INCORPORATING REAL-LIFE CONTEXT INTO SCHOOL CHEMISTRY ENHANCES MEANINGFUL LEARNING

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ABSTRACT

This policy brief describes the importance and significance of incorporating real-life contexts into school chemistry for enhancing students' meaningful learning. *[African Journal of Chemical Education—AJCE 14(3), July 2024]*

INTRODUCTION

The context-based learning approach emerged 40 years ago in the 1980s in developed countries [1]. In contrast, many developing countries continue to predominantly employ a content-based (or decontextualized—context-free) approach in chemistry and science education [2] [3] [4]. This content-based instruction is centered on textbooks and adheres to a conventional curriculum that is overloaded with content, placing more emphasis on content than context. In this curriculum and teaching approach, students passively listen to the teacher instead of actively constructing knowledge themselves [5]. As a result, students often view chemistry (or science in general) as irrelevant, abstract, and challenging [6] [7], leading to disengagement, lack of motivation, and low academic performance in secondary school chemistry/science education [8] [9].

The context-based learning approach is an instructional method that starts with a context and leads to the concept, giving equal emphasis to both, as mentioned by [10, p. 47] "context and content are the two sides of a chemical coin". Context-based approach emphasizes learning within real-life contexts over isolated facts [6] [11]. This approach involves students engaging with relevant and applicable chemistry/science content, making learning more meaningful by connecting it to real-world situations [12] [13]. This study thus investigates the impact of a context-based learning approach on secondary school students' achievement, motivation, and engagement in chemistry

education. Context-based learning integrates chemical concepts with real-world applications to enhance learning outcomes and foster deeper understanding.

METHODOLOGY

The study utilized a mixed-methods approach, combining quantitative analysis of academic achievement scores, and student motivation and engagement questionnaires, with qualitative exploration of students' views about the teaching approach via semi-structured interviews. Two groups of tenth-grade students were used as experimental and control groups to evaluate effects of the intervention. The data were analysed using both descriptive and inferential statistics. The study conducted using the concept of chemistry, focusing particularly on oxides, acids, bases, and salts. The context-based learning approach utilizes the 7E learning cycle (Engage, Explore, Explain, Elaborate, Extend, Exchange, and Evaluate) as an instructional strategy. Hands-on experiments were conducted using a laboratory kit made by local carpenters in the area, containing readily available materials in the community. The internal and external design, including the color of the kit, was provided by the researcher to the carpenters, making it resemble a scientifically crafted kit (Figure 1).

Figure 1. External and internal views of locally-made laboratory Kit equipped with locally available materials

STUDY RESULTS AND CONCLUSIONS

The findings demonstrate that students who are exposed to the context-based learning approach achieve the highest scores, exhibited the highest level of engagement, and demonstrate the greatest motivation when learning the concepts of oxides, acids, bases, and salts, as delineated in the subsequent paragraphs.

Achievement: Results indicate a significant improvement in academic achievement among students exposed to the context-based learning approach, implemented through the 7E instructional strategy, compared to the conventional teaching approach. Statistical analysis revealed a notable increase in test scores and comprehension levels. These findings suggest that incorporating everyday life contexts and other active teaching methods such as in-class and take-home hands-on activities, small

group discussions, Q&A, student presentations, and computer simulations into the curriculum can lead to better learning outcomes for students. The 7E learning model appears to be an effective instructional strategy for promoting deeper understanding of concepts. The qualitative findings corroborate this result.

Motivation: The intervention positively influenced students' motivation towards learning chemistry. Findings suggest that the interactive nature of context-based learning fostered intrinsic motivation, extrinsic motivation, self-determination, self-efficacy, personal relevance, and career motivation by connecting theoretical concepts with real-world applications. Students expressed heightened interest and curiosity, attributing it to the engaging nature of the approach. The findings highlight the importance of incorporating interactive context-based learning strategies in the teaching of chemistry to promote level of motivation. The qualitative results support this outcome.

Engagement: Enhanced engagement was observed among students participating in the context-based learning. The study result shows that a context-based learning approach enhances students' emotional, cognitive, and behavioural engagement in the study of chemistry. Students reported greater enjoyment and willingness to learn abstract concepts, contributing to a more immersive learning environment. These findings suggest that incorporating daily life scenarios into the curriculum can significantly impact students' overall learning experience and engagement in

chemistry. By connecting theoretical concepts to practical applications, students are able to see the relevance and importance of what they are learning, leading to increased interest and participation in their learning [13]. Context-based learning has then the potential to transform conventional teaching methods and create a more dynamic and engaging learning experience for students.

In conclusion, this study underscores the efficacy of a context-based learning approach, through the 7E instructional strategy, in improving secondary school students' achievement, motivation, and engagement in chemistry education. By incorporating real-world contexts relevant to students' lives, in-class and take-home hands-on activities, collaborative learning, Q&A, student presentations, and computer simulations, teachers can enhance students' understanding and appreciation of chemistry concepts. Moving forward, it is crucial for schools and educational institutions to prioritize the implementation of context-based learning strategies to empower students and cultivate a lifelong passion for chemistry in particular and science in general. Thus, by leveraging innovative teaching methods, policymakers and educators can foster a more enriching and impactful learning experience, ultimately preparing students for success in science and STEM disciplines and beyond.

POLICY RECOMMENDATIONS / TAKEAWAYS

- **Curriculum Design:** Policy initiatives should prioritize the implementation of context-based learning approach across chemistry/science curricula utilizing locally made laboratory kits in secondary schools. By aligning education with real-world contexts, students can develop practical skills and a deeper understanding of scientific concepts. This approach can then improve students' ability to solve real-life problems by applying these concepts.
- **Teacher Training:** Professional development initiatives should focus on equipping educators with the necessary pedagogical skills to implement context-based learning effectively. Training programs should prioritize active learning methods, such as integrating technology, fostering collaborative learning, and incorporating both in-class and take-home hands-on activities to facilitate the real-world application of theoretical concepts.
- **Resource Allocation:** Adequate resources should be allocated to support the implementation of context-based learning in secondary schools. Investments in educational material and technology infrastructure can facilitate the successful adoption of context-based learning approach.

EXECUTIVE SUMMARY

- The foundation of chemistry education hinges on nurturing a profound comprehension of fundamental principles within the framework of students' daily lives [6]. This necessitates not only the ability to articulate knowledge but also the capacity to apply it in new situations. A pivotal aspect of advancing the learning journey in chemistry is aligning course materials with students' interests and experiences, establishing tangible connections between chemical concepts and real-life situations. Consequently, it becomes essential to develop context-rich chemistry courses and curricular materials to foster an enabling learning environment.
- Central to implementing a context-based learning approach is the utilization of specific instructional strategies, such as the 7E learning model, which encompasses essential components akin to spare parts, active teaching methods. Furthermore, the effectiveness of the context-based approach depends on the meticulous selection of appropriate contexts—those closely intertwined with students' everyday lives—guided by overarching principles [1] [6] [11]. Embracing this embracing approach allows educators to create enriched chemistry learning experience that empowers students to understand and apply chemical concepts effectively. This helps in nurturing a generation of skilled problem solvers, who are motivated, engaged, and achieving better results, ready to tackle real-world challenges.

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IMPORTANT LINKS

1. https://www.academia.edu/117316500/The_effect_of_simulation_integrated_context_based_instructional_strategy_on_grade_10_students_achievement_in_chemistry
2. https://www.academia.edu/117316123/Enhancing_secondary_school_students_engagement_in_chemistry_through_7E_context_based_instructional_strategy_supported_with_simulation
3. https://www.academia.edu/117315610/CONTEXT_BASED_APPROACH_IN_CHEMISTRY_EDUCATION_A_SYSTEMATIC_REVIEW