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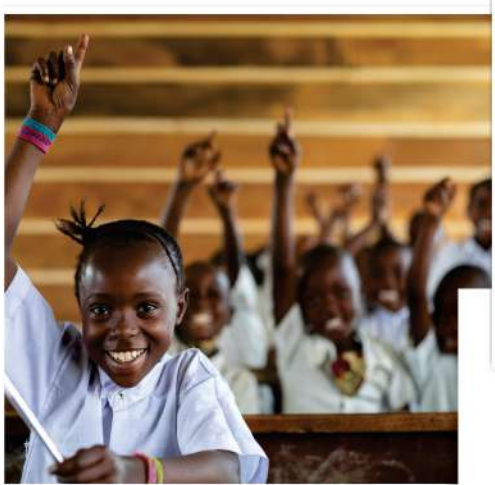
INNOVATIVE STRATEGIES FOR TEACHING VOCATIONAL, SCIENCE, TECHNOLOGY AND MATHEMATICS EDUCATION: CLASSROOM PRACTICES



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PREFACE

The electronic book (e-book) acknowledges that traditional methods in Vocational, Science, Technology and Mathematics Education: Classroom Practices may not be sufficient to equip students with the necessary skills for a rapidly evolving technological landscape.

Therefore, it advocates for the adoption of Innovative teaching approaches that promote a more dynamic and effective learning experience.

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FOREWORD

This book entitled "**Innovative Strategies for Teaching Vocational, Science, Technology and Mathematics Education: Classroom Practices",** is a book of readings on various innovative classroom pedagogies. It is a welcome literature for Education System and a very important resource book for teachers who are functioning in the disciplines of Vocational Education, Science, Mathematics and Technology education and training. It is a compendium of most of the **active learning strategies** aimed at producing graduates who have been prepared for adaptation to the conditions of the 21st century world of fluidity. The 21st century world accommodates soft skills which the individual can edit from time to time as the conditions of socio-cultural, economic and technological environments change constantly and uncontrollably. A century in which cross-border job openings are important means of employment, a century where attitude is more important than subject-based excellence, a century where collaboration, innovation and creativity are irreducible demands by employers of labour, a century where adaptive skills are critical for entrepreneurship, creation of jobs and wealth.

All categories of teachers at all levels of education would find this resource book interesting and professionally helpful for their teaching practice. Because conditions of the modern world are in perpetual flux, teachers have to re-skill in order to produce adaptive graduates and the era of lecture method is literally over. It is these modern innovative instructional strategies that would enable teachers to produce such graduates who would survive and then succeed in the 21st century global economy.

This book would also be very useful to researchers and innovators in the envisioned pedagogic paradigm shift of this era. I therefore, proudly recommend this book, a compendium on innovative pedagogies to all classes of teachers and researchers on pedagogies and curriculum reforms in the modern era.

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DEDICATION

This book is dedicated to educators in the world

CHAPTER 22

CLASSROOM-BASED INNOVATIVE TEACHING STRATEGIES IN AGRICULTURAL EDUCATION

Anyachor Charles N.

Abstract
Agricultural Education is central to national development but faces significant challenges such as traditional teaching methods, practical training and insufficient integration of modern teaching methodologies. This article/paper sought to highlight the effectiveness of classroom-based innovative teaching strategies in enhancing students' engagement and critical thinking in agricultural education. Such classroom-based innovative teaching strategies include problem-based learning, flipped classrooms, integration of digital tools like e-learning platforms, blended learning and collaborative learning etc. The advantages of classroom-based innovative teaching strategies include enhanced students engagement and participation, improved critical thinking and problem-solving skills while the challenges in adopting the approach include limited access to technology, inadequate infrastructure and outdated curricula. It is recommended that utilization of digital tools, incorporation of precision Agricultural techniques enhancement of infrastructure and resources allocation as well as adoption of students-central method should be employed.
Keywords: Classroom-based innovative teaching strategies.

Introduction

Agricultural education is undergoing dynamic transformation to meet the evolving needs of a rapidly changing world. Traditional teaching methods, while foundational, are no longer sufficient to equip learners with the critical skills, adaptability and innovation required in modern Agriculture. As such, there is a growing emphasis on integrating classroom-based innovative teaching and learning strategies that foster experiential learning, critical thinking, problem-solving and technological literacy. Classroom-based innovative strategies in the teaching of agricultural education encompass a wide range of approaches including the use of digital technologies, project-based learning, inquiry-based instruction, blended learning and competency-based education. These strategies aim to create learner-centered environment that encourages active participation, collaboration and real-world application of knowledge. By incorporating tools such as simulation software, virtual reality, online platforms and mobile learning apps, educators can make agricultural concepts more accessible, engaging and relevant. As agriculture becomes increasingly global and technologically driven, embracing classroom-based innovative teaching and learning strategies is essential to preparing the next generation of agricultural professionals who are creative, resilient and responsive to the challenges and opportunities of the 21st century.

Statement of the Problem

Agricultural Education faces significant challenges that hinder its effectiveness in producing graduates equipped with the necessary skills to address the nation's agricultural needs. Traditional teacher-centered instructional methods, dominate leading to passive learning environments that fail to engage students actively. This approach has been linked to poor academic performance, low students interest and lack of critical thinking and problem-solving skills among graduates.

Moreover, the existing curricula are often outdated and not aligned with current agricultural practices or technological advancements. This misalignment results in a gap between the education provided and the skills required in the agricultural sector. The lack of integration of classroom-based innovative teaching strategies such as problem-based learning, flipped classrooms and the use of digital tools further exacerbate this.

These limitations impede the implementation of effective teaching strategies and acquisition of the relevant skills by students. Therefore, there is an urgent need to explore and implement classroom-

based innovative teaching strategies that can enhance students' engagement, improve learning outcomes and better prepare graduates for the challenges of the 21st century in the agricultural sector.

Purpose of the Study

The primary purpose of this paper is to highlight the effectiveness of classroom-based innovative teaching strategies in enhancing the learning outcomes of agricultural education students. The paper also sought to identify and highlight some challenges and prefer solutions for effective adoption of classroom-based innovative teaching strategies in agricultural education.

Concept of Innovation

Continuing, UNESCO added that innovation refers to any persistent change in the patterns of behaviour of members of an identifiable social system. It is novel departure from a customary practice that can be sustained for some time which is situational and relevant to a group in time and place and when widely adopted, it becomes a reform. Innovation refers to a new technique, method or approach deliberately designed and developed to improve effectiveness and efficiency in a given setting. It is a change in thought process of doing things or a successful application of discoveries and inventions. Innovation is equally the introduction of new ideas or ways of doing something that has been discovered or introduced. It could be new ways of teaching, production, construction, etc. It must be an improvement to existing one and must be in positive direction which would be necessitated by the need for improvement.

From the foregoing, innovation therefore is an idea that is new to a situation and can take the form of process, programs, products, the means or ends. Innovative approach or strategy may be entirely a new package, or an old approach with new ideas holistically integrated to improve effectiveness and efficiency. Innovative practices are therefore those actions or practices engaged by man through which new inventions are introduced into the society. Innovative practices can be seen in the areas of health, communication, agriculture, industry, governance and education etc.

Innovation in Education

Innovation in Education is a creative, new educational policy, a new creative way to renew education, a creative solution, a creation of a new educational culture, a new opening and a new idea to overcome some problems in education. Adoption in Education means to take-up or accept an innovation and make use of it in the educational sector. The adoption of innovations in education offers the educational institutions the opportunity of making changes or improvement in the educational sector. This is because it is when innovations are widely adopted that reforms or policies that have always been desired in the educational sector will be achieved. Therefore, any move in education to accommodate new knowledge, remove obsolete ones and adopt multidisciplinary orientation is likely an innovation in education. It is believed that innovative practices in science education can help to enhance students´ academic achievement in the science subjects. Therefore, it is pertinent that new things should be introduced into science education for more efficient and effective academic achievement of students.

Concept of Agricultural Education

Agricultural education is a type of vocational training involving the equipping of the learners with knowledge and skills involved in productive agriculture. Agricultural education is the systematic and organized teaching, instruction and training (theoretical as well as hands-on, real world field work based) available to students, farmers or individuals interested in the science, business and technology of agriculture (animal and plant production) as well as the management of land environment and natural resources. It involves the training of both the head and hands of the learners (Olusoga, 2014). According to Amadi and Lazarus (2017), the teaching of agricultural education in tertiary institutions is aimed at producing citizens with skills, competencies and reasoned judgement to successfully live and add meaningfully to the economic growth of Nigeria. It is part of the curriculum of many primary and secondary schools along with the tertiary institutions such as colleges, universities, vocational and technical schools.

Vocational agriculture is an aspect of vocational education which emphasized skills, knowledge and attitude required in all areas of agriculture for proficiency in agricultural production. One of the principles of vocational agriculture is learning by doing. Teaching of agriculture in secondary schools aims at ensuring that the learner is exposed to and taught the basic principles that are important to agricultural production in the country and exposing and involving learners in various practical and projects that will help them develop the necessary skills and abilities required in agricultural production (Olajide et al, 2015).

The main purpose of agricultural education encompasses building a skilled agricultural workforce through training and preparation of future farmers and agricultural professionals, promotion of sustainable and responsible agricultural practices, enhancement of food security, development of cutting-edge agricultural technologists, innovators and leaders, improvement of awareness and understanding of agriculture to bridge the gap between the source of food and the broader community of consumers, contribution to rural economic development and growth and strengthening the connection between urban and rural agricultural communities.

Innovative Teaching Strategies in Agricultural Education

Innovative teaching strategies are instructional approaches that involve the use of technology, hands-on activities and other materials to help students learn in a meaningful way. These strategies focus on encouraging students to take active roles in their learning. Instead of relying solely on lectures and textbooks, these strategies provide students with opportunity to explore various topics through experimentation, discussion, critical thinking and collaboration. Innovative teaching strategies are beneficial because they create a more engaging learning environment. By providing various ways for students to interact with the materials, these strategies can help them gain a deeper understanding of the subject matter. When students have the opportunity to explore, think critically and collaborate, they can develop their problem-solving and decision-making skills.

The Current Teaching Methods/Practices in Agricultural Education

1. Lecture method
2. Discussion method
3. Farm practice method

iv. Project method
v. Demonstration method
vi. Exhibition method
vii. Discovery method
viii. Field trips
ix. Questions and answer method, etc.

Different Types of Classroom-Based Innovative Teaching Strategies in Agricultural Education

1. **The Scavenger Hunt:** Field trip assignments no longer require students to leave the classroom. A technical scavenger hunt can be designed and displayed in the classroom to allow students to apply critical thinking to identify the location of materials and to provide an explanation and analysis of the discovery process. Technical scavenger hunts may require students to search solely online or to use technology to locate physical resources.
2. **Jing:** This is a web-based tool which can be used to best illustrate a course concept in an online classroom. It allows users/students to record key strokes and visual learners to benefit by watching the teacher/instructor complete the specific tasks. A jing video can capture the audio and visual recordings of meetings in which the instructor/teacher may provide instructions, and for the students to follow in the classroom.
3. **Group Work:** In the online classroom, teachers can create an individual research assignment and ask students to share and discuss findings with a small team.

4. **Personalized Learning:** Personalized learning customizes what, when and how each student is taught. Rather than using a single approach or plan to teach the entire class, teachers adjust to the capabilities of each student to help them succeed. Under personalized learning we have:
    a. **Blended Learning:** This teaching strategy gives the students more responsibility over their own learning with the teacher functioning as a general guide and overseer over a more discovery-based learning environment. Students are allowed to choose how and at what pace they move through the content.
    b. **Adaptive Learning:** Adaptive Learning technology collects data from students' responses to specific questions on a computer. Then the software uses the information to provide immediate feedback or adaptation for the student and notifies the teacher so that they can change the lesson plan accordingly.
5. **Project-Based Learning:** This creates exercises that require students to identify a real world problem and then devise a solution. Project-based learning is built on the development of specific, transferable skills such as research, critical thinking, problem-solving and co-operation. It is an active form of learning in which students gain expertise via implementation of their knowledge rather than remote memorization. Team work digital tools and using problem-solving skills to find solution to the challenge at hand are key components of problem-based learning.
6. **Flipping the classroom:** In this strategy, standard lectures are set aside in favour of class time spent on research, application and assessment to better connect learners and their needs. Outside of class, students study topics by reading, watching short pre-recorded video lectures or researching tasks. Class time is used to assist students in working through the content in groups or individually during active learning, emphasizing complex reasoning and problem-solving skills.
7. **Jigsaws:** Any educator understands that being able to teach a concept to others successfully demonstrates true mastery. Jigsaws a tried-and-true co-operative learning technique that capitalizes on this idea by having students teach others. Students are split into groups and each group is given distinct information that they must learn well enough to teach another group. As they teach others, students become experts in what they have learned.
8. **Simulations**: Simulated teaching refers to the use of virtual, controlled environments where you can practice teaching methods and classroom management. You can do this without interacting with real students. It provides a safe space for experimentation, allowing you to test new strategies, manage classroom disruptions and work on specific skills. e.g question techniques, time management and lesson delivery. The core aim of simulated teaching is to replicate the classroom experience as closely as possible.
9. **Peer Teaching**: Allowing students to teach their classmates reinforces their understanding while building confidence.
10. **Use of Educational Apps**: Integration of technology such on Apps designed for learning can optimize each student´s experience catering for their unique needs. Research by Lai and Hwang (2016) revealed that students using educational apps improved math fluency by 25% over a semester.

Implementation Strategies for Classroom-Based Innovative Teaching Practices

1. **Teacher Training:** For teachers to successfully implement classroom innovative teaching techniques, professional department is vital. Continued training helps educators stay current with teaching practices and overcome challenges like resistance to change and limited resources (Darling-Hammond et al, 2017).
2. **Curriculum Design:** Curricula needs need to be flexible enough to adapt to various teaching methods and students' needs. Support for teachers in modifying their curricula to incorporate innovative techniques can lead to a more enriched learning environment.
3. **Assessment Methods:** Using diverse assessment methods such as portfolios, presentations and peer evaluations offer a more holistic view of students learning. This approach provides deeper insight into students´ progress and areas for improvement beyond traditional testing methods.

Benefits of Classroom-Based Innovative Teaching Strategies

Innovative classroom teaching strategies can have a number of benefits for both teachers and students.

1. **Creation of an Engaging Environment:** This encourages active learning experience for students.
2. **Critical Thinking:** It fosters critical thinking skills and creativity which can lead to improved problem-solving and decision-making abilities in the long run.
3. **Students Retention:** It helps to improve students' retention and when actively involved in their process, they are more likely to remember and apply the lessons learnt.
4. **Good Relationship:** It helps to build better relationship between teachers and students by creating an effective environment that encourages exploration and collaboration.
5. **Revolutionizes Teaching:** The use of classroom-based innovative teaching strategies has the potentials to revolutionize the way we teach our students. By encouraging active participation, fostering critical thinking skills and improving students' retention and engagement. These strategies have the potential to equip the next generation with the tools they need for success in today's world.

Conclusion

Innovative teaching strategies are essential for enhancing classroom engagement of students in agricultural education. By enhancing technology, promoting collaboration and providing hands-on learning experiences, teachers or educators could create an environment that excites students and support their academic success. Educators are encouraged to remain open, adaptable, seeking out new method and strategies that meet the varying needs of their students.

Recommendations

The study recommends the following;

1. Utilization of Digital tools and Agricultural Apps: Incorporate mobile application and digital platforms to provide students with real-time data interactive learning and access to current agricultural tends which enhance their engagement and prepare them for the technological advancements in the agricultural sector.
2. Incorporate precision agricultural techniques by introducing students to technologies such as drones and gaps systems used in precision farming.
3. Adopting students-centered method such as problem-based learning, flipped classroom approach, develop virtual learning environment and strengthen infrastructure and resources availability.

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