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Evaluation of the Effectiveness of Computer Science Curriculum Implementation in Hassan Usman Katsina Polytechnic, Katsina State

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Abstract

Nigeria has integrated computer science into its education system, recognising its importance for professional development and economic empowerment, but challenges persist in effective implementation of this curriculum. This study investigated the effectiveness of computer science curriculum implementation in Hassan Usman Katsina Polytechnic, Katsina state, Nigeria. Survey design was used, and researchers designed questionnaire was utilised for data collection. Three objectives, and corresponding research questions guided the research. The data were analysed descriptively. The results revealed that computer science curriculum implementation in the Polytechnic was satisfactory, but there were concerns about power supply, air conditioning, and lab space. Software was suitable, but infrastructural facilities were lacking. Manpower provision was satisfactory, but maintenance workers were needed. Lecture methods and practical demonstrations were used, but computer-aided instruction was less emphasised. Both teachers and students agreed on manpower provision. The study recommended addressing resource gaps in computer labs, infrastructural facilities, and computer availability to improve the learning environment. It also suggested allocating resources for qualified staff and exploring innovative approaches like computer-aided instruction to align with evolving educational needs and technological advancements.

Keywords: Curriculum; Computer Science; Curriculum Implementation; Curriculum Evaluation; Curriculum Resources.

Introduction

Education is widely recognised as the most effective and efficient tool for attracting professional development and economic empowerment (Robinson, 2008). Education can be viewed as a catalyst and major mover for social, economic, and human transformations. The incorporation of new innovative technology (computer education) at all levels accelerates and improves any country's educational progress (Hernandez-de-Menendez, Escobar Díaz, & Morales-Menendez, 2020). Nigeria Federal Government gratefully joined other countries in embracing computer integration in their educational system in order to remain economically and educationally viable in the 21st century technology boom.

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The global education landscape is undergoing a transformation, especially in computer science, due to the increasing role of technology in shaping societies and economies. Institutions worldwide are incorporating robust curricula to prepare students for the digital age. Tertiary education is the sort of education provided after secondary education; polytechnics are among the institutions that provide such education. Courses offered at polytechnic as tertiary education institutions include Computer Science. Computer Science is critical to national development, and it is on this basis that the Federal Government of Nigeria tried to integrate computer science into the educational system from primary to higher education institutions.

This recognition is particularly evident in Nigeria, where education is viewed as a critical tool for national progress, as emphasised in the National Policy on Education (NPE, 2004). Institutions such as Hassan Usman Katsina Polytechnic play a pivotal role in this context, offering courses in sciences and technical education with a notable emphasis on computer science. The Nigerian government has taken proactive steps to integrate computer science into the national education system, aligning with the global acknowledgment of the transformative role of computers in the economy. This study evaluates the computer science curriculum in Hassan Usman Katsina Polytechnic, aiming to address challenges in technological literacy in Nigeria. The evaluation considers practical skill development, students' engagement, and the impact on students' preparedness for future academic and professional challenges.

Computers have revolutionised human lives, enhancing efficiency, precision, and precision in education, banking, health, and transportation. Schools and organisations invest heavily in technology education for children. Teachers can use Computers for teaching, assessment, administration, and personal purposes, contributing to students' learning and academic achievement (Wu, Xiao, Sun, Zhang, Ma, & He, 2022; Bulman & Fairlie, 2016; Alemu, 2015; Comi, Argentin, Gui, Origo, & Pagani, 2017; Sagar, Gaikwad, & Kakade, 2021).

Nigeria's national curriculum incorporates computer science, addressing cognitive, affective, and psychomotor domains. Successful implementation requires adequate resources, finance, in-service training, quality teachers, and sufficient time (Talan, 2021; Maki, 2023; Fisher, Frey, & Hite, 2016); Nevenglosky, 2018; Sama, Adegbuyi, & Ani, 2021).

Isaac, Amana, Christian, and Adewale (2018) examined the disparity between Nigeria's National Computer Policy and the actual implementation of computer education in secondary schools, particularly in Northeast Nigeria. A study of 10 secondary schools reveals a significant computer resource shortage, ineffective education, and suggests government funding, curriculum development, teacher ICT training, and increased community awareness.

The integration of Computer science into education is crucial due to its growing importance in modern life. Institutions like Hassan Usman Katsina Polytechnic aim to equip students with digital skills, but implementation is not guaranteed. In the context of Nigeria, where

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technological literacy issues persist, the challenges in implementing computer science become even more pronounced. The recognised importance of science and computer in fostering innovation, problem-solving, and competitiveness on a global scale emphasises the urgency of addressing any shortcomings in the educational system. This study examines the implementation of the computer science curriculum at Hassan Usman Katsina Polytechnic, addressing challenges such as curriculum effectiveness and resource availability. It emphasises the importance of laboratory facilities and equipment for practical application. The goal is to improve the quality of the curriculum, preparing students for the rapidly evolving technological environment.

Objectives of the Study

Based on the above introduction, the objectives of the study were to:

1. Examine the extent to which computer laboratory facilities and equipment are adequately provided for the implementation of computer science curriculum implementation in Hassan Usman Katsina Polytechnic.
2. Determine the adequacy of the provision of manpower for the implementation of computer science curriculum implementation in Hassan Usman Katsina Polytechnic.
3. Explore the extent of integration of practical skills development within the computer science curriculum implementation in Hassan Usman Katsina Polytechnic.

Research Questions

The following research questions were answered in line with the objectives:

RQ1. To what extent are laboratory facilities and equipment adequately provided for the implementation of computer science curriculum in Hassan Usman Katsina Polytechnic?

RQ2. Is there adequate provision of manpower for the implementation of computer science curriculum in Hassan Usman Katsina Polytechnic?

RQ3. What are the practical skills development integrated into the computer science curriculum in Hassan Usman Katsina Polytechnic?

Methodology

This study used a descriptive survey design to gather data from students in Computer Science department of Hassan Usman Katsina Polytechnic, Katsina state. The sample consisted of 50 students and 10 lecturers. The questionnaire was designed using a modified Likert four-point

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scale and consisted of 31 items. The instrument was validated by experts in Curriculum and Computer Science at Federal University Dutsin-ma, and the reliability test yielded .870 reliability index. After distribution, 44 responses were collected from students and 10 from lecturers. The research questions were answered using frequency counts and percentages.

Results

RQ1. To what extent are laboratory facilities and equipment adequately provided for the implementation of computer science curriculum in Hassan Usman Katsina Polytechnic?

Table 1: Provision of Adequate Laboratory Facilities and Equipment for the Implementation of Computer Science Curriculum in Hassan Usman Katsina Polytechnic

Provision of Adequate Lab. Facilities and Equipment for the Implementation of Computer Science Curriculum	Responses								Mean
	SA		A		D		SD		
	F	%	F	%	F	%	F	%	
Availability of alternative source of power supply	25	46.3	16	29.6	9	16.7	4	7.4	3.14
There is functional air conditioning in the laboratory	13	24.1	21	39.9	11	20.4	9	16.7	2.70
There is not enough space in the Computer laboratory	16	29.6	18	33.3	17	31.5	3	5.6	2.45
Availability of suitable software for Computer applications	14	25.9	25	46.3	9	16.7	6	11.1	2.87
Inadequacy of infrastructural facilities like electricity	12	22.2	22	40.7	13	24.1	7	13.0	2.32
Unavailability of Computers and accessories	13	24.1	25	46.3	9	16.7	7	13.0	2.41
Availability of functional internet connectivity	21	38.9	13	24.1	17	31.5	3	5.6	2.96
Availability of classrooms	26	48.1	16	29.6	8	14.8	4	7.4	3.19

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Provision of Adequate Lab. Facilities and Equipment for the Implementation of Computer Science Curriculum	Responses								Mean
	SA		A		D		SD		
	F	%	F	%	F	%	F	%	
Availability of Computer laboratory	16	29.6	21	38.9	6	11.1	11	20.4	2.78
Availability of audio-visual aids	8	14.8	11	20.4	27	50.0	8	14.8	2.35
Availability of audio materials	9	16.7	8	14.8	27	50.0	10	18.5	2.29
Availability of printed materials	17	31.5	18	33.3	12	22.2	7	13.0	2.83
Availability of projectors	13	24.1	22	40.7	13	24.1	6	11.1	2.78

Table 1 shows the adequacy of laboratory facilities and equipment for the computer science curriculum at Hassan Usman Katsina Polytechnic. Positive feedback includes alternative power supply, air conditioning, suitable software, and classrooms. Concerns include space, electricity, and computers and accessories. Hence, it can be deduced that many laboratory facilities were adequate for the implementation of computer science curriculum in Hassan Usman Katsina Polytechnic, while there are still some that are needed for effective implementation of computer science curriculum in the Polytechnic.

RQ2. Is there adequate provision of manpower for the implementation of computer science curriculum in Hassan Usman Katsina Polytechnic?

Table 2: Provision of Adequate Manpower for the Implementation of Computer Science Curriculum in Hassan Usman Katsina Polytechnic

Provision of Adequate Manpower for the Implementation of Computer Science Curriculum	Responses								Mean
	SA		A		D		SD		
	F	%	F	%	F	%	F	%	
Availability of qualified and well-motivated teachers	23	42.6	26	48.1	3	5.6	2	3.7	3.29
Laboratory technicians	23	42.6	22	40.7	7	13.0	2	3.7	3.22
Availability of laboratory cleaners	15	27.8	16	29.6	14	25.9	9	16.7	2.46
Equipment maintenance workers	12	22.2	23	42.6	11	20.4	8	14.8	2.34

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Table 2 shows positive perceptions of computer science manpower provision at Hassan Usman Katsina Polytechnic, with qualified teachers and laboratory technicians being highly regarded. However, concerns were raised about laboratory cleaners and equipment maintenance workers. Hence, it can be deduced that some computer science manpower were adequate for the implementation of computer science curriculum in Hassan Usman Katsina Polytechnic, while others are still needed for effective implementation of computer science curriculum in the Polytechnic.

RQ3. What are the practical skills development integrated into the computer science curriculum in Hassan Usman Katsina Polytechnic?

Table 3: Integration of Practical Skills Development within the Curriculum for the Implementation of Computer Science Curriculum in Hassan Usman Katsina Polytechnic

Integration of Practical Skills Development within the Curriculum for the Implementation of Computer Science Curriculum	Responses								Mean
	SA		A		D		SD		
	F	%	F	%	F	%	F	%	
Practical demonstration is used	21	38.9	24	44.4	8	14.8	1	1.9	3.20
Lecture method is used	25	46.3	27	50.0	2	3.7	0	0.0	3.42
Resource places and field-based experiences	15	27.8	33	61.1	6	11.1	0	0.0	3.16
Seminar and tutorials are used	20	37.0	20	37.0	12	22.2	2	3.7	3.07
Supervised Projects are used	18	33.3	26	48.1	10	18.5	0	0.0	3.14
Students' guided practice is used	21	38.9	23	42.6	6	11.1	4	7.4	3.13
Problem-solving/inquiry methods are used	19	35.2	25	46.3	7	13.0	3	5.6	3.11
Computer-aided instruction is used	16	29.6	23	42.6	12	22.2	3	5.6	2.36

The result in Table 3 revealed the integration of practical skills development within the computer science curriculum implementation. Results indicated that lecture methods were widely utilised, followed by resource places and field-based experiences. Practical demonstration, supervised projects, guided practice, and problem-solving/inquiry methods

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were also commonly used. However, there was less emphasis on computer-aided instruction. Hence, it can be deduced that many of the practical skills required for the implementation of computer science curriculum in Hassan Usman Katsina Polytechnic were integrated into the curriculum, while there are still some that are needed for effective implementation of computer science curriculum in the Polytechnic like the computer-aided instruction.

Discussion

The findings from this study shaded light on the adequacy of laboratory facilities and equipment for the implementation of computer science curriculum in Hassan Usman Katsina Polytechnic based on survey responses. Notably, there's generally positive feedback regarding the availability of alternative power supply, air conditioning, suitable software, and classrooms with majority of the respondents agreeing, indicating a satisfactory provision of this essential resource.

However, the provision of functional air conditioning appears to be less satisfactory, as few agreed that it exists. Furthermore, a notable concern arises regarding the lack of space in computer laboratories, with many of the respondents agreeing that it is insufficient, indicating a pressing issue that needs addressing. Conversely, there was relatively positive feedback regarding the availability of suitable software for computer applications, with many agreeing, suggesting a well-equipped environment in this aspect. Despite these positive aspects, concerns persist regarding the inadequacy of infrastructural facilities like electricity, with many agreeing on its insufficiency, highlighting an area requiring immediate attention.

Additionally, a significant number of respondents agree that computers and accessories are unavailable, signalling a critical gap in resources provision. While the availability of functional internet connectivity is perceived positively, with many agreeing. Again, mixed perceptions emerged regarding the availability of computer laboratories, suggesting room for improvement. Majority of respondents agreed on the availability of classrooms, indicating a positive aspect of the learning environment. This result is in accord with that of Bamidele and Bakare (2015).

On the other findings, it was found that well-motivated qualified teachers and laboratory technicians were highly regarded, but concerns about laboratory cleaners and equipment maintenance workers emerged. A significant gap in support staff allocation was identified, highlighting the need for immediate attention to address the shortage of staff, which is a common issue in schools in the country. In relation to the integration of practical skills development within the curriculum at Hassan Usman Katsina Polytechnic, the findings revealed that lecture methods were widely utilised, with majority of the respondents agreeing on their usage, indicating a predominant approach to instruction. Additionally, resource places

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and field-based experiences were highly utilised, with majority agreed on their integration, suggesting a significant emphasis on hands-on learning opportunities. Practical demonstration and supervised projects also feature prominently, indicating a practical approach to skills development. However, there was less emphasis on computer-aided instruction, with very few agreed on its usage, suggesting a potential area for improvement in leveraging technology for enhanced learning experiences. Overall, the findings suggest a moderate to high level of integration of practical skills development within the curriculum and the finding contradicts with the finding of Ibrahim (2015).

Conclusion

This study investigated the implementation of computer science curriculum at Hassan Usman Katsina Polytechnic Katsina state, Nigeria. The study shaded light on the state of computer science curriculum implementation at Hassan Usman Katsina Polytechnic, offering valuable insights into its strengths and areas that require attention. The computer science curriculum in Hassan Usman Katsina Polytechnic is effective, but differing opinions among teachers and students highlighted the need for a deeper understanding of curriculum challenges. The study's significance lies in its potential to inform policy decisions, guide curriculum improvements, and influence resource allocation, preparing students for the digital age.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. There is need to address critical resources gaps in computer science, such as space in laboratories, infrastructural facilities, and computer availability, to improve the overall learning environment.
2. There is need to to allocate more resources for recruiting and retaining qualified support staff and creating a conducive environment for effective teaching and learning.
3. The institution should explore innovative methods like computer-aided instruction and continuously evaluate teaching methods to improve students' learning experiences and keep up with technological advancements.

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