EDUCATIONAL ROBOTS FOR ENHANCED LEARNING EXPERIENCES: ASSESSING ITS PROMOTION OF ACTIVE ENGAGEMENT AND PROBLEM SOLVING AMONG SECONDARY SCHOOL STUDENTS IN AKWA IBOM STATE.

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ABSTRACT

The study was carried out to examine the effect of educational robots on enhanced learning experiences with emphasis on promotion of active engagement and problem solving among secondary school students in Akwa Ibom State. Correlational design was adopted to carry out the study. The study was conducted in Akwa Ibom State. The population of the study comprised of all secondary school students in Akwa Ibom State. Simple random sampling technique was used to select a total of 180 respondents used for the study. The instrument used for data collection was a structured questionnaire tagged "Educational Robots and Enhanced Learning Experience Questionnaire (ERELEQ). Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.89, and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical techniques such descriptive analysis to answer research questions. The findings of the research revealed that the extent of secondary school students' utilization of educational robots for active educational engagement in Akwa Ibom State is high and that Ozobot educational robots was mostly used in schools in Akwa Ibom State. The study concluded that educational robots offer significant advancements, enriching learning by bridging theory with practice. One of the recommendations was that schools should emphasize project-based learning approaches that allow students to apply their knowledge and skills in real-world scenarios through collaborative robotics projects.

KEYWORDS: EDUCATION, ROBOT, LEARNING AND EXPERIENCES

INTRODUCTION

In recent years, educational robots have emerged as a powerful tool in the realm of education, offering unique opportunities to enhance students' learning experiences. These robots, equipped with advanced technology and interactive features, are designed to engage students actively, promote problem-solving skills, and foster a deeper understanding of various subjects. As technology continues to evolve, so too does the role of educational robots in classrooms around the world.

Educational robots, also known as pedagogical robotics, serve as a bridge between theoretical concepts and practical applications, providing students with hands-on experience in fields such as computer programming, science, technology, engineering, and mathematics (STEM). They come in various forms and sizes, from small programmable robots like Ozobot and BeeBot to larger humanoid robots and modular robotic blocks like Cubelets. These robots offer educators versatile tools to enhance their teaching methodologies and create dynamic learning environments.

The integration of educational robots into the curriculum has been shown to positively impact student engagement, motivation, and academic achievement (Gordon, 2024; Alla, 2021). By encouraging active participation and collaborative learning, these robots stimulate students' curiosity and creativity while also honing their problem-solving abilities (Alexander, 2023). Moreover, educational robots provide personalized learning experiences tailored to individual students' needs and learning styles (Lee and Wong, 2018).

Despite their numerous benefits, the widespread adoption of educational robots faces several challenges, including cost barriers, the need for teacher training and support, technical complexities, and concerns regarding equity and accessibility (Chen et al., 2020). Addressing these challenges is essential to ensure that all students have equal opportunities to benefit from the transformative potential of educational robots. This work, explores the role of educational robots in enhancing learning experiences, with a focus on their promotion of active engagement and problem-solving skills among students.

STATEMENT OF PROBLEM

The use of educational robots in secondary schools has gained increasing attention as a means to enhance learning experiences and promote active engagement and problem solving among students. However, the extent to which educational robots are effectively utilized and their impact on student learning outcomes in Akwa Ibom State, Nigeria, is not well understood. The problem this study seeks to address is the lack of empirical evidence on the effectiveness of educational robots in enhancing active engagement and problem-solving skills among secondary school students in Akwa Ibom State, and to also examine the extent and types of educational robots utilized by student is for active educational engagement.

OBJECTIVES

- To find out the extent to of secondary school students' utilization of educational robots for active educational engagement in Akwa Ibom State
- To examine the types of educational robots used in schools in Akwa Ibom State.

RESEARCH QUESTION

- What is the extent of secondary school students' utilization of educational robots for active educational engagement in Akwa Ibom State?
- What are the types of educational robots used in schools in Akwa Ibom State?

CONCEPT OF EDUCATIONAL ROBOT

Educational robots are becoming a more and more common tool for educators and learners as technology develops. These robots are intended to improve student engagement and interaction while also giving teachers additional tools to improve their instructional strategies. A robot that teaches robot design, analysis, application, and operation is called an educational robot. According to Gordon (2024), educational robotics is a rapidly developing field in which robots interact with children through emotion-perceiving technology and human-like face features while teaching them subjects.

A collaborative learning environment built around the usage of robots is known as an educational robot. Pedagogical robotics is another name for educational robots. The main goal is to expose kids to computer programming and robots at a very young age. It teaches how to develop, use, analyse, and run a robot in its entirety. Educational robots give young children all the skills they need to design, construct, programme, and, in the end, create a robot that can carry out a variety of tasks (Botzees, 2022).

According to Alla (2021), the field of study known as educational robotics seeks to enhance students' educational experiences by developing and utilising robot-related activities, technology, and artefacts. A physical robot built especially for the above activities may be used in these activities. Students at all skill levels can benefit from such activities, which can be designed to involve robot design, programming, application, and experimentation.

According to Alexander (2023), educational robots have the potential to completely transform the educational environment by giving kids the tools they need to succeed in the future and prepare them for life. Robots for education make learning more effective. As tools for active learning, they can encourage student cooperation, problem-solving, and active engagement. Educational robots can serve as tutors or co-learners, enabling kids to teach the robot new material or clarify ideas to strengthen their own comprehension.

Robots created especially for use in educational environments are known as educational robots, and they enhance the dynamic and engaging nature of learning. These robots come in a variety of shapes and sizes, ranging from tiny programmable robots that students can programme on their own to larger robots intended for greater social interactions with kids. It is an educational tool that helps pupils advance their technological and scientific knowledge (Smowl, 2023).

According to Fredys (2023), educational robotics is a field of study that uses technology and robots to help people learn and acquire new skills. With the help of educational robots, children can learn a variety of STEM (science, technology, engineering, and math) subjects. These subjects are becoming more and more vital in a world where technology is developing quickly.

CONCEPT OF LEARNING EXPERIENCE

Personalised and dynamic, the learning process is impacted by technology, pedagogy, and content. Students gain knowledge, abilities, and attitudes through a variety of activities, interactions, and situations that make up their learning experience. The term "learning experience" describes the pedagogical strategies teachers employ to deliver course material. It entails utilising instructional strategies to hold students' attention and provide the material in a comprehensive and meaningful way. Creating activities that are specifically tailored to each learner's needs requires an awareness of their individual needs.

According to Susanne (2020), a learning experience is essentially any programme, course, engagement, or other activity that fosters learning. It can occur in conventional educational environments, especially in formal education, when pupils are physically taught and guided by educators, trainers, and instructors. It is important in developing the student's abilities, concepts, and viewpoints and aids in their complete self-understanding.

"The contextual or co-created conditions within which trainees experience the learning environment, including physical or virtual surroundings, instructors, course design, and the institution's emotional and cognitive cultures," is how James (2024) described learning experience. Stated differently, a learning experience encompasses any programme, course, interaction—whether conventional or modern—or any encounter where learning takes place. In essence, the learning experience emphasises the goal of learning instead than the means or location of delivery.

"A holistic experience that is purposefully designed and carefully crafted to help the learner achieve a meaningful learning outcome that is mostly predefined," is how Niels (2023) defined a learning experience. A learning experience is an individual journey that includes every action, thought, and emotion that a person has from the start of the encounter to the finish and even beyond. Combining the cognitive components of learning with the subjective, affective, physical, and contextual facets of human experience results in a holistic experience.

According to Dave (2024), a learning experience is any event that a student participates in and gains knowledge from. They can occur outside of schools as well as within, and they can be purposeful or inadvertent. There are four types of learning experiences: direct, indirect, structured, and vicarious. They may be gained by reading, watching, taking part in an activity, or listening to a lecture. In order to accommodate students' preferred learning styles, it is linked to both academic goals and real-world contexts. According to Sammy (2024), a learner's engagement with external conditions in their surroundings allows them to respond to those conditions. It is also known as the actions that students take in educational settings in order to gain knowledge. Activities that students participate in to influence behaviour in desirable directions are referred to as learning experiences.

Learning experiences involve doing or attempting things in order to obtain knowledge and insights. Inquiries, theories, experiments, problem-solving techniques, taking ownership of one's actions and beliefs, creative expression, and conclusion-making are all part of the learning process. Decisions made after gaining knowledge can be based on an individual's actions and situational adaptations (Indeed, 2022).

CONCEPT OF ACTIVE ENGAGEMENT IN SCHOOL

Students' academic progress in school is measured in part by their active engagement in the classroom. Students' participation is encouraged, and it has a significant positive impact on their academic achievement. Additionally, one of the things that can stop pupils from acting out in their studies is active participation in the classroom. All that students do to actively participate in or interact with their learning and materials is referred to as active engagement in the classroom. It is also the process of involving all students in activities that encourage them to develop a deeper understanding of content by working with and reflecting upon the material being presented.

"The degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education," according to Larry (2022), is how active engagement in the classroom is defined. It could also be used to describe strategies that adults, such as teachers, administrators, and other school personnel, use to involve students more completely in the governance and decision-making processes, with an emphasis on involvement in extracurricular, social, and academic activities. According to Manisah (2018), kids' active engagement in the classroom is a measure of how engaged they are with their kind and the context of their attachment. Studies on student engagement usually concentrate on quantifiable elements including behaviour, homework, attendance, disciplinary actions taken against them, involvement in classrooms, zeal for learning, and the calibre of their finished assignments.

According to Jennifer (2023), the idea that students maintain their focus or interest in academics both inside and outside of the classroom is represented by their active involvement in the classroom. Active participation in the classroom helps students stay interested in a subject or task even when it is difficult and will probably improve their performance. The majority of kids engage in both academic and extracurricular activities at school, which helps them feel like they belong. They also form friendships, get along well with teachers and other students, and respect and identify with the goals of their education.

"An instructional method that engages students in the learning process" is what Cheryl (2022) termed as "active engagement in the classroom." To focus and consider what they are doing, students must engage in meaningful learning activities. Students who actively participate in the educational process at school are more likely to look for possibilities for independent study. When there is a high level of active participation at school, students learn better. Similar to this, Kelly (2021) clarified that a student's level of learning and contact with others, including teachers and other students, is measured by their active involvement in the classroom, which is a crucial indicator of long-term student success. Students that are actively involved can organise study groups, take part in extracurricular activities, and attend events. It helps them make significant progress in their academic performance.

CONCEPT OF PROBLEM SOLVING IN SCHOOL

Problem solving is the process of finding a satisfactory solution for a particular problem or circumstance, ideally existing somewhere in the grey area between the two. Solving problems can be simple if you know how to approach it well. In the end, one of the most crucial abilities for children to have in schools everywhere is the ability to solve problems. Teachers use this broader category of critical thinking abilities to educate their pupils how to work through problems and come up with satisfying answers.

According to Miranda (2022), students' ability to solve problems is one of their most valuable learning outcomes since it is a fundamental component of every subject they study. Students have the power to alter the course of history and make a lasting impression on the world around them if they can apply their problem-solving abilities to the problems they observe in their communities or even worldwide. Students get more accustomed to the kind of critical and analytical thinking that will translate into other areas of their academic careers the more they solve problems.

Solving problems is an effective way to teach pupils how to think. By participating in this exercise, students are exposed to several ways of thinking that they can use to address problems in the real world. Students learn how to solve everyday challenges as they grow throughout their lives through problem solving. It fosters pupils' creativity, especially when they apply it to problem solving and they may find it helpful to learn how to think outside the box and come up with fresh answers (2023).

Students get the chance to collaborate with their classmates, engage in social interactions, exchange fresh perspectives, exercise critical thinking, and organise their imaginative thoughts in order to solve problems in the classroom. Before choosing the best course of action to solve the issue, the pupils must have a thorough understanding of it. Solving problems might be challenging and even tiresome, but it teaches kids persistence and patience (Sinaga, 2023).

Maheshwari (2017) asserts that problem solving is and ought to be a significant component of the curriculum. It assumes that pupils are capable of shouldering some of the accountability for their own education and are able to act independently to resolve issues. It helps students think at higher levels by giving them opportunity to apply their freshly learned material in practical situations.

TYPES OF EDUCATIONAL ROBOTS IN SCHOOLS

The ozobot, Edison robot, mBot, beebot, cubelets, cubetto, dash robot, humanoid robots, root, sphero, and thymio are just a few of the educational robots that may be found in classrooms.

- **Ozobot:**

Ozobot is a tiny, programmable robot with sensors that allow it to react to colour codes and follow lines (Ozobot, 2023). It is the perfect tool for teaching kids of all ages computational thinking and coding because of its interactive features and small size. Ozobot carries out commands using an easy-to-understand color-based language. Students can programme Ozobot to do different actions by drawing lines and patterns with different coloured markers. This is an engaging and creative way for them to learn basic programming ideas. Teachers can easily include Ozobot into a variety of courses, such as science, technology, and mathematics. For example, students can develop experiments where Ozobot travels around a simulated environment to illustrate scientific concepts, or they can create coded paths to represent mathematical equations.

- **Edison Robot:**

With its sensors and motors, Edison is a little robot that may be used at different educational levels. Its purpose is to present programming principles to pupils in an approachable and practical way (Edison Robot, 2023). The curriculum's many subjects can be enhanced by the Edison Robot. Instructors can include it into science classrooms to provide hands-on examples of engineering and physics ideas, or they can use it in math classes to help students understand concepts through practical applications.

- **Makeblock (mBot):**

Popular educational robot mBot is used in classrooms to teach robotics, coding, and STEM disciplines. It is intended to help students afford and have access to education. Makeblock's robot kits are easy for students to assemble and teach them the fundamentals of robotics and programming since they include electronic and building components, learning materials, and rich learning resources. Block-based programming is supported by MBot, which makes it easy for students to switch to text-based programming languages like Python. The robot is a great teaching tool for robotics and programming in schools because of its user-friendly design and clear instructions. It is appropriate for kids in grades K–12. mBot uses tough exercises and game-based learning to increase student motivation and engagement in the classroom. Makeblock provides a comprehensive education solution, comprising software and educational materials, to enable educators and motivate students in STEM education.

- **BeeBot:**

BeeBot is an educational robot made to teach young kids vocabulary, programming, counting, sequencing, directionality, estimate, and problem-solving skills in an easy-to-understand manner. It's a programmable bee robot that can be easily set to move forward, backward, left, right, and stop by pushing the buttons on its back. To continue, BeeBot employs a 6-inch grid structure. It may be used to teach any lesson using either pre-made BeeBot grids or custom-made grids. For kids as young as five years old, BeeBot is a great resource for teaching 21st-century skills like coding, problem solving, and directionality. In order to make learning more interesting and enjoyable, BeeBot is equipped with a variety of cross-curricular mats, activity tins, and entertaining accessories. BeeBot is made to be user-friendly. For teaching programming, directionality, and control in educational settings, BeeBot is the perfect educational robot.

- **Cubelets:**

Cubelets are magnetically assembled modular robotic blocks. They are becoming a common teaching tool, drawing in pupils from preschool through high school. They are an accessible platform for introducing robotics and nurturing a variety of valuable skills because of their straightforward design and easy operation (Modular Robotics, 2024). With the help of Cubelets, kids may explore and play with concepts without having to worry about complicated programming (Why Cubelets, 2023). Students explore fundamental STEM ideas like cause-and-effect, sequencing, and problem solving as they construct robots that move, light up, and interact with their surroundings (Modular Robotics, 2024).

- **Dash Robot:**

The amiable Wonder Workshop robot, Dash, has made a name for himself in classrooms by winning over young students' hearts and brains. Dash draws in pupils and makes learning enjoyable with its expressive lights, sounds, and motions (Wonder Workshop, 2024). Students are motivated and even hard subjects become more approachable with this entertaining approach. Math, science, language arts, and social studies are just a few of the topics where Dash can be used (Wonder Workshop, 2024). This enables students to apply their learning in larger contexts and make connections between many subject areas.

- **Humanoid Robots:**

Due to its interactive characteristics and human-like appearance, humanoid robots have the potential to pique students' interest and grab their attention (Alcorn, 2019). Increased desire and participation may result from this interaction, especially in STEM-related courses (Keane et al., 2022). According to Chang (2010), this robot has the ability to be trained to adjust to the unique learning styles and paces of each user, offering tailored guidance and feedback. This guarantees that kids are not bored or left behind while meeting a variety of needs.

- **Root:**

With Root, the entertaining coding robot from iRobot, robotics and computational thinking can be learned practically in the classroom. Root can be used in math, science, language arts, social studies, and other topics even though it is mostly focused on coding (Modular Robotics, 2024). This integration links several subject areas and enables students to understand the practical uses of coding.

- **Sphero:**

The ball-shaped robots from Sphero have become classroom mainstays, enthralling pupils from primary school through high school with their whimsical design and adaptable educational possibilities. By moving, lighting up, and reacting to human orders, Sphero's robots create an interactive learning environment that piques interest and encourages participation (Sphero, 2024). Students find complex ideas like physics and coding more approachable and tangible when taught through this hands-on method. Science, math, art, language arts, and even history can all benefit from the application of sphero robots, which incorporate coding and robotics concepts (Sphero, 2024). Students are better able to apply their understanding in a variety of scenarios and recognise the connections between various subject areas thanks to this cross-curricular approach.

- **Thymio:**

The small and adaptable mobile robot Thymio has become a classroom favourite, sparking children' interest in coding and robotics at an early age. Thymio puts accessibility first by designing its hardware and software with open-source principles (Thymio, 2024). Because robotics is so affordable, more schools are able to include it in their curricula, promoting inclusion and giving a larger spectrum of kid's access to opportunities. Thymio is not limited to proficient programmers. With "codeless" options for novices and a variety of well-known programming languages, like Python and Scratch, for more experienced users, it accommodates a wide range of ability levels (Kubii, 2024). Students may grow at their own speed and continually push themselves thanks to this adaptability.

EFFECT OF EDUCATIONAL ROBOTS ON ENHANCED LEARNING EXPERIENCE BY STUDENT

Educational robots have become cutting-edge instruments in the field of education, providing special chances to improve students' educational experiences. According to Ahmad (2013), educational robots are a helpful tool for teaching computer programming, science, technology, math, and hands-on experience in a variety of areas, such as mechanical, electrical, and computer engineering. Including instructional robotics in the curriculum aids in information acquisition and the development of students' problem-solving abilities, especially in the areas of coding and computational thinking. According to Zhumaniyaz (2023), educational robots can improve student learning by encouraging creativity and innovation and offering practical experiences in STEM (science, technology, engineering, and math) education.

According to similar findings, educational robots have a good impact on students' creativity in STEM education and can raise learning motivation, according to research by

Shih-kai and Hung-Chung (2023). A notable benefit of integrating instructional robots into the classroom setting is the increased degree of student involvement. Research indicates that students' attention is captured and a more dynamic learning environment is created through interactive and hands-on encounters with robots (Jones, 2019). Students actively participate in their education through interactive exercises and programming games, which boosts their motivation and piques their interest in the material.

Enhancing problem-solving abilities, critical thinking, and teamwork are some of the benefits of programming robots, debugging, and working together on robotics projects (Smith and Johnson, 2020). These abilities have wider applications in other academic fields and real-world situations in addition to being beneficial in the robotics setting. Because of their versatility, educational robots may provide individualised learning experiences that are catered to the needs of each learner. According to Lee and Wong (2018), robots can be designed to present challenges that are tailored to each student's skill level, making learning more individualised and flexible. With this individualised approach, different learning styles and rates of advancement are addressed, allowing every student to advance at their own pace.

Numerous research have looked into how instructional robots affect students' academic achievement. The usage of educational robots has been found to positively correlate with academic achievement, especially in STEM (science, technology, engineering, and mathematics) fields (Brown & Howard, 2021). Working with robots is hands-on and gives practical application in addition to reinforcing theoretical principles, which enhances comprehension of the subject matter.

EFFECT OF EDUCATIONAL ROBOTS ON ACTIVE ENGAGEMENT BY STUDENT

Students' interest and enthusiasm are piqued by robots, which turns learning from a passive process into an active investigation (Alimisis and Dimitracopoulos, 2018; Benitti, 2012). They captivate pupils and inspire them to participate because of their innate novelty and lightheartedness. Educating robots primarily encourage students to participate actively by piqueing their interest and motivation. Students are drawn to robots because of their novelty and interactive quality, which can be used to generate a first curiosity that leads to further participation (Anderson and Brossard, 2018). Students are inspired to explore, experiment, and actively participate in educational activities by the dynamic and hands-on encounters with robots that foster a pleasant learning environment. Beyond the confines of conventional teaching methods, educational robots facilitate interactive learning experiences. Students actively participate in the learning process through programming exercises, team projects, and problem-solving challenges (Serholt et al., 2016). Engagement levels rise as a result of this interaction, which fosters a deeper comprehension of subjects and empowers students to take charge of their education. With their adaptability to different learning styles, educational robots may provide students experiences that are specifically designed for them. A personalised learning strategy is made possible by the capacity to programme robots based on each person's preferences and skill levels (Kazakoff, 2013). By ensuring that every student is suitably challenged, this personalisation promotes a sense of achievement and ongoing involvement with the instructional activities at hand. Many educational robot activities are collaborative, which encourages students to communicate and work as a team. Through peer contact, collaborative problem-solving and project-based learning with robots encourage active involvement (Khusainov, 2020). Students are learning from one another as well as from the robots, fostering a social and dynamic learning environment that raises student engagement and fosters a feeling of community. A variety of abilities, such as computational thinking, problem-solving, and critical thinking, are enhanced by educational robots. Working with robots provides an experiential learning environment that applies theoretical information to real-world settings, making learning more relatable and realistic (Bocconi, 2018). Students are more likely to remain actively involved in the learning process when they experience the immediate results of their programming and robot interaction efforts.

Academic achievement has been connected to the active participation that educational robots promote. Studies indicate that children who actively participate in their robotics education attain greater academic success, especially in STEM fields (Somanath, 2019). The abilities gained by actively interacting with instructional robots lay the groundwork for future professional preparedness and academic achievement.

EFFECT OF EDCUCATIONAL ROBOT ON PROBLEM SOLVING CAPABILITY BY STUDENTS

Emerging technologies are being embraced by the educational sector, and educational robots are one of the most potent instruments available. They have the capacity to improve students' problem-solving skills while also increasing student engagement. Learning from mistakes and experimenting are encouraged by educational robots (Alimisis and Dimitracopoulos, 2018). Students create, code, and test their robots, seeing both good and bad results firsthand. Through this iterative process, individuals develop a "problem-solving mindset," where they discover how to adjust, troubleshoot, and come up with answers by making mistakes. Open-ended tasks with various viable answers are a common feature of robot activities (Dermirbas and Arsalan, 2017). This inspires kids to use their imaginations, weigh different options, and come up with original plans of action to accomplish the goal. Its unrestricted style encourages autonomous problem-solving and critical thinking. According to Kotsomitopoulos (2019), robots offer a concrete depiction of abstract programming principles. The robot's activities allow students to witness the direct results of their programming, which helps them visualise issues, spot mistakes, and efficiently debug their solutions. This visualisation helps with the development of logical reasoning abilities and the understanding of difficult situations. Cooperation and communication are essential when designing, programming, and controlling robots (Alimisis and Dimitracopoulos, 2018). As they collaborate to overcome obstacles, share ideas, and defend their positions, students develop critical problem-solving abilities in a group setting. Peer learning and support are facilitated via collaborative robot activities (Dermirbas and Arsalan, 2017). Students can share tactics, learn from one other's methods, and assist each other in debugging their programmes. This cooperative learning setting encourages information sharing and strengthens problem-solving abilities.

According to Chen et al. (2020), educational robots can be customised to meet each student's needs and learning style. This makes it possible to provide students with differentiated learning experiences, which guarantees that they will be adequately challenged and able to solve problems at their own pace. It is possible to programme robots to give pupils focused assistance and direction while they work through challenges (Dermirbas and Arsalan, 2017). With the aid of this scaffolding, children can take on challenging tasks, hone their own methods for addressing problems, and gain self-assurance. Real-world issues and applications can be addressed by robotic activities (Kotsomitopoulos, 2019). Students are inspired to apply their knowledge to tackle significant problems by this context, which helps them recognise the value of their problem-solving abilities.

FACTORS THAT INHIBITS ACQUISITION OF EDUCATIONAL ROBOTS

There are a number of obstacles standing in the way of educational robots' widespread acceptance in classrooms, despite their enormous potential to transform education. These obstacles consist of:

- **Cost:**

The cost of an educational robot might range from several hundred to several thousand dollars per unit (Alimisis and Dimitracopoulos, 2018). This major financial barrier makes it difficult for many schools with tight budgets to provide all children with the tools they need to participate meaningfully in society.

- **Teacher Training and Support:**

For integration to be effective, teachers must have a solid grasp of coding, robotics, and the pedagogical strategies for utilising these technologies (Kotsomitopoulos, 2019). But a lot of teachers don't have this crucial assistance and training, which makes them hesitant or unable to utilise the robots' full potential (Lauria et al., 2019).

- **Technical Challenges:**

Robotics setup, upkeep, and troubleshooting frequently require technical know-how (Kotsomitopoulos, 2019). For schools without these kinds of resources, this can be intimidating, which could cause dissatisfaction and discourage frequent robot use.

- **Equity and Accessibility:**

Students from poor families may be disproportionately affected by financial constraints and unequal access to technology (Chen et al., 2020). This presents moral questions and calls for measures to guarantee inclusivity and close the accessibility divide.

- **Limited Assessment Tools:**

Well-designed examinations that go beyond measuring technical skills are necessary to evaluate how robots affect student learning (Dermirbas and Arsalan, 2017). Creating and executing these kinds of evaluations can be difficult.

- **Space and Storage:**

Older schools with inadequate infrastructure may find it difficult to secure and maintain a fleet of robots without a specific place (Kotsomitopoulos, 2019).

- **Safety and Security:**

It is crucial to guarantee student safety when utilising robots, particularly for younger kids (Lauria et al., 2019). Careful attention is also required due to worries about data privacy and other security threats related to linked robots.

- **Sustainability and Long-term Support:**

Long-term sustainability necessitates planning for continuing upkeep, upgrades, and potential repairs in addition to the initial purchasing expenditures (Alimisis and

Dimitracopoulos, 2018). Schools must carefully consider the financial investment they will make in the long run.

METHODOLOGY

Correlational design was used in carrying out the study. The study was conducted in Akwa Ibom State. The population of the study comprises of all secondary school students in Akwa Ibom State. Simple random sampling technique was used to select a total of 180 respondents used for the study. The instrument used for data collection was a structured questionnaire tagged "Educational Robots and Enhanced Learning Experience Questionnaire (ERELEQ). Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.89, and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical techniques such descriptive analysis to answer research questions.

RESULT AND DISCUSSION

Research Questions 1: The research question sought to find out the extent of secondary school students utilization of educational robots for active educational engagement in Akwa Ibom State. To answer the research question percentage analysis was performed on the data, (see table 1).

Table 1: Percentage analysis of the extent of secondary school student utilization of educational robots for active educational engagement in Akwa Ibom State.

EXTENTS	FREQUENCY	PERCENTAGE
VERY HIGH EXTENT	76	42.22
HIGH EXTENT	81	45**
VERY LOW EXTENT	23	12.78*
TOTAL	**180**	**100%**

**** The highest percentage frequency**
*** The least percentage frequency**

SOURCE: Field survey

The above table 1 presents the percentage analysis of the extent of secondary school student utilization of educational robots for active educational engagement in Akwa Ibom State. From the result of the data analysis, it was observed that the highest percentage (45%) of the respondents affirmed that the extent of secondary school student utilization of educational robots for active educational engagement in Akwa Ibom State is high, while the least percentage (12.78%) of the respondents stated that the extent of secondary school student utilization of educational robots for active educational engagement in Akwa Ibom State is low. This findings correlates with that of Zhumaniyaz (2023) who mentioned that educational robots can improve student learning by encouraging creativity and innovation and offering practical experiences in STEM (science, technology, engineering, and math) education.

Research Questions 2: The research question sought to ascertain the type of educational robots used in schools in Akwa Ibom State. To answer the research question, percentage analysis was performed on the data, (see table 2).

Table 2: Percentage analysis of the type of educational robots used in schools in Akwa Ibom State.

TYPES	FREQUENCY	PERCENTAGE (%)
Ozobot	25	13.89**
Edison Robot	16	8.89
Makeblock (mBot)	23	12.78
BeeBot	23	12.78
Cubelets	22	12.22
Dash Robot	22	12.22
Humanoid Robots	19	10.56
Root	8	4.44*
Sphero	9	5
Thymio	13	7.22
TOTAL	180	100%

** The highest percentage frequency
* The least percentage frequency

SOURCE: Field Survey

The above table 2 presents the percentage analysis of the type of educational robots used in schools in Akwa Ibom State. From the result of the data analysis, it was observed that the type tagged “Ozobot” 25(13.89%) was rated as the highest type of educational robots used in schools in Akwa Ibom State while “Root” 8(4.44%) was rated the least type of educational robots used in schools in the State. This findings correlates with the opinion of Alexander (2023), who stated that educational robots have the potential to completely transform the educational environment by giving kids the tools they need to succeed in the future and prepare them for life.

CONCLUSION

Educational robots offer significant advancements, enriching learning by bridging theory with practice. They foster STEM skills, active engagement, and collaboration, benefiting student achievement. Challenges like cost and training must be addressed to ensure equitable access to these transformative tools in education.

RECOMMENDATIONS

- Schools should emphasize project-based learning approaches that allow students to apply their knowledge and skills in real-world scenarios through collaborative robotics projects.
- Educators should be encouraged to integrate educational robots into interdisciplinary curriculum frameworks that span multiple subject areas, such as science, mathematics, language arts, and social studies.
- Researchers should be encouraged to conduct longitudinal studies and rigorous evaluations to provide evidence-based insights into the effectiveness of educational robotics interventions.

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