Availability and Utilization of Steam Educational Resources for Economic Diversification in Federal Colleges of Education Special Oyo

Allwell Iye Agada-Adeleye (PhD)[1], Olubiyi Johnson Ezekiel (PhD)[2], Oluwafunmike Oyenike Ezekiel (PhD)[3], Dorcas. O. OYAWOLE (PhD)[4]& Olufunso Caroline Dele-Adisa[5]

[1,2,4]School of Secondary Education (Science Programmes) Federal College of Education Special Oyo

[3,5]School of General Studies Education Federal College of Education Special Oyo

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ABSTRACT

Economic diversification is a critical driver of sustainable national development, particularly in resource-dependent economies such as Nigeria, where over-reliance on crude oil has rendered the economy vulnerable to external shocks. Despite the recognised strategic importance of Science, Technology, Engineering, Arts, and Mathematics (STEAM) education in building the human capital needed for economic transformation, little empirical attention has been given to the state of STEAM resource provision and utilisation in Nigerian Colleges of Education institutions that are pivotal in shaping teacher quality at the foundational level. This study investigated the availability and utilisation of STEAM educational resources at the Federal College of Education (Special), Oyo, and their implications for teacher preparation and economic diversification. A descriptive survey research design was adopted. The target population comprised all 97 lecturers from the Departments of Science Education, Mathematics Education, Technology Education, and Arts Education. Total enumeration (census) was employed, making all 97 lecturers both the population and the sample, thereby eliminating sampling error. Data were collected using a researcher-developed instrument the STEAM Educational Resources Availability and Utilisation Questionnaire (SERAUQ) validated by subject matter experts and found to have a reliability coefficient of 0.82. Data were analysed using descriptive statistics, including means, standard deviations, frequency counts, and percentages. Findings revealed that STEAM resource provision is inadequate and skewed toward traditional science laboratory equipment and library materials, while critical infrastructure such as digital tools, engineering workshops, arts studios, and reliable power supply are significantly lacking. Utilisation rates were correspondingly low, constrained by poor maintenance culture, absence of institutional resource-management policies, and unstable electricity supply rather than any deficiency in lecturer competence. The study concludes that systemic and infrastructural deficiencies, not lecturer incompetence, are the primary barriers to effective STEAM delivery. It is recommended that the institution pursue balanced investment in STEAM infrastructure, establish a coherent resource-management policy, and strengthen power and ICT systems to fulfil its mandate in human capital development and national economic diversification.

Keywords: STEAM Education, Educational Resources, Teacher Preparation, Human Capital Development, Economic Diversification, Nigeria.

INTRODUCTION

The issue of economic diversification is a crucial requirement of sustainable national development, especially in developing economies that rely on a slender range of sources of revenues. Overdependence on crude oil as the main source of government revenues and foreign exchange earnings on the Nigerian setting has subjected the economy to advanced volatility and therefore made it susceptible to external shocks like changes in the world oil prices. Lashitew, Ross, and Werker (2021) indicate that the most common definition of economic diversification is the purposeful expansion of a productive foundation of a country on more than one sphere (agriculture, manufacturing, technology, and creative industries). To realise substantive diversification, however, the population should have the knowledge, skills, and innovative abilities required to make productivity in these diversified areas more efficient (Asongu and Nwachukwu, 2018). As a result, the fundamental nature of education and, more precisely, the level of education resources offered in the system on any of its levels can be seen. The relationship between higher education and economic development which is established is adopted in the extant literature. In a groundbreaking study of the world, relying on data on almost 15,000 universities across 78 countries (1950-2010), Valero and Van Reenen (2019) concluded that an increase in the number of universities within a region by 10 per cent is associated with an increase in future GDP per capita by an average of 0.4 per cent. They also explained that the mediating factor on this relationship is the increased supply of human capital and increased innovation, which are necessary conditions to an effective economic diversification effort. Empirical studies repeatedly show that the association of universities in advanced economies with STEM-related field in the economic growth is stronger, which is why the special importance of the orientation of higher education on science and technology can be attributed to countries on the technical edge (Aghion, Meghir, and Vandenbussche, 2006; Hanushek and Woessmann, 2015; Valero and Van Reenen, 2019). The findings form strong empirical evidence to the argument that the quality and access of STEAM learning materials in the Nigerian tertiary institutions, particularly the Colleges of Education, has a direct bearing on the diversification agenda in the country.

Science, Technology, Engineering, Arts, and Mathematics (STEAM) education can be considered one of the key elements of the diversification agenda as it has become an international phenomenon aimed at providing students with the integrated skills to handle complex and real-life issues (Henriksen, Mehta & Mehta, 2019). Introducing the Arts into the traditional STEM model, STEAM education takes a step further and allows to consider creativity, critical thinking, design-thinking, and interdisciplinary problem-solving that are all invaluable in the economic activity that is driven by innovation. The accessibility and use of STEAM teaching resources such as physical infrastructures, computer tools, laboratory equipment, instructional resources, and professionally trained teachers are the key factors of STEAM instructional quality in educational establishments (Dare, Ellis & Roehrig, 2018). These resources are also supposed to be used in Federal Colleges of Education in Nigeria to train the next generation of teachers that will, in turn, provide STEAM-oriented education at the basic and secondary levels of education in the country and thus establish an influx of STEAM-conscious graduates that can be used to diversify the economy. The adoption of integrated STEAM education in schools has continued to face obstacles due to the lack of resources and insufficient theoretical understanding of the concept in spite of the strategic value attached to it. In a systematic review of integrated STEM instructional practises in secondary schools, Thibaut et al. (2018) found that there is a lack of material resources, which is considered to be one of the biggest obstacles to the successful implementation of STEAM. Their criticism was that, in many instances, integrated STEM education demands massive amounts of materials and resources to help students such as construction tools, electronic components, computers, design software, robotics kits and calculators and that, in order to create a school culture and environment that encourages an integrated approach to teaching and learning STEM, can prove to be a costly and time-intensive endeavour. The discovery is especially view instructive to the situation in Nigeria, where Colleges of Education often face infrastructure shortages, lack of access to laboratories, and lack of access to digital technologies, which are the requirements to any meaningful STEAM teaching (Asongu and Nwachukwu, 2018). In addition to the resources that are available, the efficient use of the resources that are available in STEAM is very important, which is significantly influenced by the capacity and readiness of teachers. In a phenomenological multiple case study involving nine teachers of science on their first occasion in teaching integrated STEM curricular units in the middle-school physical science classrooms, Dare, Ellis, and Roehrig (2018) discovered that the teachers demonstrated significantly varying levels of STEM integration,on a low to high scale, contingent on the ability of teachers to develop explicit and meaningful links among STEM disciplines, their study found out that teachers who lacked proper professional development had difficulties in balancing the content delivery of science with engineering design and mathematical reasoning. Therefore, integrated STEM tended to be simplified into a peripheral process as opposed to a truly interdisciplinary learning. These results highlight the fact that the simple delivery of STEAM resources is not enough, and equal investment in the development of teacher capabilities is required. These findings raise critical questions in the Federal Colleges of Education in Oyo State, as not only are the physical resources of STEAM available, but also the level to which lecturers and instructors have the pedagogical competence to effectively use these resources to support the integrated and real life learning experiences (Olasehinde et al., 2014; Adeyemi, 2008). The three interconnected theoretical approaches provide the best explanation to these empirical observations and are used together to explain the connexion between the accessibility and use of STEAM learning materials and economic diversification. First, there is the Human Capital Theory, which was expressed by Schultz (1961) and further elaborated by Becker (1964) and holds that investments in education and training produce a direct positive effect on productive capabilities of individuals, as a result of which the growth and development of the economy is promoted. In this context, the accessibility to, and successful use of, STEAM educational tools in Colleges of Education can be viewed as a type of human capital investment that prepares potential educators, and, by default, the further generations of students, with the technical and creative skills needed to engage in a diversified economy. The empirical research by Valero and Van Reenen (2019) supports this theoretical assumption as it shows that universities play a significant role in improving the economic development of a given economy due to the provision of skilled human resources. Second, the pedagogical basis of understanding how STEAM resources when appropriately used prove to help in building knowledge and skills through real-life engagement (authentic, real, and actual) is provided by Social Constructivism, which is based on the findings of Vygotsky (1978) and implemented within the framework of the integrated STEM/STEAM education, operationalized in terms of problem-centred learning, inquiry-based learning, design-based learning, and cooperative learning (Thibaut et al., 2018). This position argues that STEAM resources are not only material objects but pedagogical tools the usefulness of which is realised in actionable socially situated learning processes. Collectively, these theoretical models form a consistent conceptual framework within which the possibility of the availability and use of STEAM educational tools in Federal Colleges of Education in Oyo State can contribute to the overall national goal of economic diversification.

Statement of the Problem

The strategic importance of STEAM education to the diversification agenda of the Nigerian economy is well known; however, there is an increasing number of concerns that the Federal College of Education (Special) in Oyo might be short of STEAM resources or be inefficient in leveraging on the available resources. Many teacher-training schools continue to exist with insufficient laboratory facilities, insufficient digital resources, inaccessible learning resources, insufficient workshop support, and untrustworthy electricity access, which has a drastic limiting effect on the delivery of an integrated, practice based STEAM curriculum. The availability of some facilities is hampered by congestion, limited access time, culture of poor maintenance, ineffective institutional support systems, and lack of a pedagogical knowledge base among lecturers who are expected to provide interdisciplinary, design-based and problem-centric learning. This has particularly serious consequences in the case of a special institution that has the responsibility of training teachers to respond to the various needs of the learners because lack of exposure to the practical and innovative STEAM practices at the preparatory level might create a breed of poorly prepared teachers and learners who lack the creative, technical, and entrepreneurial skills needed to operate in the new economic sectors. It is therefore unclear that resources of STEAM that are currently available and used in the Federal College of Education (Special), Oyo, are adequate to nurture a human capital to drive meaningful economic diversification. It is against this background that the current research project is aimed at, evaluating the level of access and proper use of STEAM materials, and assessing their possible impact on the general objective of developing skills, innovation, and productivity to facilitate sustainable economic change..

Aim and objectives

The aims of this study is to examine the availability and utilization of STEAM educational resources in Federal Colleges of Education Special Oyo with a view to determining their implications for effective teacher preparation and economic diversification.

Objectives of the study

Specifically, the study seeks to:

1. assess the level of availability of STEAM educational resources in Federal Colleges of Education Special Oyo;
2. examine the extent to which available STEAM educational resources are utilized for teaching and learning in Special Oyo; and

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3. identify the challenges affecting the effective utilization of STEAM educational resources in Federal Colleges of Education Special Oyo

Scope of the study

This study tends to examine the availability and utilization of STEAM educational resources for economic diversification in Federal Colleges of Education Special Oyo.

METHODOLOGY

This study adopted a descriptive survey research design, which was considered most appropriate for systematically collecting data on the availability and utilization of STEAM educational resources in Federal College of Education (Special), Oyo, describing existing conditions as they naturally occur without any manipulation of variables. The population comprised all 97 lecturers teaching science-related courses under the STEAM framework spanning departments of Science Education, Mathematics Education, Technology Education, and Arts Education and the entire population was used as the sample through the intact sampling technique. This approach was justified on the grounds that all 97 lecturers share the same institutional context and resource environment, the small population size makes total enumeration practically feasible, it eliminates sampling error entirely, and the homogeneous nature of the target group reduces the risk of bias associated with selective sampling procedures. Data were collected using a self-developed structured questionnaire, the STEAM Educational Resources Availability and Utilization Questionnaire (SERAUQ), organised into four sections addressing demographics, resource availability, resource utilization, and challenges to utilization. The evaluation of all substantive items was done based on a four-point Likert scale (Strongly Agree=4 to Strongly Disagree=1). This four-point scale was included instead of a five-point scale to exclude the neutral point, in order to impose definitive judgements on respondents. The instrument was justified by measuring face and content validity by two experts in Science Education and one expert in Measurement and Evaluation. The amendments proposed by these professionals were put in place before the ultimate implementation of the instrument. The reliability was determined using a pilot study consisting of 20 lecturers in a similar institution in a nearby state. The Taro Yamane formula was used to analyze the data, and the reliability coefficient was obtained to be 0.82. The SERAUQ was sent to all the 97 respondents with Google Forms that was distributed via institutional email and WhatsApp**.** Google Forms was adopted because it is cost-effective, eliminates data entry errors by automatically organizing responses into a spreadsheet, reduces social desirability bias by allowing respondents to complete the questionnaire at their convenience, supports validation rules that prevent incomplete submissions, and provides a confidential environment that encourages candid responses. Data were analysed using statistical tools matched to each research objective. For the first objective on the level of availability of STEAM resources, descriptive statistics mean scores, standard deviations, and frequency counts with percentages were used, For the second objective on the extent of utilization, descriptive statistics (mean and standard deviation) were applied For the third objective on challenges affecting utilization, frequency counts, percentages, and mean score rankings were used to produce a prioritized profile of barriers, transforming Likert-scale data into an interpretable hierarchy of challenges for institutional policymakers.

FINDINGS

Table 1: Descriptive Statistics on the Level of Availability of STEAM Educational Resources

S/N	Item	SA f(%)	A f(%)	D f(%)	SD f(%)	Mean	SD
1	The college has adequate science laboratory equipment (e.g., microscopes, beakers, burners) for STEAM instruction.	32(33.0%)	45(46.4%)	15(15.5%)	5(5.2%)	**3.07**	0.83

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S/N	Item	SA f(%)	A f(%)	D f(%)	SD f(%)	Mean	SD
2	Modern digital tools such as computers and projectors are available for use in STEAM-related courses.	10(10.3%)	17(17.5%)	51(52.6%)	19(19.6%)	**2.19**	0.87
3	The college is equipped with functional technology workshops for practical STEAM activities.	12(12.4%)	15(15.5%)	25(25.8%)	45(46.4%)	**1.94**	1.06
4	Sufficient and up-to-date textbooks and instructional materials relevant to STEAM subjects are available in the library.	27(30.0%)	40(44.4%)	13(14.4%)	10(11.1%)	**2.93**	0.95
5	The college has a stable and accessible internet connection to support digital STEAM learning resources.	15(15.5%)	20(20.6%)	35(36.1%)	27(27.8%)	**2.24**	1.03
6	Arts and design studios with the necessary materials and equipment are available for creative STEAM integration.	5(5.2%)	15(15.5%)	45(46.4%)	32(33.0%)	**1.93**	0.83
7	Mathematics resource centresor dedicated learning aids (e.g., mathematical sets, models) are provided for lecturers.	25(25.8%)	20(20.6%)	25(25.8%)	27(27.8%)	**2.44**	1.15
8	Engineering and construction tools necessary for technology and design-based learning activities are available in the college.	5(5.2%)	15(15.5%)	30(30.9%)	47(48.5%)	**1.77**	0.90
9	The college has functional audio-visual resources (e.g., smart boards, projectors, televisions) for STEAM instruction.	19(19.6%)	22(22.7%)	26(26.8%)	30(30.9%)	**2.31**	1.11
10	Adequate and well-maintained power supply (or alternative energy sources) is available to support STEAM resource utilization.	13(13.4%)	24(24.7%)	35(36.1%)	25(25.8%)	**2.26**	0.99
	Grand Mean					**2.31**	

Results have shown that only one piece of equipment was deemed to be available, and that was science laboratory equipment (Item 1, Mean = 3.07) and textbooks/instructional materials in libraries (Item 4, Mean = 2.93). This trend indicates a comparatively strong provision of traditional scientific infrastructure and print provision services in the institution. In comparison, most other STEAM variables were less than the set benchmark (Grand Mean = 2.31), therefore, indicating an omnipresent shortage of resources. The most common shortcomings were in digital tools, technology and arts workshops, engineering and audio-visual equipment, stable internet connection, and electricity. The mean score was minimum in engineering instruments (1.77) in support of the strong lack of real world, design based learning facilities. Together, these results demonstrate a very high level of inequity in STEAM resources allocation, institutional allocation in particular is disproportionally focused on traditional science and library resources as opposed to an integrated, holistic, STEAM system.

Table 2: Descriptive Statistics on the Level of Utilization of STEAM Educational Resources

S/N	Items	SA f(%)	A f(%)	D f(%)	SD f(%)	Mean	SD
11	I regularly use available laboratory equipment to conduct practical demonstrations during STEAM-related lectures.	37(38.1%)	42(43.3%)	10(10.3%)	8(8.2%)	3.11	0.90
12	I integrate digital tools such as computers and projectors into my STEAM lesson delivery on a consistent basis.	17(17.5%)	10(10.3%)	30(30.9%)	40(41.2%)	2.04	1.11
13	I utilize the college's technology workshop facilities to engage students in hands-on, project-based STEAM activities.	12(12.4%)	15(15.5%)	35(36.1%)	35(36.1%)	2.04	1.01
14	I make regular use of library resources and instructional materials to support and enrich STEAM course content.	20(20.6%)	27(27.8%)	27(27.8%)	23(23.7%)	2.45	1.07
15	I access and use online resources and the internet to source current STEAM instructional materials and research.	35(36.1%)	32(33.0%)	20(20.6%)	10(10.3%)	2.95	0.99
16	I incorporate arts and design materials into my teaching to foster creativity and interdisciplinary STEAM connections.	23(23.7%)	30(30.9%)	17(17.5%)	27(27.8%)	2.51	1.14
17	I use mathematical models and manipulatives available in the college to enhance students' conceptual understanding.	37(38.1%)	25(25.8%)	20(20.6%)	15(15.5%)	2.87	1.10
18	I deploy engineering and construction tools in practical sessions to facilitate design-based and problem-solving learning.	10(10.3%)	12(12.4%)	45(46.4%)	30(30.9%)	2.02	0.92
19	I utilize audio-visual resources to present STEAM concepts in	10(10.3%)	15(15.5%)	35(36.1%)	37(38.1%)	1.98	0.98

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S/N	Items	SA f(%)	A f(%)	D f(%)	SD f(%)	Mean	SD
	an engaging and visually stimulating manner.						
20	The frequency of my use of available STEAM resources is sufficient to meaningfully support student learning outcomes.	32(36.8%)	35(40.2%)	15(17.2%)	5(5.7%)	3.08	0.88
Grand Mean						**2.50**	

As shown in the table above, the aggregate level of utilisation was marginal (Grand Mean= 2.50), thus consistent with the set benchmark. The most commonly used resource was the laboratory equipment (Item 11, Mean=3.11) which is also aligned with its availability. Online sources (Item15, Mean=2.95) and mathematical models (Item17, Mean=2.87) were also associated with the acceptable rates of utilisation, which indicates that lecturers are already trying to cover the institutional shortcomings. On the other hand, the use of digital tools, workshops, engineering tools, and audio-visual facilities were not used to its maximum, which is arguably explained by the fact that these materials were severely lacking. Even though the lecturers indicated that they used resources adequately (Item 20, Mean =3.08), this perception may be an inflated use of scarce resources instead of a wholesome use of STEAM pedagogy. Through this, the patterns of utilisation are limited by the shortcomings of the structure.

Table 3: Frequency Counts, Percentages, and Mean Score Rankings on Challenges Affecting STEAM Resource Utilization

S/N	Items	SA f(%)	A f(%)	D f(%)	SD f(%)	Mean	SD	Rank
21	Inadequate quantity of STEAM equipment and materials limits my ability to conduct effective practical sessions.	27(27.8%)	45(46.4%)	10(10.3%)	15(15.5%)	2.87	1.00	**4**
22	Poor maintenance and frequent breakdown of available STEAM resources hinder their consistent use in teaching.	47(51.1%)	20(21.7%)	15(16.3%)	10(10.9%)	3.13	1.05	**1**
M// 23	Unstable power supply disrupts the use of digital and electronic STEAM resources during instructional periods.	50(46.7%)	27(25.2%)	17(15.9%)	13(12.1%)	3.07	1.06	**3**
24	Overcrowded classrooms and large student-to-resource ratios make it difficult	34(35.1%)	33(34.0%)	10(10.3%)	20(20.6%)	2.84	1.12	**5**

S/N	Items	SA f(%)	A f(%)	D f(%)	SD f(%)	Mean	SD	Rank
	to utilize STEAM materials effectively.							
25	Limited access time to shared STEAM facilities (e.g., laboratories, workshops) restricts my instructional delivery.	27(27.8%)	30(30.9%)	25(25.8%)	15(15.5%)	2.71	1.04	**6**
26	Insufficient training and professional development in STEAM resource utilization reduces my confidence and competence in using them.	18(17.6%)	12(11.8%)	37(36.3%)	35(34.3%)	2.13	1.08	**10**
27	The absence of a clear institutional policy on STEAM resource management discourages systematic utilization by lecturers.	35(36.1%)	42(43.3%)	15(15.5%)	5(5.2%)	3.10	0.85	**2**
28	Lack of technical support staff to assist with the operation and maintenance of STEAM equipment affects their effective use.	22(22.7%)	25(25.8%)	27(27.8%)	23(23.7%)	2.47	1.09	**9**
29	Financial constraints within the college prevent the procurement of new and relevant STEAM instructional materials.	27(27.8%)	30(30.9%)	20(20.6%)	20(20.6%)	2.66	1.10	**7**
30	Poor internet connectivity hampers the use of online and digital STEAM resources for teaching and research purposes.	32(33.0%)	25(25.8%)	15(15.5%)	25(25.8%)	2.66	1.19	**8**
Grand Mean							**2.76**	

These results support the idea that structural and institutional barriers are the major barriers in the implementation of STEAM initiatives (Grand Mean = 2.76). The most visible challenge is the low maintenance and regular failure of resources (Rank 1, Mean = 3.13), followed by lack of a clear policy within the institution (Rank 2, Mean = 3.10) and unstable power supply (Rank 3, Mean = 3.07). These statistics indicate institutional failures in the administration and infrastructure delivery. Other notable limitations include inadequate number of equipments, congested classrooms, inadequate facilities and finances as well as ineffective internet connectivity. Remarkably, the most low-ranking challenge relates to the lack of training (Mean = 2.13), which means that lecturers tend to consider themselves as capable of using the resources. This therefore means that the major problem is not in the capability of the staff but in the infrastructural shortcomings, lack of maintenance culture, policy gap and limited funding.

DISCUSSION OF FINDINGS

Current research has shown that the available resources of STEAM instruction at the Federal College of Education (Special), Oyo, are poor and unfair in the multi-disciplinary areas covered by STEAM. Even though the percentage of scientific laboratory equipment and bibliography collections was stated as quite high, the key infrastructural resources, i.e., the digital platforms, engineering and construction machinery, technologic workshops, art studios, reliable internet connection, and consistent electricity supply, were stated to be insufficient. The limited access to engineering instrumentation indicates a strong imbalance of the design-oriented and problem-solving learning environment, the key to the effective introduction to the learning setting of the integrated STEAM education. This trend implies that the institution operates in a traditional, science-based paradigm as opposed to a well-rounded STEAM ecosystem. These results are supported by previous empirical research studies that suggest material and architectural barriers as major hindrances to the implementation of integrated STEM. Inadequate resources were found to be an obstacle to successful multidisciplinary teaching according to the study of Liesbeth Thibaut et al. (2018). Incorporated STEAM education necessitates, the supply of heterogeneous instruments, learning settings and technical infrastructure that should support inquiry-based, project-based and design-oriented teaching methods. The prevalence of traditional laboratories in the modern academic world refers to a lack of the true multidisciplinary interaction. The lack of adequate investment in various STEAM materials can hamper the ability of the institution to graduate students with technical, innovative, and entrepreneurial skills that are needed to diversify the economy. The level of overall utilisation was low, which means that instructors use resources at their disposal stingily. The most commonly used items were laboratory equipment which is congruent with their relative supply. The use of online resources and mathematical models was fairly successful, and this implicates the idea of professors working to counterbalance the weaknesses of the institutions using their own initiative. However, the use of digital tools, technical equipment, workshops and audio-visual resources was still less than ideal due to their limited supply. The given observation is consistent with the findings of Emily A. Dare et al. (2018) who pointed out that the quality of the teachers is not the only predictor of effective STEM integration but that it is conditional on proper infrastructure delivery and the existence of institutional support structures. The current study shows that the lack of training is not viewed as a significant hindrance, which means that the constraints are more systemic and structural in nature than numerous capabilities of lecturers. This was confirmed by an analysis of barriers. Weak culture of maintenance, unclear policies of institutions with regard to resources management, and intermittent power supply were the main factors that hindered the ideal utilisation. The findings imply institutional management and infrastructural failures which hinder the implementation of sustainable resources. According to Anna Valero and John Van Reenen (2019) this empirical evidence shows that an institution of higher education can make a significant contribution to the overall economic development of a country through innovation and development of human capital. However, the current weaknesses in the provision of STEAM resources might limit the ability of the institution to support the sufficient economic diversification in Nigeria. There is urgent need to improve the infrastructure and governance systems of STEAM to maximise teacher training in line with expectations of national development.

CONCLUSION

According to the study, the Federal College of instruction (Special) in Oyo has the basic infrastructure needed to support science laboratories and printed materials, but the overall ecosystem needed to support the effective delivery of integrated STEAM teaching is lacking. The level of utilisation in the case is adequate but severely limited by the lack of infrastructural amenities, poor maintenance regimes, unreliable electricity provision, and the lack of well-defined institutional policy frameworks. The results indicate that it is not a lack of competence in lecturers that is the major challenge but structural and systemic limitations. As a result, the ability of the institution to prepare instructors with multidisciplinary and innovation-oriented skills that are fundamentally necessary in significant economic diversification is hindered. It is therefore necessary to sustainably enhance infrastructure, management systems and policy implementation.

RECOMMENDATIONS

1. It is clear that there is a need of a balanced and strategically guided investment in STEAM structure, especially in engineering workrooms, digital laboratories, arts studios, and innovation centres, in which interdisciplinary learning and design-oriented learning would be promoted.

2. It is recommended that the institution should establish and establish a unified policy framework that would define how STEAM resources are procured, maintained, and utilised integrating a systematic maintenance schedule and a system of accountability to make them sustainable.

3. The power supply and ICT infrastructure strengthening through alternative energy sources and improvement of the internet connectivity are a defining concern in the efficient and effective use of digital and electronic instructional resources.

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