CONTEXTUALIZATION APPROACH TO TEACHING AS AN INNOVATIVE TOOL FOR REPOSITIONING SCIENCE AND MATHEMATICS EDUCATION IN SECONDARY SCHOOLS: TEACHERS' PERSPECTIVE

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Abstract

Contextualization is one of the innovative approaches engaged in teaching mathematics. This is a pedagogical practice in face-to-face classes which goes beyond problem solving aimed at relating the students' context to science and mathematical contents taught in school. This study therefore covered the concept and application of contextualization approach by science and mathematics teachers. The extent to which contextualization approach of teaching can go in boosting understanding of science and mathematical concepts, thereby helping to reposition their education in the technological society was as well explored. More so, challenges encountered by teachers in using the approach and ways of remediation of these challenges were as well proffered. Suggestions on the way forward on the usage of contextualization approach in the teaching of science and mathematics were made. Amongst which include that teachers need to be professionally developed so as to be skilled enough to make a paradigm shift of teaching pedagogies so that their students can get motivated and involved in teaching-learning process.

Keywords: Contextualization Approach, Repositioning, Science, Mathematics Education, Application.

In a traditional science and mathematics classes, teaching involves teacher-centered approach dominated by lecturing, abstract concepts, theoretical lessons and chalks and talk technique. However, these traditional approaches in teaching seem not effective in the modern times. Traditional teaching strategies in science and mathematics often perpetuate the gap between learning and not learning by failing to stimulate interest and engage students in purposeful activities. They often fail to challenge the culture of science and mathematics instruction that exist in our schools today. While educators and researchers (Moltz, 2010; Ahmad, Muhamad, Naji, Avi. 2017; Miller, 2018; Mbelede, 2019) are aware of the shortfall in learning, changes in curricula and teaching practices have been slow in coming. However, these traditional approaches and other proposals are confined to school-structured situations or simulated apprenticeships, rather than actual situations that relate directly to the student (Stephanie & Kathleen, 2010). The traditional teaching strategy of using a lecture-type approach may perhaps be favored by those students who are in favor of the didactic methods of learning and who are considered conscientious (Ahmad et al 2017). Furthermore, the intellectual practice of teaching science and mathematics in the abstract tends to limit the learning of most students, learners seem more confused, unmotivated, uninterested and disengaged (Tilson, Castek & Goss, 2010). These attitudes make it more challenging and tedious for the teacher who then seek for new teaching

pedagogies that will catch students' interest and attention to enhance learning. Even Moltz, (2010) opined that in the traditional approaches, teachers often give few examples and ask students to answer what is on the board. And students in such classes often listen to teachers having their lectures, but hardly ever ask questions for some clarifications. Miller, (2018) also lamented that crucial failing of education worldwide has been their lack of relevance to the lives of learners.

These saddened conditions have led to a renewed interest in effective methods for teaching science and mathematics and in the conditions in mathematics education that leads to higher levels of learning. Besides being relevant to educational researchers, information on effective science and mathematics teaching methods are also of great interest to teacher education. Teachers often do not know which ways of teaching are most effective for success of their students. Nonetheless, it is eminent that contextualization was one of the promising new delivery system with the potential to address some of the challenges of traditional development education models.

More information is needed on practical ways to improve teaching and to secure effective learning time (Ahmed et al, 2017). Educators believed that science and mathematics will be learned by more students and hence reposition their place in our present society if

- taught with other subjects in a real-world context,
- practical learning apprenticeships are developed, and
- educators articulate and challenge their own beliefs and values about science and mathematics, learning and teaching. Teaching science and mathematics concepts in real-life contexts give some low- and average-achieving students a double boost. In the findings of Mbelede, (2019), it was indicated that students exposed to real life objects and situations understand mathematical concepts better than their counterparts taught with the traditional methods. Hence, teaching of mathematics problems with emphasis on real-life situations aids in the development of mathematics problems that are authentic and related to real-world applications that are connected to students' future careers (Valenzuela, 2018). More so, contextualization approach to teaching goes beyond problem solving, rather it

- helps students to think mathematically about the world,
- provides students with the opportunity to enter the culture of mathematical practice and
- makes students actively engaged in "doing" science and mathematics.

Scholars suggest that science and mathematics teaching should focus on concepts and contextualization instead of instructing isolated (Ahmed et al, 2017; Joey, 2017; Mbelede, 2019) and abstract facts. They opined that

- learning is a student-centered process, students' autonomy should be fostered;
- learning should be contextualized and associated with authentic real-world environments and examples; social interaction and discourse form an important part of learning;
- the taught elements should be made relevant to the learner; the taught elements should be linked with the learners' previous knowledge;
- it is important to facilitate continuous formative assessment mechanisms, self-esteem and motivation;
- teachers should act as orchestra synchronizers rather than speech givers;
- and teachers should consider multiple representations of their teachings.

What Is Contextualization Approach

Contextualization, involves teaching lesson in the real life context. This increases significantly the learning and understanding of science and mathematical concepts, motivates the learners to know, understand, and appreciate cultural heritage (Center for Occupational Research and Development, 2012; Bringas, 2014).

On the other hand, is another way of addressing the content of activities undertaken in the science and mathematics classrooms (Tilson et al, 2010). Teaching students through concrete things before moving to abstraction leads them gradually from actual objects through symbols. This technique had shown to be particularly effective with students who have difficulties in science and Mathematics. Researchers found that grounding science and mathematics problems in real-life contexts gives some low- and average-achieving students a double boost: They perform better on tests and then can apply what they learned to new projects. (Joseph, Alvin, Ma. Lourdes, Florabel, Chona, 2019).

Connecting science and mathematical concepts through the use of objects create better retention and integration of concepts in physical world (Joseph, et al 2019). Contextualized Teaching and Learning implies "diverse family of instructional strategies designed to more seamlessly link the learning of foundational skills and academic or occupational content by focusing teaching and learning squarely on concrete applications in a specific context that is of interest to the student. Hence, it is a process built on the recognition that some students learn more effectively when they are taught in a hands-on, real-world context rather than in an abstract manner (Stephanie & Kathleen, 2010). The primary purpose of contextualization approach to learning is to utilize the context supported by traditional academics to drive instruction, thus engaging students in active learning to assist them in making meaning (Badway in Perin 2011; Flores, 2010). Bond (2004) identified the characteristics of contextualized learning, as opposed to traditional learning approaches:

- Focuses on concrete skills and knowledge needed in work and life
- Combines academic learning with workplace applications
- Personalizes instruction for each student
- Presents abstract ideas through the senses
- Indicates utility or usefulness of information
- Provides factual information during hands-on experiences so that it immediately makes sense
- Presents information in small increments instead of large chunks or thick books

Contextualized teaching and learning builds upon a similar concept of putting academic activities into perspective to achieve the best teaching and learning outcomes. Researchers and academics Berns, and Erickson, (2001) published a paper that defines contextualized learning as a practice that endeavors to link theoretical constructs that are taught during learning, to practical, real-world context. The underlying theme behind the use of contextual learning activities is simple. It recognizes that by embedding instructions in contexts that learners are familiar with, learners more readily understand and assimilate those instructions (Nikos, 2017).

Why Contextualization Approach?

For any teaching and learning approach to be adopted as an acceptable pedagogy, it must demonstrate that its core principles are in keeping with the broader body of pedagogical findings, help

in repositioning and sorting out the pedagogical challenges. Hence contextualized learning approach is characterized by the following principles.

- Flexible and adaptable: Contextualized curricula can be adjusted to the class and individual student needs. Contextualization in the words of Miller, (2018) implies the process of presenting lesson in meaningful and relevant context based on previous experiences and real-life situations. It helps teachers and students comprehend concepts by relating and presenting lesson on the context of prevailing local environment, culture and resources. This in other words makes lesson flexible, creative, relevant and meaningful. This undoubtedly is a way of localizing instruction to make it adaptive to students' level of understanding and promote achievement of instructional needs/goals. Helps learners to remember the problems better and can better transfer the skills they gained to real practical situations.
- Behavior Modification: Helps to develop in Low-achieving students in science and mathematics the skill of often becoming persistent in trying for longer time, which leads in turn to behaviour modification.
- Can enhance engagement and motivation by providing relevancy to workforce skills: This is the basic principle of contextualization. Helps to improve students' class performance by strengthening their skills and capacities, increasing their engagement and motivation to succeed, and building self confidence in their own abilities.
- Helps students relate their situations on their lesson. It makes the lesson meaningful and relevant to the students' lives by relating the students' context to mathematical content taught in school.

Contextualization approach in the words of Nikos, (2017) has also been proven to be grounded in:

1. Pedagogical theory: Contextual learning activities are aligned with the mainstream pedagogical body of knowledge, including Motivation Theories, Social Learning Theories, Problem-centered Learning and modern psychological and physiological research around how human brains learn.
2. Real world application: Rather than teach for the abstract or theoretical world, using contextual learning strategies helps companies prepare their employees to take on real-world challenges that their staff faces in the workplace.
3. Specificity: Because the contextual learning approach to teaching relies on "context", students can offer content built to deal with specific context in mind.
4) Speed: By focusing on the "big picture first", this teaching approach, trains learners much quicker than the traditional "crawl…toddle…walk…run" approach.

Challenges of Contextualization Approach

Although contextualized learning has strong advocates and a growing foundation of theoretical and practical applications, teachers may encounter challenges during implementation. Some possible challenges include:

- Finding ways to apply abstract material to concrete experiences.

- Working with national curricula that emphasize high-stakes testing, leaving little time for active learning applications in the classroom. The Teacher therefore experienced time consuming for the preparation of materials if they are to contextualize the lesson because not all materials are available within the community immediately. They need to find suitable materials to their lessons
- Helping students adjust to a type of instruction that differs from traditional instruction to which they are accustomed.
- Adjusting to the high energy levels required for managing a louder and more active classroom.
- Difficulties obtaining additional funding for hands-on classes
- Developing on a continual basis creative and effective teaching and learning strategies and
- Teachers can get disenchanted because of confusion over problem-solving and how to teach it. Thereby withhold introduction of more complex and interesting content,
- Another challenge for teachers, is to find problem-solving activities that are set in the real world, are important to the learner and are manageable in the school context.

Indicators of Contextualization

According to Center for Research on Education, Diversity & Excellence (CREDE) (2020), there is several activities of the teacher that are indicators of contextualization approach. The teacher:

- begins activities with what students already know from home, community, and school.
- designs instructional activities that are meaningful to students in terms of local community norms and knowledge.
- acquires knowledge of local norms and knowledge by talking to students, parents or family members, community members, and by reading pertinent documents.
- assists students to connect and apply their learning to home and community.
- plans jointly with students to design community-based learning activities
- provides opportunities for parents or families to participate in classroom instructional activities.
- varies activities to include students' preferences, from collective and cooperative to individual and competitive.
- varies styles of conversation and participation to include students' cultural preferences, such as co-narration, call-and-response, and choral, among others.

Conclusion

In conclusion, in the bid to reposition science and mathematics education in Nigeria, there is dare need to explore the innovative pedagogies. Hence this paper discussed the contextualization approach to teaching science and mathematics in secondary schools. Its challenges and prospects was also discussed. The researcher as well reviewed the characteristic features of contextualization that made the approach outstanding in the understanding of science and mathematical concepts.

Suggestions and Way Forward

Based on the enumerated challenges of contextualization approach to teaching science and mathematics, there are several ways they could be minimized which in the other way round help in repositioning science and mathematics education in our secondary schools. .

- Teacher education should challenge teachers to develop a kind of meta-contextual knowledge in order to learn to be explicit about the content they intend to teach. Teachers should be aware of what contexts he/she is actually communicating. In that sense, it will not only be a matter of a teacher possessing a repertoire of forms of representations, techniques and examples.
- For a contextualized approach to learning to be effective, it's not sufficient to just impart the knowledge or skills required to achieve a learning objective. The teacher needs to design activities that also teach the procedures, processes and discipline on how and when to apply those skills and that knowledge in a given context. Thus, there is need to challenge teachers to **design** contextualized learning activities in a way that learners are able to adapt and transfer them to newer contexts, as opposed to relating them to just one specific context.
- Teachers should be adaptive and creative in using contextualization in teaching. Such principle should be considered during curriculum reforms to make the secondary school curriculum conform, reflect and be flexible to the needs of learners, especially the 21st century learners who need to be holistically and skillfully developed to attest the global technological demands. More so, the standards of quality and relevance of content should be considered by teachers all the times and should not be compromised just for the sake of contextualized learning.
- During assessment, teachers **should evaluate learners based on authentic assessments**, instead of measuring their command of remembering or blindly performing specific activities.
- There is need for professional development. Teachers need training in order to learn how to teach effectively. This will help to improve and maintain the quality of instruction and student outcomes in mathematics. Professional development can help teachers to clarify the learning outcomes afforded by an integrated curriculum, reach greater understanding of how to develop contextualized learning content and teach in a contextualized manner (Stephanie & Kathleen, 2010).

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