

# Effect of Contextualized Science Instruction on Learners' Understanding of Science Concepts

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## Abstract

This literature review examined the effect of contextualized science instruction on learners' understanding of science concepts, with particular attention to Science 6 and its relevance to the educational context of the Schools Division Office of Aurora (SDO Aurora). The review synthesized recent Philippine and international studies published mainly from 2021 to 2026 that explored contextualized, localized, context-based, and real-life approaches in science teaching. Findings generally showed that contextualized instruction can improve conceptual understanding, academic performance, engagement, scientific reasoning, and the application of knowledge when scientific ideas are connected with learners' experiences, local environments, and familiar situations. The literature also highlighted the value of contextualized instructional materials in addressing difficult concepts and supporting meaningful learning. However, the effectiveness of contextualization depends on the quality of instructional design, scientific accuracy, teacher competence, and alignment between context and curriculum objectives. Challenges identified in the literature included limited teacher preparation, lack of validated localized materials, large class sizes, and differences in implementation across settings. The review concludes that contextualized science instruction is a promising approach for strengthening Science 6 learning. Further research, particularly within SDO Aurora, is recommended to determine how contextualized approaches can be adapted to learners' local experiences, environments, and science learning needs.

**Keywords:** Contextualized Science Instruction, Science Concepts, Conceptual Understanding, Science 6, Elementary Science Education

## 1. Introduction

Science education helps learners understand the world around them, develop scientific reasoning, and use what they learn in everyday situations. At the elementary level, building a clear understanding of scientific concepts is especially important because these concepts serve as a foundation for more advanced learning. However, science can be difficult for learners when lessons depend mainly on abstract explanations, definitions, and textbook examples that have little connection to their actual experiences. One approach that responds to this challenge is contextualized science instruction, which relates scientific ideas to situations, environments, and experiences that are familiar and meaningful to learners. Teshager et al. (2021) emphasized that context-based science teaching can make science more relevant and meaningful by connecting scientific ideas with real-world experiences. Hüfner et al. (2026) likewise showed that contexts can help organize learning, connect content with meaningful situations, and provide learners with different ways of understanding scientific knowledge. In this regard, this literature review examines the effect of contextualized science instruction on learners' understanding of science concepts, particularly in Science 6 and upper-elementary education.

Contextualized instruction is particularly useful in science because many concepts become easier to understand when learners can relate them to familiar events and experiences. Everyday materials, community practices, environmental conditions, local situations, and real-life problems can serve as useful starting points for explaining scientific ideas. Through this kind of instruction, learners are encouraged not only to memorize scientific terms but also to understand how concepts work and why they matter in real-life situations. Studies conducted in the Philippines support the value of contextualization in science teaching. Picardal and Sanchez (2022), through a meta-analysis of Philippine studies, found that contextualized science instruction had a positive effect on students' science achievement. Their review also showed that different contextualization strategies were used to connect science lessons with authentic learning situations. In a similar way, Bello et al. (2023) reported improved learner performance when localized and contextualized science teaching and learning materials were used. These findings suggest that contextualization goes beyond simply replacing textbook examples with local ones. It involves designing learning experiences that allow learners to connect scientific ideas with situations they can recognize, observe, and understand.

Understanding science concepts involves more than remembering facts and definitions. Learners are expected to recognize relationships among ideas, explain scientific phenomena, apply concepts in different situations, and connect new information with what they already know. Contextualized instruction can support these processes because it presents scientific ideas within situations where learners can see their practical meaning. Baydere (2021) examined a context-based approach that combined prediction, observation, and explanation among fifth-grade learners. The study showed that the approach strengthened learners' conceptual understanding of states of matter, heat, and temperature while also helping address alternative conceptions. This is especially relevant to elementary science because it shows how familiar contexts and active reasoning can help learners develop a clearer understanding of scientific concepts. Similar findings were reported by Ayotte-Beaudet et al. (2023), who studied fifth- and sixth-grade learners. Their study found that contextualized outdoor science education supported learners' understanding of living organisms and ecosystem relationships. Learning in the immediate environment also encouraged deeper learning, scientific investigation, and engagement. Philippine studies reflect a similar pattern. Montero and Geducos (2022) found that localized and contextualized learning activities improved conceptual understanding in Biology compared with conventional activities. Bello et al. (2023) also reported improved science learning performance through localized and contextualized materials. Taken together, these studies suggest that contextualization can help learners build stronger connections between scientific concepts, prior knowledge, and actual experiences.

In the Philippine setting, contextualized science instruction has been used through localized materials and activities that relate scientific ideas to learners' immediate environments and experiences. Picardal and Sanchez (2022) found positive effects of contextualization on science achievement across Philippine studies, while Bello et al. (2023) showed that localized and contextualized materials can improve learning performance. These findings highlight the value of making science instruction more responsive to the situations learners encounter in their own communities and surroundings. International studies provide similar support. Teshager et al. (2021) found that context-based teaching is an important way of strengthening the connection between theory and practice in upper-primary science education. Hüfner et al. (2026) further explained that contexts may come from personal experiences, social situations, scientific practices, and other meaningful environments. These different forms of context can give learners several ways of approaching and understanding scientific content. Overall, both Philippine and international literature point to the same idea: science becomes more meaningful when learners can relate what they study to situations they know and understand.

The literature reviewed does not identify a specific formal theory or named conceptual framework for the study. However, the discussion consistently centers on the idea that learners understand scientific concepts more effectively when new knowledge is connected to familiar experiences, prior knowledge, and observable situations. This idea is reflected in the studies reviewed, where contextualized instruction is associated with improved conceptual understanding, scientific reasoning, engagement, and knowledge application. In this sense, contextualization serves as a way of bringing abstract scientific concepts closer to learners' actual experiences. Instead of treating science as a set of isolated facts, it allows learners to see how scientific ideas can be observed, interpreted, and applied in meaningful settings.

Recent studies show that contextualized science instruction is associated with positive outcomes in science achievement, conceptual understanding, scientific reasoning, engagement, and knowledge application (Abebe et al., 2023; Ayotte-Beaudet et al., 2023; Baydere, 2021; Bello et al., 2023; Montero & Geducos, 2022; Picardal & Sanchez, 2022). Hüfner et al. (2026) further demonstrate that context-based science education has developed into a broad field with different ways of defining and using context in primary and secondary science instruction. Giamellaro et al. (2025) similarly demonstrated the breadth of contextualized science learning research, identifying multiple areas of scholarship that connect school science with contexts in which scientific knowledge is applied, experienced, observed, or made relevant to learners. This growing interest is also reflected in bibliometric evidence showing sustained scholarly attention to context-based learning across different areas of

science education (Fayzullina et al., 2023). Despite this growing evidence, the existing studies differ in terms of grade level, science subject area, instructional setting, and type of contextualization. Some studies focus on localized learning materials, while others examine outdoor learning, context-based activities, authentic situations, or contextualization combined with other teaching strategies. Because of these differences, there is still a need to bring recent findings together and examine what they collectively show about the effect of contextualized science instruction on learners' understanding of science concepts. This is particularly important for Science 6 and upper-elementary education, where learners are expected to develop stronger conceptual foundations in science. Thus, this literature review aims to synthesize recent studies on how contextualized approaches are used, their reported effects on conceptual understanding and related learning outcomes, and the instructional features that may support meaningful science learning, with particular consideration of their relevance to Science 6 instruction within SDO Aurora.

The study is most closely aligned with SDG 4, Quality Education, because it focuses on an instructional approach that aims to make science learning more meaningful, understandable, and relevant to learners. By examining how contextualized instruction supports the understanding of science concepts, the review contributes to the broader goal of improving the quality of teaching and learning in elementary education. Its emphasis on meaningful and learner-centered science instruction also supports efforts to strengthen educational experiences that are responsive to learners' needs and contexts.

The study is relevant to educational sustainability because it examines an approach that can help learners develop a more meaningful and lasting understanding of scientific concepts. When science lessons are connected with familiar experiences and real-life situations, learning becomes more relevant and easier to apply beyond the classroom. This can contribute to stronger foundations for continued science learning. The study also has relevance to community-oriented educational sustainability because contextualized instruction allows local environments, everyday experiences, and community situations to become part of the learning process. By bringing these elements into science instruction, teaching can become more responsive to the actual context of learners. In this way, the review may help clarify how contextualized instruction can support more meaningful, relevant, and sustainable science learning in Science 6.

## **2. Materials and methods**

### **2.1 Research Design**

The study employed a literature review design using a systematic and organized process for locating, screening, and examining relevant research. Rather than conducting a classroom experiment, the review sought to determine what recent studies collectively show about contextualized science instruction and learners' understanding of scientific concepts. Both Philippine and international studies were considered to provide a broader perspective on the use of contextualization in science education. The review primarily covered studies published from 2021 to 2026 to maintain the relevance and currency of the evidence. Earlier sources were considered only when needed to explain an established methodological principle or concept not adequately represented in recent literature. The search and selection procedures followed principles of transparency and reproducibility in evidence synthesis (Page et al., 2021; Rethlefsen et al., 2021).

### **2.2 Locale of the Study**

Although the study employed a literature review design and did not involve primary data collection in a specific school, it was contextualized within the Schools Division Office of Aurora (SDO Aurora). SDO Aurora served as the educational setting for considering the relevance and possible application of the findings to Science 6 instruction. The review included Philippine and international studies on contextualized science instruction to provide a broader understanding of how this approach supports learners' understanding of scientific concepts. Particular attention was given to findings that may be relevant to elementary science education and to instructional practices that connect scientific concepts with learners' experiences, local environments, and familiar situations.

### **2.3 Respondents of the Study**

As a literature review, the study did not involve human respondents from SDO Aurora or any other educational setting. Instead, the sources of evidence were published scholarly studies related to contextualized science instruction and science learning. Priority was given to research involving elementary and basic education learners, particularly those at or near the Grade 6 level. Studies from other grade levels were also considered when their findings contributed directly to understanding the effects of contextualization on science learning. Eligible studies were primarily published from 2021 to 2026, written in English, and focused on science education. They were required to examine contextualized, context-based, localized, authentic, real-life, or related instructional approaches and report findings associated with conceptual understanding, academic achievement, reasoning, engagement, science learning, or the application of scientific knowledge.

## **2.4 Sample and Sampling Procedure**

The body of literature was selected using defined inclusion and exclusion criteria. Studies unrelated to science education, those that did not address contextualization or a comparable instructional approach, sources focused only on subjects outside science, studies lacking sufficient information relevant to the review, and duplicate records were excluded. Non-scholarly materials without adequate academic or methodological support were also not used as primary evidence. Selection was conducted in stages. Titles and abstracts were first screened for relevance, after which potentially eligible studies were examined in full text and assessed against the established criteria. Duplicate records were removed, and attention was given to each study's purpose, educational level, type of contextualization, science content, research design, and reported outcomes. The screening process was informed by PRISMA 2020 (Page et al., 2021). Search reporting was also guided by PRISMA-S recommendations (Rethlefsen et al., 2021). No predetermined number of studies was set before screening; the final literature included sources that met the eligibility criteria and provided sufficient evidence to address the purpose of the review.

## **2.5 Research Instrument**

The study used a structured literature search and data extraction process to gather relevant evidence from published scholarly sources. Studies were located through Google Scholar, ERIC, Scopus, and ScienceDirect, together with the reference lists of highly relevant publications. Search terms included "contextualized science instruction," "context-based science education," "localized science instruction," "contextualized learning in science," "science conceptual understanding," "science concept learning," "elementary science education," "primary science education," "Grade 6 science," and "Science 6." Boolean operators such as AND and OR were used to combine and refine search terms. The search strategy was designed to capture different forms of contextualization while remaining focused on science teaching and learning, consistent with recommendations for clearly documenting information sources, search terms, and search procedures (Aromataris et al., 2024; Rethlefsen et al., 2021). Relevant information extracted from the selected studies included the author and year of publication, educational context, grade or educational level, form of contextualized instruction, science content, research design, and major findings related to conceptual understanding and other learning outcomes.

## **2.6 Data Gathering Procedure**

Relevant studies were gathered through systematic searches of the identified academic databases and scholarly platforms. Reference lists of highly relevant studies were also examined to locate additional sources. Titles and abstracts were screened first, followed by full-text examination of studies that appeared relevant. Each study was then assessed according to the inclusion and exclusion criteria. Information from eligible studies was organized and compared to identify similarities, differences, and recurring findings. Particular attention was given to evidence showing how contextualized instruction connected scientific ideas with everyday experiences, local environments, authentic situations, and prior knowledge. The screening procedure followed transparent reporting principles for identifying, selecting, and including studies (Page et al., 2021). Search procedures were documented to support clarity and reproducibility (Rethlefsen et al., 2021). The credibility of the review was further supported through clearly defined eligibility criteria, multiple academic information sources, consistent search terms, and a structured screening process. Peer-reviewed studies were prioritized, and each source was assessed for relevance to the research question. These procedures were consistent with established guidance for documenting information sources, study selection, data extraction, and synthesis (Aromataris et al., 2024). Transparent reporting of the identification, selection, and synthesis of studies was likewise guided by PRISMA 2020 (Page et al., 2021).

## **2.7 Data Analysis Techniques**

The selected studies were analyzed through narrative synthesis rather than statistical meta-analysis. Findings were grouped according to recurring themes involving the forms of contextualization used in science education, their reported effects on learners' understanding of science concepts, related learning outcomes, and instructional characteristics associated with meaningful science learning. Studies reporting similar findings were examined together, while differing or contradictory results were also considered to provide a balanced interpretation of the evidence. Philippine findings were compared with international research to identify areas of similarity and difference in the use of contextualized science instruction. The analysis also considered the relevance of the available evidence to Science 6 and upper-elementary science education. Conclusions were based on patterns across the body of literature rather than on isolated findings from individual studies.

# **3. Results and Discussion**

## **3.1 Conceptual Understanding through Contextualized Science Instruction**

The reviewed studies consistently showed improvements in conceptual understanding when science concepts were presented through meaningful contexts. Baydere (2021) found that a context-based approach combined with prediction, observation, and explanation strengthened fifth-grade learners' understanding of states of matter, heat, and temperature while helping address alternative conceptions. Montero and Geducos (2022) similarly reported better conceptual understanding among learners exposed to localized and contextualized Biology activities than

among those taught through conventional activities. Among elementary learners, Ayotte-Beaudet et al. (2023) found that contextualized outdoor science education improved understanding of living organisms and ecosystem relationships, scientific investigation abilities, engagement, and deeper learning. Barrun and Cajurao (2025) also reported improved conceptual understanding and related outcomes through contextualized Science, Technology, and Society lessons. These findings suggest that contextualization makes scientific ideas easier to understand when learners can connect them with situations they can observe and recognize. Instead of learning concepts only as definitions or isolated facts, learners are given opportunities to predict, investigate, explain, and apply scientific ideas within meaningful situations. This is particularly relevant to Science 6, where concepts related to mixtures, ecosystems, forces, energy, the human body, and the environment can be connected with experiences and materials found in learners' homes, schools, and communities. However, meaningful learning requires more than simply adding familiar examples; the context must be directly related to the scientific concept and should support explanation, investigation, and application.

### **3.2 Contextualized Materials and Science Learning Performance**

The literature also showed positive effects from contextualized instructional materials. Picardal and Sanchez (2022), through a meta-analysis of Philippine studies, found that contextualized science instruction positively influenced science achievement and that differences in educational level and science domain did not significantly affect the overall results. Bello et al. (2023) likewise reported improved learning performance when localized and contextualized science materials were used. Abenir (2025) similarly found that contextualized activity sheets contributed to improved science proficiency among elementary learners. The use of the local dialect and hands-on activities also supported real-world application, critical thinking, motivation, engagement, and collaborative learning. At the Grade 6 level, Lituañas and Dela Cruz (2024) developed contextualized Strategic Intervention Materials after identifying difficulties involving mixtures, particularly in distinguishing solutes and solvents, describing suspensions, and explaining methods of separating mixtures. Lituañas and Dela Cruz (2025) further highlighted the usefulness of these materials in improving comprehension and performance in difficult science concepts through guide activities, assessments, enrichment tasks, and reference resources. These results show that contextualized materials can respond to specific learning difficulties rather than serving only as general teaching aids. When instructional resources are designed around identified areas of difficulty and linked to familiar objects, processes, or situations, scientific concepts may become more accessible to learners. The findings of Picardal and Sanchez (2022) and Bello et al. (2023) further suggest that contextualization can be incorporated into activities, assessments, worksheets, modules, and other learning resources. Nevertheless, familiarity alone is not enough. Contextualized materials must remain scientifically accurate and closely aligned with the intended learning objectives.

### **3.3 Engagement, Scientific Reasoning, and Meaningful Application**

Beyond conceptual understanding and achievement, the reviewed studies identified benefits related to engagement, scientific reasoning, and meaningful application. Ayotte-Beaudet et al. (2023) found that contextualized outdoor science experiences encouraged deeper learning and engagement because learners were able to investigate scientific relationships in authentic environments. Kostøl and Remmen (2022) likewise found that a context-based science curriculum made learning activities more engaging by giving scientific content a meaningful purpose. However, they also emphasized that effective implementation requires attention to the authenticity of the context, teacher involvement, and alignment between learning activities and assessment. Similarly, Erdoğan and Uluçınar Sağır (2024) found that context-based learning using the REACT model positively affected Grade 6 learners' science achievement and interest in science, although no significant effect was observed on science anxiety. Their findings provide direct evidence that contextualized instruction can support important learning outcomes among learners at the Grade 6 level. Abebe et al. (2023), however, reported a more qualified result. Learners taught through conventional instruction integrated with context-based activities demonstrated stronger scientific reasoning than other groups, while the context-based REACT strategy alone did not significantly outperform conventional instruction. Hüfner et al. (2026), after examining 101 peer-reviewed studies, also found that context can perform different functions in science education, including organizing content, structuring activities, introducing scientific practices, connecting learning with meaningful situations, and providing different points of access to scientific knowledge. These findings indicate that contextualization is most useful when it supports rather than replaces sound science instruction. Familiar experiences can attract learners' attention and provide meaningful starting points, but learners still need structured explanations, scientific guidance, opportunities to reason from evidence, and appropriate assessment. Abebe et al. (2023) demonstrate that merely labeling an approach as context-based does not guarantee stronger learning outcomes. Similarly, Hüfner et al. (2026) show that the effectiveness of contextualization depends partly on the role that context plays within instruction. In Science 6, familiar materials, environmental conditions, community practices, and natural phenomena can therefore be used as starting points for questioning, prediction, investigation, observation, and scientific explanation.

### **3.4 Relevance of Contextualization to Philippine Science Education**

Philippine studies consistently showed that contextualization has practical relevance to science learning. Picardal and Sanchez (2022) reported an overall positive effect of contextualized science instruction on achievement, while Bello et al. (2023) demonstrated positive outcomes from localized and contextualized materials. Montero and Geducos (2022) likewise found stronger conceptual understanding through localized science activities. Banzuelo and Quiñones (2026) identified Philippine practices such as the use of local biodiversity, Indigenous knowledge, and community-based problem solving and found that these approaches were associated with greater engagement, deeper conceptual understanding, and stronger connections between learning and learners' cultural environments. These findings suggest that the Philippine environment can provide meaningful contexts for elementary science instruction. Local plants and animals, weather conditions, household materials, food preparation, agriculture, water use, waste management, and community environmental concerns may serve as accessible learning contexts when they are aligned with curriculum competencies. However, contextualization does not imply that local knowledge and scientific knowledge are identical. Rather, familiar experiences can provide starting points from which teachers guide learners toward scientifically accepted explanations. Banzuelo and Quiñones (2026) therefore reinforce the importance of connecting science instruction with learners' cultural and community experiences while maintaining scientific accuracy.

### **3.5 Challenges in Implementing Contextualized Science Instruction**

Despite the generally positive findings, several implementation challenges were identified. Teshager et al. (2021) found that context-based science teaching was only moderately implemented among upper-primary science teachers, indicating that curriculum expectations do not necessarily lead to consistent classroom application. Banzuelo and Quiñones (2026) identified inadequate teacher preparation, limited availability of validated localized materials, large class sizes, rigid curriculum pacing, and difficulties integrating different knowledge systems as barriers to contextualization. The evidence base also remains limited in some areas. Banzuelo and Quiñones (2026) noted that many Philippine studies are relatively small in scale and that longitudinal evidence remains limited, while Picardal and Sanchez (2022) recommended further investigation of factors affecting the implementation of contextualized science instruction. These findings show that effective contextualization requires more than teacher willingness. Teachers need sufficient preparation, appropriate resources, planning time, and support in developing materials that are both meaningful to learners and scientifically correct. The limitations identified in the literature also suggest that positive outcomes should be interpreted carefully, since different forms of contextualization may not produce the same results across learners, science topics, or educational settings. Teshager et al. (2021) further highlight the importance of teacher competence in selecting appropriate contexts, adapting materials, regulating learning, and integrating investigations into instruction. More research focused specifically on elementary and Grade 6 science is therefore needed.

### **3.6 Synthesis and Implications for Science 6 in SDO Aurora**

Overall, the reviewed evidence indicates that contextualized science instruction is associated with improvements in learners' understanding of scientific concepts when it is purposefully designed and aligned with learning objectives. Scientific concepts appear to become more accessible when learners can connect them with observable phenomena, familiar materials, local environments, and authentic situations (Ayotte-Beaudet et al., 2023; Baydere, 2021; Montero & Geducos, 2022). Contextualization can also support achievement and provide targeted interventions for difficult concepts (Bello et al., 2023; Lituañas & Dela Cruz, 2024, 2025; Picardal & Sanchez, 2022). At the same time, Abebe et al. (2023) demonstrated that integrating context-based activities with structured conventional instruction may sometimes produce better outcomes than using a context-based strategy alone. The evidence therefore supports the use of contextualization as a means of strengthening, rather than replacing, established science teaching practices. For Science 6, contextualization is particularly relevant because many curriculum concepts can be related to learners' immediate environments and daily experiences. Scientifically accurate contextualized activities and materials can provide opportunities for learners to observe, investigate, explain, and apply concepts rather than simply memorize information. The overall findings support the value of contextualized science instruction while also emphasizing the importance of teacher competence, appropriate instructional resources, careful integration of context with scientific content, and continued research involving upper-elementary and Grade 6 learners. In the context of SDO Aurora, the reviewed findings suggest that contextualized instruction may provide a useful direction for making Science 6 lessons more meaningful and responsive to learners' experiences. Familiar materials, local environmental conditions, community practices, and everyday situations may serve as possible contexts for explaining scientific concepts when they are appropriately aligned with curriculum competencies. However, since the present study is based on existing literature rather than primary data from schools within SDO Aurora, the effectiveness of these approaches in the division still needs to be examined through future classroom-based research.

#### 4. Conclusion & Recommendations

The reviewed literature indicates that contextualized science instruction can contribute positively to learners' understanding of science concepts by connecting scientific ideas with familiar experiences, local environments, real-life situations, and meaningful learning activities. Across the studies, contextualized approaches were associated with improvements in conceptual understanding, academic performance, engagement, scientific reasoning, and the application of knowledge. The literature also suggests that these benefits are strongest when contextualization is carefully aligned with scientific content and supported by clear explanations, appropriate instructional materials, and meaningful learning tasks. For Science 6, contextualized instruction appears particularly useful because many scientific concepts can be connected with situations and materials that learners encounter in their homes, schools, and communities. These findings may also be relevant to Science 6 instruction within SDO Aurora, particularly in developing learning experiences that reflect learners' local surroundings and everyday experiences. However, their effectiveness within the division still needs to be established through research conducted directly in its schools.

Based on the reviewed literature, science teachers are encouraged to incorporate contextualized activities, examples, and instructional materials that are relevant to learners' experiences while maintaining scientific accuracy and alignment with curriculum competencies. Schools and curriculum developers may also support teachers by providing validated contextualized resources and professional development on how to design and implement context-based science instruction effectively. Future studies should further examine contextualized instruction specifically among Grade 6 learners and across different Science 6 topics to determine which approaches are most effective in improving conceptual understanding. Within SDO Aurora, classroom-based studies may also be conducted to identify appropriate local contexts, develop and validate contextualized learning materials, and determine how these approaches influence learners' understanding of science concepts. Research involving different schools within the division may provide stronger evidence for the practical application of contextualized science instruction.

This literature review is limited by the scope and availability of published studies included in the synthesis. The reviewed research varied in terms of grade level, science topic, instructional strategy, research design, and educational setting, which limits direct comparison across studies. Although priority was given to recent literature and studies relevant to elementary and basic education, only a limited number of studies focused specifically on Grade 6 science. No primary data were collected from schools within SDO Aurora; therefore, the implications presented for the division are based on findings from the reviewed literature rather than direct evidence from the local setting. Accordingly, the conclusions should be interpreted as a synthesis of the available evidence and not as confirmation that contextualized instruction will produce the same outcomes across all Science 6 classrooms in SDO Aurora.

#### 5. Compliance with ethical standards

The study was conducted as a literature review using published scholarly sources related to contextualized science instruction and science learning. It did not involve human respondents or the direct collection of primary data from learners or teachers. The review relied on the systematic selection, organization, comparison, and synthesis of existing research relevant to the study.

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