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INTEGRATING MULTIPLE KNOWLEDGE SYSTEM IN TECHNOLOGY AND VOCATIONAL EDUCATION: PANACEA FOR ENRICHING AND SUSTAINING MANPOWER DEVELOPMENT IN NIGERIA

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INTEGRATING MULTIPLE KNOWLEDGE SYSTEM IN TECHNOLOGY AND VOCATIONAL EDUCATION: PANACEA FOR ENRICHING AND SUSTAINING MANPOWER DEVELOPMENT IN NIGERIA

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Abstract

The study is on integrating multiple knowledge system in technology and vocational education: panacea for enriching and sustaining manpower development in Nigeria. Survey research design was adopted for the study. Four research questions were raised for the study. A total of 28 questionnaire items on the response mode of 4 points were generated to answer the research questions. These items were subjected to both face validation and consistence test. The population for the study included all the lecturers in the Department of Technology and Vocational Education, University of Lagos; School of Technical and Vocational Education, Federal College of Education, Technical, Akoka; Department Technology and Vocational Education. Yaba College of Technology and School of Technology and Vocational Education Adeniran Ogunsanya College of Education, Ijaniki. There are 12 lecturers in University of Lagos, 30 lecturers in Federal College of Education, 35 lecturers in Yaba College of Technology and 15 lecturers in Adeniran Ogunsanya College of Education, Ijaniki. The total number of the respondents is 92. There was no sampling as the population can be managed. It found out that integrated multiple knowledge system method of teaching can enhance student understanding of the subject, apply what they have learnt in classroom in real world situation, focuses on basic skills, content, and higher-level thinking and provides connections among various curricular disciplines. Several students' related factors affect integrated method of teaching. These factors include maturity of the student, health status, readiness, ability and will power, active participation, attention level of the student, satisfaction and level of aspiration. It was proven that integrated multiple knowledge system method of teaching has great advantages over the traditional method especially when it has to do with enriching and sustaining manpower development. It was concluded that lecturers should constantly upgrade themselves to acquire more knowledge and experience in their discipline.

Introduction

Knowledge integration is the process of synthesizing multiple knowledge models (or representations) into a common model (representation). It is information integration, which involves merging information having different schemas and representation models. Knowledge integration focuses more on synthesizing the understanding of a given subject from different perspectives. For example, multiple interpretations are possible of a set of student grades, typically each from a certain perspective. An overall, integrated view and understanding of this information can be achieved if these interpretations can be put under a common model, say, a student performance index. Michael (2020) said that knowledge integration refers to the process of merging two or more originally unrelated knowledge structures into a

single structure. Michael further pointed out that in the most general sense, it can encompass the complexities of how two digital databases can be merged or how two companies can effectively combine the knowledge of their workers. In the learning of sciences, however, the term usually refers to knowledge integration within persons' memory. Michael believed learners pick up pieces of knowledge (e.g., experiences, observations, ideas, hypotheses, explanations) in many different situations, for example, everyday life observations, conversations with friends, the Internet, and school instruction. Novices in a domain often do not see which of these newly acquired pieces of knowledge relate to each other and why they should be related at all. Recognizing relations usually depends on relevant prior knowledge, for instance, knowing an underlying rule.

Knowledge integration has also been studied as the process of incorporating new information into a body of existing knowledge with an interdisciplinary approach. This process involves determining how the new information and the existing knowledge interact, how existing knowledge should be modified to accommodate the new information, and how the new information should be modified considering the existing knowledge. Knowledge integration is important to achieve deep conceptual understanding, which requires students to develop well-connected knowledge structures through the central idea of a concept. To effectively represent and analyse knowledge integration, a conceptual framework of facts is developed to map learners' knowledge structures in terms of how conceptual ideas and contextual conditions are connected. Compared to information integration, which involves merging information having different schemas and representation models. Knowledge integration focuses more on synthesizing the understanding of a given subject from different perspectives. The knowledge integration perspective capitalizes on the varied ideas held by students both individually and collectively to stimulate information. The knowledge integration perspective synthesizes recent findings and instruction, culminating in a set of knowledge that promote coherent and cohesive understanding, and design principles that aids customization of shapes. Integration is the coordination of different activities to ensure harmonious functioning. It is the coordination of different teaching activities to ensure the harmonious functioning of the educational process for more effective health manpower development. Integration refers to the combination or linking of related subjects, facts, concepts, and knowledge while teaching and learning.

From foregoing it is evident that integration of multiple knowledge in Technology and Vocational Education brings about new set of knowledge which is a base for enriching and sustaining manpower development. Merging of ideas from different field of Technology and Vocational Education always create opportunity for inventions. Most scientific and technological inventions are the product of integration of multiple knowledge. However, the field which may merge as multiple knowledge integration must be fields that operate similar work plan or are closely related. These fields must share common ideology, methodology and pedagogy. However, it is not out of place to adapt knowledge or information from like medical science, management science or any other social or natural science discipline. An example of the knowledge integration is the birth of Mechatronics Programme. This field of study browed knowledge from electronics, electrical, mechanical and computer. The products from Mechatronics today are encompassing in both technology and economic world of life.

Technology and Vocational Education is a field of study that trains an individual in knowledge, attitude and practical skills to enable him to be useful citizen of the society. According to UNESCO and the International Labour Organization (ILO) Technology and Vocational Education refers to "aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupants in various sectors of economic and social life" (UNESCO and ILO, 2001). In addition to technical knowledge and aptitude, increasing emphasis is on "softer" skills – communication, negotiation, and teamwork. TVET is dispensed in public and private educational establishments, or other forms of formal or informal instruction aimed at granting all segments of the society access to life-long learning resources. Musa and Okorieocha (2012) said that it can also be defined as a means of preparing for occupational fields and effective participation in the world of work. It also implies lifelong learning and preparation for responsible citizenship. In its broad definition Technical Vocational Education and Training (TVET) includes technical education, vocational education, vocational training, on-the-job-training, or apprenticeship training delivered in a formal way. This means that it prepares an individual for self-reliance which is a veritable tool for national development.
To achieve sustainable development, attention should be paid to strengthening the bridge between education and preparation for the world of work with attention paid to improving vocational education and training in Nigeria. The current university curriculum in Nigeria tends to reduce socio-economic opportunities of those who are more oriented towards work than academics. Graduates of vocational and technical institutions are highly skilled entrepreneurs. They rely on their effort and abilities which if encouraged can lead to sustained manpower development. This can reduce

hiring foreign experts who are paid huge sums of money to build roads, bridges and provide other infrastructural facilities in Nigeria. Cole, (2008) in Musa and Okoriocha (no date) stated that the focus of manpower development tends to be primarily on an organisation's future manpower requirements and secondly on the growth needs of individuals in the place of work. Musa and Okoriocha (no date) further defined development of manpower as means of exposing individual or group of individuals to those experiences that will enable them to be intellectually matured to acquire skills that will enhance their abilities in solving their personal and financial problems. Hence, manpower development relates to the trainings and development of a nation's human resources to achieve the highest productivity and most efficient interaction with other factors of production.

The importance of integration in teaching and learning

Integrated teaching and learning processes enable children to acquire and use basic skills in all the content areas and to develop positive attitudes for continued successful learning throughout their secondary education. Integration of acknowledge builds on the relationships which exist among all things. IPL (2022) pointed out that integrated teaching and learning is essential for a dynamic and holistic interaction between the lecturers and students. Therefore, in my faculty, health, and sciences, especially, we incorporated active engagement, attainment to students, shared, sustained conversations and intentional teaching.

A recent study done by Shah and Uresh, (2016) revealed that an integrated approached is the best and significant process compared to isolated learning, for students in universities. Integration in education can be defined as co-ordination in teaching learning activities to ensure harmonious functioning of the educational processes (Shah & Uresh, 2016). Generally, this approach can be delivered by two-way mediums which are (1) Vertical Integrative Teaching and (2) Horizontal Integrative Teaching. So far, this method has been applied in my learning.

The traditional separate subjects' approach of teaching; a heritage from the colonial past, may not encourage the citizens to identify themselves with their own historical, geographical, and political traditions as compared with integrated approach which hide several other vital subject areas. However, the proponents of separate subject approach believed the lumping together of subjects into study areas makes the identity of subjects difficult and as a result some very important subjects are not taught or are taught scantly in schools. The situation is made worse by the limited time of training. For example, woodwork and metal work are almost non-existent though there are members of the teaching staff for the two subjects. Integrated teaching certainly has advantages over any type of non-coordinated teaching of separate subjects, but it remains a form of traditional teaching in which the teacher is predominant and is less conducive to efficient learning than educational activities designed to help the student and lead him to achieve the necessary integration by his own efforts.

Statement of the Problem

There is the need to shift from the traditional separate subject teaching to more acceptable and result oriented method of lesson delivering in classroom. The separate subject method of teaching inherited from the Colonial Master has some inadequacies or shortcomings of not enabling learners to acquire and use basic skills in all the content areas and to develop positive attitudes for continued successful learning. This can be effectively addressed in the integrated method of teaching especially in Technology and Vocational Education were most of the subjects are interrelated. To effectively sustain manpower development through Technology and Vocational Education the integrated method of teaching is recommended for expected result. It is against this background therefore that this study seeks to explore how integrated method of teaching can enrich and sustain manpower development in Nigeria.

Purpose of the Study

The purpose of the study is to find how integrated method of teaching can enrich and sustain manpower development in Nigeria. Specifically, the study intends to:

1. Determine how integrated method of teaching enhances student understanding of the subject.
2. Find the students related factors that affect the integrated method of teaching.
3. Find the teachers related factors that affect the integrated method of teaching.
4. Determine how integrated method of teaching can improve students' positive attitudes towards learning.

Research Question

1. How can integrated method of teaching enhances student understanding of the subject?
2. What are the students related factors affecting the integrated method of teaching?
3. What are the teachers related factors affecting the integrated method of teaching?
4. How does integrated method of teaching enhances student's positive attitudes towards learning?

Methodology

Population for the Study

The population for the study included all the lecturers in the Department of Technology and Vocational Education, University of Lagos; School of Technical and Vocational Education, Federal College of Education, Technical, Akoka; Department Technology and Vocational Education. Yaba College of Technology and School of Technology and Vocational Education Adeniran Ogunsanya College of Education, Ijaniki. There are 12 lecturers in University of Lagos, 30 lecturers in Federal College of Education, 35 lecturers in Yaba College of Technology and 15 lecturers in Adeniran Ogunsanya College of Education, Ijaniki. The total number of the respondents is 92.

Sampling

There was no sampling because the population can be managed. The entire population forms the respondents.

Instrument for Data Collection

A total of 40 questionnaire items were generated to answer the research questions raised in the study. The questionnaire has four sections, A to D. Section A elicited information from the respondents to answer the research question on how integrated multiple knowledge system method of teaching enhances student understanding of the subject? Section B sought information on "the students' related factors affecting the integrated method of teaching" while Section C Obtained responses from the respondents on "the teachers related factors affecting the integrated method of teaching". Section D sought information on "determine how integrated method of teaching can improve students' positive attitudes towards learning". The questionnaire items were generated on four-point response scale; Very Good (4), Good (3), Bad (2) and Very Bad (1).

Validation of the Instrument

Three copies of the developed questionnaire instrument were given to three experts in Technology and Vocational Education and a copy to an expert in department of Measurement and Evaluation. The experts in Technology and Vocational Education were asked to assess how appropriate are the contents while the expert in Measurement and Evaluation was asked to determine the appropriateness of the statistical tool for analysis of the data collected from the respondents.

Reliability of the Instrument

To ensure the reliability of the instrument, thirty copies of the questionnaire were distributed to thirty lecturers in department of Technology and Vocational Education, University of Education, Aguoye, Ogun State. The completed questionnaire was collected and subjected to analysis. The 30 questionnaire items were divided into two halves, odd and even numbers. The two set of scores were correlated using Pearson Product Moment Correlation coefficient. The result obtained was 0.72, which shows that the items are reliable.

Method of Data Collection

A total of 92 copies of the questionnaire were distributed to the respondents. A period of two days was given to them to fill the questionnaire after which I collected the same number. However, sometimes items were not responded to but they were re-administered to get the exact number distributed.

Method of Data Analysis

The data collected were analysed using mean and standard deviation. Mean values 2.50 and above are regarded as good and mean values below 2.50 are regarded as bad.

Results

Research Question 1: How can integrated method of teaching enhances student understanding of the subject?

Table 1: Responses of the respondents on how integrated method of teaching can enhance student understanding of the subject.

S/No	Items	SD	$\overline{X}$	Remark
1.	Allows students to have a deeper understanding of the course subject matter.	0.78	2.75	Good
	Allows students to apply what they have learnt in classroom in real world situation	0.69	3.06	Good
3.	Provides connections among various curricular disciplines	0.81	2.88	Good
4.	Focuses on basic skills, content, and higher-level thinking	0.78	3.01	Good
5.	Provides connections among various curricular disciplines	0.86	3.34	Good
6.	Accommodates a variety of learning styles, theories, and multiple intelligences	0.68	3.24.	Good
7.	Students develop higher-level thinking skills	0.88	2.77	Good

Table 1 showed that most of the lecturers believed all the factors on the table can enhance student understanding of the subject when integrated method of teaching is adopted. Item number 5 has the highest mean value of 3.34 with corresponding standard deviation of 0.86 while item number 1 has the lowest mean value of 2.75 with a corresponding standard deviation of 0.78. Therefore, integrated method of teaching has many it can improve teaching and learning.

Research Question 2: What are the students related factors affecting the integrated method of teaching?

Table 2: Responses of the respondents on the students related factors affecting the integrated method of teaching.

S/No	Items	SD	$\overline{X}$	Remark
1.	Maturity of the learner.	0.89	2.88	Good
2.	Readiness and will power: This is just like motivation.	0.65	3.07	Good
3.	Ability level of the learner.	0.78	3.30	Good
4.	Level of aspiration and achievement.	0.59	3.00	Good
5.	Attention.	0.68	3.78	Good
6.	General health condition of the learner.	0.68	2.89	Good
7.	Aptitude of the student	0.60	2.87	Good
8.	Active participation of the student	0.59	3.80	Good
9.	Satisfaction student finds in the course and the lecture	0.71	3.01	Good

Table 2 revealed that there are many students related factors affecting integrated method of teaching. These factors among others include maturity of the learner, readiness and will power, ability level of learner and his academic achievement. Also, health condition, aptitude, active participation, and satisfaction among the students are factors that affect integrated method of teaching. Active participation of the student has the highest mean value of 3.80 with corresponding standard deviation of 0.59.

Research Question 3: What are the teachers related factors affecting the integrated method of teaching?

Table 3: Responses of the respondents on the teachers related factors affecting the integrated method of teaching.

S/No	Items	SD	$\overline{X}$	Remark
1.	Teaching experience	0.83	3.33	Good
2.	Professional Qualification	0.68	2.08	Bad
3.	Teaching Styles	0.81	2.61	Good
4	Academic Qualification	0.72	2.00	Bad
5.	Proper sitting arrangement	0.89	1.89	Bad
6.	Classroom management	0.68	2.76	Good
7.	Limited time for teaching	0.77	2.88	Good

From the table 3 it can be observed that the respondents agreed that items number 2, 3 and 4 do not affect the integrated method of teaching while the rest of the items are remarked good as they affect the integrated method of teaching. Teaching experience has the highest mean value of 3.33 and a corresponding standard deviation of 0.83 while teaching style has the lowest mean value of 2.61 in the group of the factors that affect integrated method of teaching.

Research Question 4: How does integrated method of teaching enhances students' positive attitudes towards learning?

Table 4: Responses of the respondents on how integrated method of teaching enhances students' positive attitudes towards learning.

S/No	Items	SD	$\overline{X}$	Remark
1.	Enable children to acquire and use basic skills in all and to in all the content areas.	0.76	3.21	Good
2.	Develop positive attitudes for continued successful learning	0.81	2.78	Good
3.	Integration of acknowledge builds on the relationships which exist among all things.	0.62	3.04	Good
4.	The teacher is not predominant and is less conducive to efficient Teaching and learning	0.76	2.88	Good
5.	Allows students to make connections among different. subject areas and to their own lives.	0.60	3.33	Good

Table 4 revealed that most of the respondents agreed that all the items on the table can positively enhance students' attitudes toward learning. Item number 5 has the highest mean value of 3.33 with corresponding value of standard deviation of 0.60 while item number 2, development of positive attitude for continued successful learning. It shows that there are available various ways by which integrated method of teaching can enhance students' attitude toward learning.

Discussion of the findings

The findings of the study revealed that integrated multiple knowledge system of teaching can enhance student understanding of the subject through gaining a deeper understanding of the course subject matter. It gives students the opportunity to apply what they learnt in classroom in real life situations. Integrated method of teaching also allows students to make connections among different subject areas and to their own lives. When students make these connections and understand why they need to know certain skills or pieces of knowledge, the learning process becomes positive for the students. Jan and Bruce (2009) in their study believed educators in professional or service-related fields desire their students not only to learn theory and understand why theories are important but also to learn how to apply the theoretical frameworks in practice. Jan and Bruce further said that too often people commented about anecdotal accounts of students in internships who are unable to make this transition from theory to practice with confidence and effectiveness. Perhaps the difficulty in making the transition from theory to practice arises, at least in part, from a failure of the teacher to integrate both theory and practice into the same course in the curriculum in ways that are relevant and meaningful to the student. Such integration helps students to be more closely associate the practical value of learning theoretical concepts. It is imperative that students in professional programs be able to put into practice what they have learned in the classroom. To help students become capable and competent practitioners requires that they have training in self-awareness, knowledge acquisition, and skill building (Kramer, 1998).

It was evident in the study that several students' related factors affect integrated method of teaching. These factors include maturity of the student, health status, readiness, ability and will power, active participation, attention level of the student, satisfaction and level of aspiration. Textbook Edu Solution (2022) observations supported the finding of the study as he said that the main factors affecting integrated teaching and learning are motivation of the learner, maturation of the learner, teaching strategies and physical and emotional health of the learner. He further said that the interest of the student is closely related in nature to that of symbolic drive and reward. A favourable mental attitude facilitates learning. As regards physical and emotional health of the learner, Textbook Edu Solution stressed that concentration needs emotional and mental poise and absence of mental conflict or complexity. Some learners find it difficult to prepare for the examinations, simply because of fear of the examination and anxiety neurosis. Giving motivation to the learner can increase their interest in learning. Also, maturation of the learner affects learning because maturation is related to the structure and potential capacity. Maturation is the process by which we change, grow, and develop throughout life.

The study revealed that teachers' related factors affecting the integrated method of teaching include teaching experience and style, classroom management and time allocation. Consequently, professional, and academic qualifications do not affect the integrated method of teaching. The teacher's experience in teaching is an added advantage in his professional discharge of his duty. An experienced teacher can easily apply a blended method of teaching to deliver effectively and efficiently his or her lesson. The application of integrated method of teaching will not difficult for him or her to apply in teaching. UGCNET PAPER 1(2022), observed that it is well-known fact that it's easy to become teacher after fulfilling the criteria, but they actually become 'Master' with their experience. High Qualification may give teachers edge in terms of understanding the different topics or complex formula but it's the

experience in the classroom which helps you to learn and employ better methods to effect learning of students. This is also required to handle different mind-sets of different students in the classroom. Regarding knowledge matter, UGNET PAPER 1 pinioned that many time teachers have been assigned a subject in which he is not specialized and he himself not in better position to help learners in effective way so the passion towards the subject and subject matter experience is also key factor that impact learning of students.

It was revealed in the study that integrated multiple knowledge system method of teaching can enhance students' positive attitudes towards learning in the following ways: Enable children to acquire and use basic skills, develop positive attitudes for continued successful learning, allows students to make connections among different subject areas and to their own lives. Integrated method of teaching has also been proven to be very useful in medical field. According to Gulab, Monika, Neeraj, and Mahesh (2017) integrated teaching is an important strategy in medical education, but it is a complex concept. The need for greater integration of subjects in the medical curriculum has featured prominently in reports on medical education, including the GPEP (General Professional Education of the Physicians) report. To improve the quality of students and to have effective diagnosis and better treatment of the patients', integrated learning is the need of hour. Irby and Wilkerso (2003) observed that in the recent years, throughout the world such curricula has been used by faculties who teach the students. Arun, Vishwanath, and Gurpreet (no date) said that integrated teaching & learning approaches enable learning across multiple domains. So, Medical Council of India desires the incorporation of integration in the medical curriculum to provide the students with a holistic rather than fragmented learning process. Summarily, the advantages attributed to integrated teaching are many and attractive. They include the synthesized presentation of important health problems, the avoidance of contradictions and pointless repetition, the respect for a logical order and the pruning of non-essential details, the improvement of the quality of teaching and teachers through emulation and of the relations between departments, and a better utilization of teachers.

Conclusion

Though integrated multiple teaching may have some disadvantages, but it has been proven that it has a great advantage over the traditional method especially when it has to do with enriching and sustaining manpower development. This method of teaching provides opportunity for students to effectively apply what they learnt in classroom in the real-life experience and connect with other related disciplines. There are student related factors that need to be considered when using integrated multiple knowledge system. These factors include maturity of the learner, health status, readiness, ability and will power, active participation, attention level of the student, satisfaction, and level of aspiration. Teachers' related factors affecting the integrated multiple knowledge system method of teaching include teaching experience and style, classroom management and time allocation. Consequently, professional, and academic qualifications do not affect the method of teaching.

Recommendations

The following are recommended:

1. Integrated multiple knowledge system method of teaching can enhance students' positive attitudes towards learning.
2. Teachers should be encouraged to constantly upgrade themselves for more experience in the profession.
3. Teachers who use the integrated multiple knowledge system in teaching should always be aware of the students' related factors that affect learning.

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