching practices.*

Research on CAR consistently shows that engaging in systematic inquiry has notable effects on teachers' instructional practices and professional growth. Action research helps teachers move beyond traditional trial-and-error approaches by grounding instructional changes in

evidence collected from their own classrooms. Studies indicate that when teachers conduct action research, they become more reflective, intentional, and strategic in planning and delivering lessons—a shift that enhances overall instructional quality [5]. Many teachers who have participated in CAR report increased confidence and agency in making instructional decisions. Because action research encourages educators to investigate real challenges in their teaching, teachers gain a deeper understanding of their students' learning needs and adapt their practices accordingly [11]. This process of reflection and adjustment reinforces professional autonomy and encourages teachers to explore varied instructional strategies, ultimately leading to improved responsiveness to diverse learner needs.

Moreover, action research promotes a culture of continuous learning among teachers. When educators repeatedly cycle through planning, acting, observing, and reflecting, they build enduring skills in inquiry and data use that extend beyond a single project [13]. Engagement with action research also supports collaboration and professional dialogue, as teachers often share insights and strategies with colleagues, contributing to a supportive school environment where reflective practice is valued. Another significant impact is the enhancement of teacher professionalism and instructional knowledge. Recent studies have found that when teachers implement action research, they are more likely to adopt innovative teaching methods and digital tools, particularly in contexts that emphasize modern pedagogy [30]. Teachers involved in CAR initiatives reported not only improved teaching strategies but also greater commitment to lifelong learning and professional collaboration—qualities that strengthen instructional capacity in the long term.

Importantly, action research also supports the development of critical reflective skills. When teachers analyse data and evaluate teaching outcomes as part of CAR, they deepen their understanding of how their actions affect student learning. This reflective capability enables them to make more informed instructional decisions and refine their teaching over time [2]. Furthermore, empirical evidence suggests that teachers who engage in action research are better prepared to tackle classroom challenges and tailor instruction to specific contexts. By repeatedly testing and refining strategies based on systematic observation, teachers can identify what works best for their students, leading to more effective and contextually relevant teaching practices [1]. Table 6 summarizes the reported impacts of classroom action research (CAR) on teaching practices across the selected studies.

**Table 6.** Reported impacts of classroom action research on teaching.

Study	Context	Key Outcomes
[32]	Teachers conducting action research projects	Enhanced teacher confidence and reflective practice; improved instructional decisions.
[28]	Serbian primary and secondary teachers	Teachers developed deeper understanding of teaching and metacognitive skills; reflective practices increased.
[39]	Action research in classroom settings	Increased teacher professionalism and continuous improvement in instructional practices.
[30]	Junior High teachers implementing CAR	Greater adoption of digital tools, reflective practices, and professional collaboration.
[1]	Secondary teachers' experiences with CAR	Positive effects on teaching-learning process, teacher development, and curriculum innovations.

It highlights consistent findings that CAR contributes to meaningful improvements in teacher development and instructional quality. Across different contexts, including primary, secondary, and junior high school settings, teachers who engaged in action research demonstrated enhanced confidence, stronger reflective practice, and improved instructional

decision-making. Several studies also reported deeper pedagogical understanding, increased metacognitive skills, and greater professionalism as teachers continuously refined their practices. In addition, CAR was associated with the adoption of digital tools, strengthened collaboration among educators, and innovation in curriculum implementation, all of which positively influenced the teaching–learning process and overall instructional effectiveness.

### *3.5. Evidence-based instruction.*

Evidence-based instruction refers to teaching practices and strategies that are validated by rigorous research and consistently shown to produce positive student learning outcomes. Rather than relying on tradition, intuition, or untested methods, evidence-based instruction uses findings from well-designed studies to guide how educators teach and assess learning [31]. This approach aligns classroom practice with what research has shown to be effective, ensuring that instructional decisions are grounded in objective data and systematic evidence rather than personal belief or anecdotal experience. In this sense, evidence-based instruction emphasizes not just what teachers teach, but how they teach it, based on sound empirical evidence that supports student engagement, understanding, and retention.

The principles of evidence-based instruction are rooted in the idea that instructional strategies should be both effective and replicable. This means that a practice should demonstrate its impact across multiple studies and diverse student populations before it can be considered “evidence-based” [15]. Evidence-based practices are characterized by clear definitions, measurable outcomes, and consistent implementation protocols that allow educators to evaluate impact reliably. They often originate from experimental or quasi-experimental research designs, systematic reviews, and meta-analyses that compare instructional approaches and measure their effects on student outcomes. The focus on rigorous evidence elevates these practices above tradition-based techniques, helping teachers adopt methods with demonstrated success.

Another core principle of evidence-based instruction is continuity with professional expertise and context. This means that while research provides the foundation, instructional decisions also consider teacher professional judgment, student needs, and classroom dynamics. Integrating research evidence with teacher experience and contextual factors ensures that evidence-based practices are implemented in a way that is both scientifically sound and practically relevant. Effective evidence-based instruction also requires ongoing professional development, reflective practice, and data analysis to adapt and refine strategies over time.

### *3.6. Common-evidence-based practices.*

One widely cited evidence-based practice is explicit instruction, which involves teaching with clear, structured, and systematic steps. In explicit instruction, teachers model new content or skills, provide guided practice, and offer corrective feedback before students engage in independent tasks. Numerous studies in reading, mathematics, and science education have shown that explicit instruction significantly improves student comprehension and skill acquisition, particularly for students struggling with foundational skills. Another evidence-based strategy is formative assessment, which involves regularly checking for student understanding and using those results to adjust instruction. Formative assessments often take the form of short quizzes, exit tickets, class discussions, or observational checklists. Research supports that formative assessment enhances learning by providing timely feedback that helps

students correct errors and allows teachers to modify instruction responsively. Cooperative learning is also well supported by evidence. This approach has students work in small groups to solve problems, complete tasks, or discuss concepts together. Cooperative learning has been found to increase student engagement, improve critical thinking skills, and enhance academic achievement when structured properly with clear roles and shared accountability.

In addition, metacognitive strategies such as teaching students how to think about their own thinking and learning, have been shown to improve self-regulated learning and academic performance. Practices like goal setting, self-monitoring, and reflection help students understand how they learn best and take ownership of their learning process. When teachers embed metacognitive instruction into lessons, students develop higher-order thinking skills and become more autonomous learners. Finally, the use of feedback is a pervasive evidence-based practice. Feedback that is specific, timely, and actionable has been consistently linked to improved student performance. Effective feedback guides students in understanding their current performance relative to learning goals and offers clear steps for improvement. Unlike grades alone, quality feedback helps students reflect and progress in meaningful ways. Table 7 presents a summary of common evidence-based instructional strategies identified in the reviewed studies, along with their supporting evidence and associated learning outcomes. It highlights Explicit Instruction, which involves systematic teacher modeling and guided practice and is consistently linked to improved comprehension and foundational skill acquisition across subject areas. Formative Assessment is emphasized as a key strategy that uses regular checks for understanding to guide instructional adjustments, resulting in increased learning accuracy and more responsive teaching. Cooperative Learning, grounded in collaboration research, promotes group-based problem solving and is associated with higher student engagement, teamwork skills, and academic achievement. Metacognitive Strategies, which encourage students to reflect on their thinking processes through goal setting and self-reflection, support enhanced self-regulated learning and critical thinking. Lastly, Feedback is identified as a powerful instructional tool, where specific and timely responses help clarify learning goals and improve overall student performance.

**Table 7.** Evidence-based instructional strategies and supporting studies.

Strategy	Supporting Evidence	Learning Outcome
Explicit Instruction	Systematic teacher modeling and guided practice linked to skill mastery in diverse subjects	Improved comprehension and foundational skill acquisition
Formative Assessment	Regular checks for understanding that inform instructional adjustments	Increased learning accuracy and responsiveness
Cooperative Learning	Group-based problem solving supported by collaboration research	Higher engagement, teamwork, and academic achievement
Metacognitive Strategies	Teaching students thinking about their thinking (goal setting, reflection)	Enhanced self-regulated learning and critical thinking
Feedback	Specific, timely feedback linked to better student performance	Clarified learning goals and improved performance

### 3.8. Data as the basis for action research and collaborative inquiry.

Classroom action research is fundamentally rooted in the use of data as the primary source of evidence to guide inquiry, instructional decisions, and reflective practice. Action research is not a random process; rather, it begins with data that help teachers identify real problems of practice, understand learning patterns, and test instructional interventions [10]. In this sense, data become the basis for inquiry because they anchor the research cycle in measurable classroom realities rather than assumptions. When teachers collect and analyse evidence from

assessments, observations, and student work, they can pinpoint specific instructional needs, evaluate the effectiveness of strategies, and make informed adjustments that benefit student learning. Data used in classroom action research can take many forms, including formal assessment results, formative checks, behavior records, and qualitative observations. These sources provide a rich, multidimensional picture of how students learn and how instruction interacts with that learning. This aligns with the broader emphasis in educational research that meaningful data must be both relevant and contextualized to the specific classroom or school environment [25, 33]. By anchoring action research in such data, teachers avoid decisions based solely on intuition or anecdote and instead build a credible evidence base for instructional improvement.

Importantly, the value of data in action research is realized only when teachers critically interpret and apply it. Teachers must develop skills to analyse patterns, compare results over time, and consider how different data sources reinforce or challenge each other. When this analytical process occurs, data serve as a lens through which teachers understand student needs, refine instructional goals, and design focused interventions. In this way, data become both the starting point and the ongoing compass of teacher inquiry, driving cycles of action that are purposeful and evidence-based. Collaborative inquiry involves teachers working together to analyse data, share insights, and collectively make instructional decisions that improve student learning. This collaborative dimension elevates action research from an individual endeavor to a community-based professional practice, fostering shared responsibility for student outcomes. Research shows that when teachers engage in data discussions together within structures like Professional Learning Communities (PLCs), they expand their understanding of student needs and instructional strategies through multiple perspectives. For example, O'Connor and Park [27] found that collaborative analysis of assessment data within PLCs helped teachers plan and adjust instruction more effectively than when working alone.

Professional Learning Communities are one of the most common organizational structures used for collaborative inquiry. A PLC is defined as a group of educators committed to continuous learning, collective reflection, and shared decision-making based on evidence [13]. In PLCs focused on data, teachers regularly meet to examine student assessment results, compare instructional approaches, and co-construct strategies to address identified gaps. Research suggests that this collaborative process not only improves instructional alignment but also builds teacher capacity in interpreting data and making meaningful instructional changes. Collaborative inquiry also promotes professional dialogue and reflective practice. When teachers examine data together, they are more likely to challenge assumptions, consider alternative instructional responses, and refine their understanding of student learning patterns. School teams that engage in collaborative inquiry develop stronger shared norms about evidence use, which can reduce isolation and increase instructional coherence across grades or subject areas, enhancing consistency in teaching quality school-wide.

However, effective collaborative inquiry is not automatic; it requires time, trust, and structured processes. Teachers must be given opportunities to engage deeply with data, supported by leadership that provides time for collaboration and access to relevant data tools. Without these supports, collaborative efforts can remain surface-level or focus narrowly on compliance rather than genuine inquiry. Studies of early PLC implementation highlight that while collaborative data use increases teacher involvement with data, the quality of collaboration and data interpretation deeply influences whether instructional changes are

sustained. Figure 3 illustrates a Collaborative Data-Informed Action Research Model, highlighting how key elements of action research and collaborative inquiry interact to improve instructional practice. The cycle begins with data collection and analysis, where teachers gather evidence from assessments, observations, and student work to understand learning patterns and identify areas for improvement. This evidence then informs collaborative planning, in which teachers work together—often within Professional Learning Communities (PLCs)—to design interventions and instructional strategies tailored to student needs.



**Figure 3:** Collaborative Data-Informed Action Research Model is a cycle of (a); Data Collection & Analysis (b); Collaborative Planning (c); Collective Reflection & Decision Making (d); Implementation of Instructional Strategies (e); and Feedback & Iterative Improvement (f).

Next, the model emphasizes collective reflection and decision-making, where educators analyse the impact of the planned strategies, discuss findings, and determine adjustments needed to enhance learning outcomes. Following reflection, teachers move to implementation of instructional strategies, applying the collaboratively developed interventions in their classrooms. Finally, feedback and iterative improvement close the cycle, allowing teachers to monitor results, refine strategies, and continue the process of evidence-based instructional enhancement.

### 3.9. Continuous improvement models.

Continuous improvement models in education refer to systematic, iterative processes designed to refine instructional practices and enhance learning outcomes over time. At the heart of many continuous improvement frameworks is the Plan-Do-Study-Act (PDSA) cycle, which originated from quality management and improvement science and has been adapted for educational settings [18, 22]. The PDSA cycle involves planning an improvement, implementing it on a small scale, studying the results, and acting on what is learned to refine the practice. Because this cycle is iterative, it supports ongoing refinement rather than a one-time change, making it especially useful in classrooms where continuous adaptation to student needs is necessary.

In education, continuous improvement models emphasize the use of data at every stage of the PDSA cycle. Schools gather evidence—such as student assessment results, classroom

observations, and formative data—and use those measures to identify instructional challenges, test new practices, and evaluate impact. This structured approach to data use mirrors the broader field of improvement science, wherein practitioners learn from each cycle and become better equipped to design effective interventions over time [18]. The repeated collection and analysis of data help teachers and school leaders monitor progress, adjust, and build collective knowledge about what works in specific contexts.

Improvement science and PDSA cycles are increasingly being embedded in school practices through Professional Learning Communities (PLCs), data teams, and networked improvement communities (NICs), which help sustain continuous learning and professional growth across classrooms. For instance, institutional cases show that schools using PDSA cycles have integrated them into district-wide improvement efforts that emphasize both instructional change and systemic accountability, leading to academic gains and strengthened teacher practices [37]. This reflects the adaptability of continuous improvement models: they can be scaled from individual teacher practice to broader school improvement initiatives.

Despite these benefits, successful implementation requires both organizational support and a culture that values iterative learning. Schools must invest in training, time for collaborative inquiry, and systems for data access and interpretation. Without these supports, continuous improvement efforts risk becoming routine or superficial, focusing more on compliance than on genuine instructional transformation. Research on education settings suggests that structures like PLCs and improvement teams play a critical role in sustaining effective continuous improvement practices [18].

### *3.10. Instructional outcomes.*

Continuous improvement models have been associated with positive instructional outcomes when effectively integrated into classroom practice and school systems. One key outcome is enhanced teacher capacity to use data for making instructional decisions. As teachers engage in PDSA or similar cycles, they become more fluent in interpreting assessment results, reflecting on what the evidence suggests, and applying changes to instruction, which contributes to improved lesson design and execution [18]. Another instructional outcome tied to continuous improvement is increased student achievement. Empirical examples and school reports indicate that when teachers adopt iterative cycles of action and reflection, student learning metrics such as proficiency scores, comprehension rates, and performance on assessments often show growth over time. For instance, specific school cases involving structured PDSA use showed marked improvements in reading comprehension and standardized test outcomes after multiple cycles of intervention and refinement. Although generalizability depends on context, these examples suggest that continuous improvement can lead to measurable student progress.

Beyond academic achievement, continuous improvement practices contribute to better instructional coherence across classrooms. Teachers working collaboratively within PLCs use data cycles to align teaching strategies, share successful techniques, and ensure consistency in instructional quality. These collaborative processes foster a culture where reflective practice and shared decision-making become norms, strengthening instructional alignment throughout a grade level or school. Additionally, continuous improvement promotes adaptive instructional practices that respond to unique classroom needs. By continuously analyzing outcome data and adjusting approaches, teachers can tailor their instruction to address specific gaps in student

understanding or engagement. This adaptability makes instruction more responsive and student-centered, which is critical in diverse learning environments. Finally, using continuous improvement models often leads to professional growth and teacher efficacy. As educators learn to design, test, and refine interventions collaboratively, they build confidence, instructional skill sets, and a deeper understanding of how to impact student learning effectively. This professional learning becomes an outcome in itself, contributing to school-wide improvement and a culture of inquiry.

Table 8 provides a summary of instructional outcomes associated with integrated continuous improvement approaches across the reviewed studies. It highlights that Enhanced Teacher Data Use was observed, where teachers strengthened their decision-making through systematic engagement with data cycles. Increased Student Achievement was also reported, particularly in areas such as reading comprehension and assessment performance, indicating the positive impact of data-informed instruction on learner outcomes. Instructional Coherence Across Classrooms emerged as another key outcome, as collaborative inquiry and shared practices helped align instruction among teachers. In addition, Adaptive Instructional Practices were evident, with teachers adjusting their strategies based on iterative analysis of classroom data. Finally, Professional Growth and Efficacy were consistently noted, showing improvements in teacher confidence, collaboration, and continuous refinement of instructional practices.

**Table 8.** Summary of instructional outcomes from integrated approaches.

Outcome	Reported Impact	Reference
Enhanced teacher data use	Teachers improved decision-making through systematic data cycles.	[18]
Increased student achievement	Gains in reading comprehension and assessment scores.	[21]
Instructional coherence across classrooms	Shared strategies and aligned instruction through collaborative inquiry.	[37]
Adaptive instructional practices	Teachers tailored instruction based on iterative data insights.	[22]
Professional growth and efficacy	Increased teacher confidence, collaboration, and instructional refinement.	[36]

### 3.11. *Synthesis of the literature review.*

The reviewed literature collectively emphasizes the critical role of data-informed teaching, classroom action research, and evidence-based instruction in improving student learning outcomes and instructional quality. Teachers who are data-literate possess the knowledge, skills, and dispositions necessary to collect, analyse, and interpret multiple forms of data, translating them into actionable instructional decisions [22, 24]. Teacher data literacy is foundational, as it enables educators to integrate assessment results, behavioral information, and classroom trends into meaningful pedagogical practices, thus fostering a culture of reflective teaching and collaborative problem-solving.

Classroom action research emerges as a natural extension of data-informed teaching, providing teachers with a structured, iterative framework to identify problems, implement interventions, observe outcomes, and reflect on instructional effectiveness [26, 33]. The literature consistently shows that action research cycles, when combined with collaborative inquiry through Professional Learning Communities (PLCs), not only enhance instructional decision-making but also strengthen teacher collaboration, knowledge sharing, and professional growth [13, 27]. Collaborative engagement around data ensures that instructional

decisions are both evidence-based and contextually relevant, reducing teacher isolation and promoting consistency in classroom practices.

Evidence-based instructional strategies such as explicit instruction, formative assessment, cooperative learning, metacognitive strategies, and effective feedback, represent the practical application of data-informed teaching and action research findings [15, 31]. These strategies, validated through rigorous research, support measurable improvements in student achievement, engagement, and critical thinking skills. When teachers combine these strategies with ongoing action research cycles, they are better equipped to adapt instruction to meet diverse learner needs, demonstrating a continuous loop of improvement and refinement.

The integration of continuous improvement models, particularly the Plan-Do-Study-Act (PDSA) cycle, with classroom action research represents a culmination of the reviewed literature [18, 21]. This integration formalizes iterative cycles of data collection, intervention, analysis, and reflection at both the classroom and school levels. It ensures that instructional practices are continuously evaluated and refined based on empirical evidence. Empirical studies consistently report that PDSA-informed approaches improve teacher efficacy, instructional coherence, adaptive teaching practices, and student learning outcomes across multiple contexts [16, 37].

The literature highlights a synergistic model in which teacher data literacy, classroom action research, collaborative inquiry, evidence-based instructional strategies, and continuous improvement cycles interact to create a dynamic, evidence-informed teaching environment. Each component reinforces the others: data literacy allows teachers to interpret results, action research provides a framework for testing interventions, collaborative inquiry amplifies insights, evidence-based strategies guide practice, and continuous improvement ensures iterative enhancement of teaching and learning outcomes.

#### **4. Conclusions**

The author would like to express deepest gratitude to Almighty God for granting the strength, wisdom, and perseverance necessary to complete this literature review. Sincere appreciation is extended to Dr. Jun S. Adlaon of Surigao del Norte State University for his invaluable guidance, insightful feedback, and constant encouragement throughout the process. The author is also deeply thankful to their family for their unwavering love, patience, and support, which served as a source of inspiration during challenging moments. Lastly, heartfelt thanks are extended to classmates and friends for their moral support, shared knowledge, and meaningful collaboration, which greatly contributed to the successful completion of this academic work.

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## Author Contribution

The author was solely responsible for the entire development of this literature review. This included the conceptualization of the study, the formulation of the methodology, and the application of inclusion criteria and PRISMA guidelines in screening and selecting relevant sources. The author also undertook the collection of updated literature, the organization and classification of reviewed data, and the comprehensive analysis and synthesis of findings across the educational context addressed in this review. All writing, interpretation of findings, and final revisions were likewise completed solely by the author.

## Competing Interest

The author declared that there were no competing financial, professional, or personal interests that could have influenced the conduct, analysis, or interpretation of this literature review. This work was carried out solely for academic and scholarly purposes, with integrity and impartiality maintained throughout the research process.

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