

Revitalizing Technical And Vocational Education For Sustainable Development: Leveraging Innovative Technologies To Address Local Challenges

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Abstract:

This paper explores the potential of innovative technologies to revitalize technical and vocational education (TVE) and promote sustainable development. Despite its importance, TVE faces numerous challenges, including outdated curricula, limited access to resources, and a lack of industry partnerships. This paper examines the role of innovative technologies — such as online and blended learning platforms, virtual and augmented reality training tools, and mobile learning applications — in addressing these challenges. The paper highlights the potential of innovative technologies to improve the access, relevance and effectiveness of TVE programmes. The paper concludes by identifying the use of blended learning, virtual and augmented reality training tools and artificial intelligence by policymakers, educators and industry managers as a means of leveraging innovative technologies, promoting sustainable development and addressing local challenges through TVE.

Keywords: Technical and Vocational Education, Sustainable Development, Innovative Technologies.

1. Introduction

Technical and vocational education (TVE) plays a crucial role in promoting sustainable development by providing individuals with the skills and knowledge needed to address local challenges and contribute to the economy [1]. However, TVE faces numerous challenges, including outdated curricula, limited access to resources, and a lack of industry partnerships [2]. The World Bank [3] estimates that by 2030 there will be a global shortage of 40 million workers with the skills

and knowledge needed to fill the jobs of the future. This shortage highlights the need for TVE programmes to be revitalized and reoriented to meet the needs of the 21st century.

Innovative technologies — such as online and blended learning platforms, virtual and augmented reality training tools, and mobile learning applications — have the potential to address the challenges facing TVE [4]. These technologies can increase access to education, enhance relevance and foster industry partnerships [5]. For example, online and blended learning platforms can provide students with flexible and personalized learning experiences, while virtual and augmented reality training tools can provide students with hands-on training and practical experience [6]. This paper explores the potential of innovative technologies to revitalize TVE and promote sustainable development, highlighting their potential to improve the access, relevance and effectiveness of TVE programmes.

2. Methods

This paper adopts a conceptual and documentary approach. It is based on a review and synthesis of relevant literature — including policy documents, international organization reports, textbooks and scholarly journal articles — on technical and vocational education, sustainable development and innovative educational technologies. The reviewed sources were analysed thematically and qualitatively to conceptualize technical and vocational education, identify the principal challenges confronting it, and examine how innovative technologies can be leveraged to revitalize TVE and address local challenges for sustainable development.

3. Results

3.1. The Concept of Vocational and Technical Education

The National Policy on Education (NPE) regards vocational and technical education as an integral part of general education in Nigeria [7]. It defines technical and vocational education as a comprehensive term referring to those aspects of the educational process involving the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. In light of this, vocational and technical education is the preparation of individuals to acquire practical skills as well as basic scientific knowledge; it provides skilled manpower for the world of work, thereby increasing the workforce in the country, with individuals possessing specialized skills as offshoots of efficient vocational and technical education, trained and equipped with workable practical skills, knowledge, aptitude and competencies required in specific occupations.

Okorie and Ezeji [8] highlighted that the theory of vocational and technical education is based on the acquisition of requisite skills, which is a means of increasing the productive power of a nation. Gill [9] emphasized that the wealth or poverty of any nation depends on the quality of its higher education. This buttresses the fact that those with productive skills and a tendency for learning can achieve all that they set out to achieve and gain fulfilment in all their endeavours. According to Okolocha and Ile [10], vocational education programmes focus on the acquisition of appropriate skills, abilities and competencies as necessary equipment for the individual to live in and adapt to the real work situation and contribute to the development of society. Vocational and technical education assists all young people to secure their own future by enhancing their transition to opportunities after school. It can be seen as an aspect of education which utilizes scientific knowledge in the acquisition of practical and applied skills in the solution of technical problems; it is the process of acquiring attitudes, knowledge and competencies relating to occupations in various factors of economic and social life [11].

Vocational and technical education has also been described by Udoeye [12] as the education that prepares students mainly for occupations requiring manipulative skills, designed to develop the skills, abilities, understanding, attitude and work habits needed on a useful and productive basis. It therefore means that vocational and technical education is the type of education that requires the inculcation of practical skills into recipients so that they will be able to practise, in real-life situations, the experiences they acquired; this can provide employment for its recipients. Fafunwa

[13] described technical and vocational education as an important practical skill-development programme designed to equip persons of trainable qualities with skills that employers of labour want in the industries; it is considered the launching pad for technological development, yet it had a very slow take-off in the history of education in Nigeria. To a great extent, the image of this type of education has greatly affected its popularity. Beal [14] observed that, for too long, vocational and technical education has been for someone else's child, and was therefore relegated to the bottom of the national education priority list; the programme was stereotyped and seen as designed for the less privileged in society. Vocational education is thus an area of study designed for the development of skills, attitudes and appreciation needed by workers to enter into and progress successfully in a chosen vocation.

Olaitan [15] and Eya [16] stated that it is a preparation for occupational endeavours in agricultural education and business education. This means that vocational education is a training that equips learners with the knowledge and skills in the productive, distributive and service industries for self or paid employment. Vocational and technical education can also be regarded as the education that enables one to acquire knowledge and skills in the vocational and technical areas to systematically solve human or societal problems [17].

This type of education trains and prepares its recipients for the world of work, laying great emphasis on skill acquisition and development to meet the human resources required in the world of work. Vocational and technical education refers to that “integral part of general education” [7, p. 30], including the Junior Secondary School, the Senior Secondary School, and technical education obtained in polytechnics, monotechnics, colleges of education (technical) and in the universities. Osuala [18] viewed this type of education as a training intended to prepare the student to earn a living in an occupation in which success is dependent largely on technical information and on the understanding of the laws of science and technology as applied to modern design, production, distribution and services. From the foregoing, vocational education can be described as an aspect of education concerned with the preparation of skilled manpower; it is the form of education and training directed towards developing students to become productive, employable or self-employed. It is therefore the bedrock upon which a country's socio-economic, technological and cultural advancement must be built [19]. Vocational education also enhances opportunities for all types of learning and has the function of providing the qualified manpower demanded by a changing society, enabling the individual to use complex technology.

To achieve the objectives of vocational and technical education, there is a need to create an enabling environment for its teaching and learning in schools in order to ensure a good-quality teaching and learning environment. This is crucial to helping students attain high academic standards; improved quality in teaching and examination has become very necessary, because graduates who pass through training in this form of education are often unable to perform adequately as they ought to, and as such unemployment and poverty have engulfed most of them. The overall aim of quality teaching and learning is to create opportunities for high-quality learning, which will be evaluated through performance in the long run.

3.2. Objectives of Vocational and Technical Education

This form of education has its own functions, as stated by the National Policy on Education in Nigeria [20], namely to:

1. Provide the technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development.
2. Provide manpower in applied science, technology and commerce, particularly at sub-professional levels.
3. Give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant.
4. Provide people who can apply scientific knowledge to the improvement and solution of environmental problems for the convenience of man.
5. Give an introduction to professional studies in engineering and other technologies.

3.3. Challenges Facing Technical and Vocational Education

Technical and vocational education plays a crucial role in promoting sustainable development by providing individuals with the skills and knowledge needed to address local challenges and contribute to the economy [1]. However, TVE faces numerous challenges, including outdated curricula, limited access to resources, and a lack of industry partnerships [2]. These challenges hinder the growth and development of TVE programmes, resulting in a mismatch between graduates' skills and employers' expectations.

One of the primary challenges facing TVE is outdated curricula. TVE curricula often fail to keep pace with changing industry needs and technological advancements [5]. This can result in graduates who are not adequately prepared for the workforce, leading to a mismatch between their skills and the needs of industry. For example, a study by the International Labour Organization found that many TVE programmes lack relevance to the needs of industry, resulting in graduates who are not adequately prepared for the workforce [2].

Another challenge facing TVE is limited access to resources. TVE programmes often lack the resources needed to provide students with hands-on training and practical experience [4]. This can result in graduates who lack the skills and knowledge needed to succeed in the workforce. For instance, a study by the World Bank found that many TVE programmes lack the resources needed to provide students with hands-on training and practical experience, resulting in graduates who are not adequately prepared for the workforce [3].

Finally, TVE programmes often fail to engage with industry partners, resulting in a mismatch between the skills and knowledge provided by TVE programmes and the needs of industry [6]. For example, a study by the Organization for Economic Cooperation and Development found that many TVE programmes lack partnerships with industry partners, resulting in graduates who are not adequately prepared for the workforce [21].

4. Discussion

4.1. Revitalizing TVE for Sustainable Development through Innovative Technologies

To address the challenges identified above, innovative technologies can be leveraged to revitalize TVE and promote sustainable development. Online and blended learning platforms can increase access to TVE programmes, particularly for individuals in remote or underserved areas [5]. Virtual and augmented reality training tools can provide students with hands-on training and practical experience, preparing them for the workforce [6]. Mobile learning applications can facilitate communication and collaboration between TVE programmes and industry partners [4].

To revitalize TVE for sustainable development, several strategies can be employed. First, TVE programmes can integrate sustainable development principles and practices into their curricula [1]. This can help ensure that graduates are equipped with the skills and knowledge needed to address local challenges and contribute to the economy. Second, TVE programmes can foster partnerships with industry partners to provide students with hands-on training and practical experience [2], helping ensure that graduates are adequately prepared for the workforce. Finally, TVE programmes can leverage innovative technologies, such as online and blended learning platforms, virtual and augmented reality training tools, and mobile learning applications [5].

4.2. Leveraging Innovative Technologies to Address Local Challenges

Innovative technologies have the potential to address local challenges and promote sustainable development. Technical and vocational education plays a crucial role in providing individuals with the skills and knowledge needed to leverage innovative technologies and address local challenges.

Local challenges are issues that affect a specific geographic area or community. These challenges can include economic development, environmental sustainability and social inequality [1]. For example, local economies may struggle with high unemployment rates, low economic growth and limited access to resources [2]. Environmental challenges — such as pollution, climate change and natural resource depletion — can also affect local communities [21].

Some examples of innovative technologies include artificial intelligence, the internet of things, and blockchain [5]. Artificial intelligence can be used to analyze data, predict outcomes and make decisions [6]. The internet of things can be used to connect devices, collect data and monitor systems [4]. Blockchain can be used to create secure, transparent and decentralized systems [21]. To leverage innovative technologies and address local challenges, several strategies can be employed. First, TVE programmes can integrate innovative technologies into their curricula to provide students with the skills and knowledge needed to address local challenges [2]. Second, TVE programmes can foster partnerships with industry partners to provide students with hands-on training and practical experience [5]. Finally, TVE programmes can encourage entrepreneurship and innovation by providing students with the resources and support needed to develop innovative solutions to local challenges [4].

5. Conclusion

Innovative technologies have the potential to revitalize TVE and promote sustainable development by improving the access, relevance and effectiveness of TVE programmes. Policymakers, educators and industry managers can leverage innovative technologies — such as blended learning, virtual and augmented reality training tools, and artificial intelligence — to address local challenges and promote sustainable development through TVE. Revitalizing TVE for sustainable development requires a multifaceted approach that addresses the challenges facing TVE and leverages innovative technologies to improve the access, relevance and effectiveness of TVE programmes. By integrating sustainable development principles, fostering industry partnerships and leveraging innovative technologies, TVE programmes can play a crucial role in promoting sustainable development and addressing local challenges. In this way, individuals can be equipped with the skills and knowledge needed to address local challenges and promote sustainable development.

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