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Information and Communication Technology Competency Needs Required for Implementing Personalized Action Learning Instruction

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Abstract

The study was to identify the competency improvement needs of teachers for utilization of personalized instruction in action learning strategy using some ICT devices to enhance academic achievement in classroom. The study was carried out in technical colleges in Abia State. The instrument for data collection was 12 item questionnaires used to collect data to answer the research questions. A null hypothesis was tested at .05 level of significance. Mean and Borich's needs assessment model was used to answer the research question. ANOVA was used to test the hypothesis. One of the results of the study shows that teachers should guide students to work at their own pace using one-on-one instructional personal computers in classroom and school workshop learning. ANOVA test shows that there is no significance difference in the mean responses of teachers with varying educational qualifications on the competencies possessed in the use of ICT in personalized action learning teaching strategies in teaching of vocational subjects in Abia State. Based on the findings, it was recommended that personalized instruction through action learning teaching strategies using ICT should be implemented in vocational education to improve students' academic achievement and retention in vocational subjects.

Introduction

Personalized instruction is an instruction that caters for individual differences. Ibraheem (2020) defined Personalized instruction as the tailoring of pedagogy, curriculum and learning environments by learners or for learners in order to meet their different learning needs and aspirations. Typically, technology is used to facilitate Personalized learning environments. Information and Communication Technology (ICT) can be a powerful tool for Personalized instruction as it allows learners access to research and information, and provides a mechanism for communication, debate, and recording learning achievements. Ajagun (2013) defined ICT as a technology which are utilized for processing, transmitting or communicating data and information. Devices such as computers, Internet, interface boxes, email varieties of software and materials form important aspect of ICT tools and resources for implementing personalized learning. Personalized instruction according to Lockee, Larson, Burton & Moore (2015) is based upon programmed learning material, through which students proceed at their own pace with the goal of mastering each step. This programmed learning material can be transmitted using ICT devices. For the student to learn through Personalized action learning using

ICT, he/she works in a medium known as learning environment. Learning environment provides the interaction between the learner and the ICT devices.

The learning environment here includes different methods and media like electronic self-study materials such as software packages on compact disc read-only memory (CD ROM) and web pedagogy. The student obtains an immediate feedback in the practice and drill provided by the CD ROM packages. This would increase their interest in the subject, thereby improving their academic achievement. This helps a slow learner in the sense that they would receive a tutorial repeatedly until they grasp the information before the practice and drill. When the student master each step presented by programmed learning material, it would not be affected by the teacher-oriented process. The teacher-oriented process does not consider sufficiently the individual differences existing in students, maybe due to the insufficient time allotted to the teaching of vocational subjects in order to 'cover' the materials in syllabus, worse still if the teacher is impatient to repeat the concept which the slower students do not understand. The learner who the teacher communicates to individually would have the opportunity to present to the teacher the peculiar area of problem or interest without affecting other students who may have a divergent interest or different problems. This helps the student to be free to discuss some personal problems they may not be free to discuss in a class situation. The teacher at this time would easily administer their function as a counsellor in vocational subjects. This would implicitly save both the teacher and the student's time. This is because the time other students who must have acquired the information a particular student would be seeking to acquire, maybe through questioning in the class, would be used for something more useful. The teacher would be addressing any problem to the student who has the problem, thereby fixing the round peg in a round hole. The Personalized instruction here used teaching strategy known as action learning.

The teaching and learning strategy which encourages problems solution and continuous process of learning is action learning. Olivier (2017) stated that action learning is supported through the provision of opportunities to access information, enhance skills and engage in experimental, collaborative and reflective learning and personal development processes. Action learning has five cyclical processes, some authors (Bertha, 2014, Carol & William, 2017) identified as; initial reflection, planning, action, observation and reflection. The experience can easily be acquired through practice and drills in programmed instruction. Television, video, radio and recorder also play a vital role in this strategy. The technical information acquired in a television and radio can be recorded in a cassette player, video, disc or any other recorder. The information offers what the student has in their repertoire of experience and probably what they do not know. That which the student does not know forms their initial reflection.

The student goes to e-library or any other sources of literature to gain the information of what they do not understand. This forms the planning and action respectively. The observation phase here is when the student goes to the teacher in a classroom situation to observe and explain the information as they understand it. Questions are formulated at this stage. The teacher in answering the question answers it in such a way that they give an assignment to the student. The answer given to the student is taken home to form the reflection phase. There the student reflects whether the answer given treated the context of the question. The student in reflection phase raises other questions from the answers given; and also, in trying to execute the assignment of the teacher may raise other issues still. These questions and issues form the next initial reflection of the next cycle.

Through practice and drills of programmed instruction, the student can generate question/s he/she would ask the teacher. The questions they are unable to answer forms the initial reflection of the cycle. They follow the phase as the former. When such student practices the learning experiences through this action learning he must have retained the information so acquired. These are very necessary when the teachers are competent with these teaching strategies. Teachers should ensure that they continue to abreast themselves in the innovations of their field in order to remain relevant and effective. One of the ways they can ensure this is by updating their competencies through training and retraining while still teaching. This means that when a teacher is found deficient in either technical or professional skill or both, they need enhancement to make up for identified inadequacies.

The difference between a level of educational qualification of same field or subject from a higher one is scope. Promila and Anviti (2019) conceived that higher education imparts in-depth knowledge and understanding so as to advance the students to new frontiers of knowledge in different walks of life (subject domains). The study seeks to determine the responses of the competence possessed by the teachers according to their level of educational qualification. Teachers who teach in technical colleges possess varied level of educational qualification, hence their responses variable are important in determining the validity of the study. The depth of their knowledge would not affect the strategy drastically. This is because any vocational teacher from National Certificate in Education to doctorate level, only needs to have a sufficient level of the use of ICT devices to teach the student using this strategy. However, the inputs of teachers who possess higher level of educational qualification are needed to validate theories of learning and pedagogy involved in the study.

Statement of the problem

There is poor performance of technical college students in Abia State in the National Technical Certificate Examination (NTCE) in recent times (Okereke, 2016). The information the students need to acquire in order to succeed academically demands faster means of acquiring them, because the faster they gain the information, the greater the amount of information acquired. Sara, Brown, David, Enos, Susan, Azra and Leonard (2010); Maria and Maria (2019), and The Scottish Government (2015) found out in their various studies that students acquired greater information in a shorter period of time when ICT devices were used to teach them against convention teaching methods of using charts, textbooks and pictures. The question now is how the teachers would teach course contents using teaching strategies that ICT devices would be applied to impart learning faster to the students. Secondly, Fortune (2019) found out that there is poor performance of technical college graduates due to their inability to retain the information they acquired in vocational subjects. The next question here is how would these students improve their retention in vocational subjects?

These problems aforementioned can better be solved when ICT is sufficiently used in teaching the students vocational subjects. However, the transmitters of knowledge need to be equipped with the competencies so that the learning strategies will be effective. Therefore, this study sought to determine the competency improvement needs of teachers using ICT in Personalized instruction through action learning teaching strategies in technical colleges.

Research Question

1. What are the competencies required of teachers in utilizing ICT in Personalized action learning teaching strategies to improve students' academic achievement in automobile technology?
2. What are the improvement needs of the teachers in utilizing ICT in Personalized action learning teaching strategies to improve students' academic achievement in Automobile technology?

Hypothesis:

There is no significance difference in the mean responses of teachers with varying educational qualifications on the competences possessed in the use of ICT in Personalized action learning teaching strategies in teaching vocational subjects in Abia State.

Methods

The study adopted survey research and Borich needs assessment model. The Borich (1980) needs assessment model requires that a mean weighted discrepancy score be calculated for each item, competency or activity included in the needs assessment. A discrepancy can be calculated by comparing the participants' behaviours, skills, and competencies, with the goals of the programme: "a discrepancy analysis that identifies the two polar positions of what is and what should be". Further, a comparison could be made to determine a group of individuals' perceived level of competence to complete a task, with their desired level of competence to complete a task.

In answering the research question, weighted mean and Improvement Needed Index (INI) was used, while Analysis of Variance (ANOVA) was used to test the null hypothesis at 0.05 level of significance and appropriate degree of freedom. The mean and INI was utilized in answering the research question. Any item with a mean rating of 3.50 and above is considered needed, while any item with a mean rating below 3.50 is regarded as not needed. The weighted mean of each item under the needed category was calculated (xn). The weighted mean of each item under the performance category was calculated (xp). The difference between the two means was calculated (xn-xp). This gave the value that indicated whether improvement is needed or not, and stated as follows: Where the difference is zero (xn-xp = 0) that is neutral, it indicates that there is no need for improvement on the item. Where the difference is positive (xn-xp = +), it indicates that there is need for improvement of teachers on the item. Where the difference is negative (xn-xp = -), it indicates that there is no need for improvement on the item because the mean performance (xp) of the teachers for the scale is greater than the level at which that scale is needed (xn). That is, the teachers can perform the skill to the level at which it is needed and even above. (That is, INI=xn-xp. Where xn means needed and xp means performance) (Olaitan and Ndomi, 2000).

The population for this study comprises of 50 vocational subject teachers in technical colleges in Abia State of Nigeria. Among these 50 teachers, computer studies teachers answered the required category, since they are experts in the use of ICT.The instrument for data collection for this study was structured questionnaire; consisting of 12 items. The questionnaire has two columns of needed category and performance category as follows: Very Highly Needed (VHN)/ Very High

Performance (VHP) - 5, Highly Needed (HN)/ High Performance (HP) - 4, Averagely Needed (AN)/ Average Performance (AP) - 3, Slightly Needed (SN)/ Low Performance (LP) - 2, and Not Needed (NN)/ Very Low Performance (VLP) - 1. Cronbach Alpha method was used to determine the internal consistency of the instrument, which gave a coefficient index of 0.93. This shows that the instrument is reliable.

Results

The results are presented according to the research question and hypothesis that guided the study.

Table 1

Mean responses of Teachers on Competences in Personalized Action Learning Teaching Strategies using ICT

S/N	Item Statement	$\bar{x}N$	$\bar{x}P$	$\bar{x}N$-$\bar{x}P$	Remark
1	Guiding each students to work at their own pace using one-on-one instructional personal computers in classrooms and school workshops	5.00	2.00	3.00	RIN
2	Providing programmed instruction for students to study with after conventional class work	4.98	2.41	2.57	RIN
3	Giving each students personal attention while studying through complex programmed instruction in the computer	4.98	2.41	2.57	RIN
4	Giving students class work from the complex lessons provided by programmed instructions	5.00	2.41	2.59	RIN
5	Guiding students relearn, through programmed instruction, the un- retained technical information	4.90	1.00	3.90	RIN
6	Teaching students practical projects using simulated machines projected from multimedia	5.00	4.90	0.10	RIN
7	Involving students to watch each process of a project several times to ascertain its feasibility before embarking on them	4.36	2.13	2.23	RIN
8	Guiding students surf for related information learnt in the classroom and/or school workshop in internet	4.18	2.22	1.96	RIN
9	Involving students to learn exercises through online pedagogy	4.80	2.00	2.80	RIN
10	Guiding students to structure questions for clarification on technical/vocational information acquired from the web and programmed instruction	4.69	1.45	3.24	RIN
11	Recording instructions for each student to take home in order to learn more	4.17	1.24	2.93	RIN
12	Recording students' excursion and field trip embarked upon to solve a problem	4.42	3.62	0.8	RIN

Note. RIN= Required and Improvement Needed (source: author)

Table 1 shows that all the 12 items are required and improvement is needed on them by the teachers.

Table 2
ANOVA of the responses of the Teachers, based on their Educational Qualifications, on the Competencies needed in the use of ICT devices in Personalized Action Teaching Strategies

Source of variance	Sum of squares	Df	(Mean square)	f-Cal	f-Tab
Between Groups	0.9122	4	0.228		
Within Groups	184.642	45	4.103	0.056	2.32
Total	183.2475	49			

The result in Table 2 indicated that calculated f value is equal to 0.056 which was less than the table value of 2.32 at 0.05 levels of significance and degree of freedom of 6 and 43. This revealed that there was no significance (NS) difference in the mean ratings of responses of the teachers, based on their level of educational qualifications, on the competencies needed in Personalized action learning teaching strategy. The null hypothesis is therefore accepted.

Discussion

The findings as presented in Table 1 showed that all the 12 items are required and improvement is needed in all the items. This signifies that the following are teaching strategies which promote learning in technical colleges: providing programmed instruction for students to study with after conventional class work; giving each students personal attention while studying through complex programmed instruction in the computer; giving students class work from the complex lessons provided by programmed instructions; guiding students relearn through programmed instruction, the un- retained technical information, and guiding students to structure questions for clarification on technical/vocational information acquired from the web and programmed instruction.

This is similar to the findings of Mei-ling (2019) who found out that programme instruction is a teaching technique which seems to be particularly useful for continuing education. The student learns by doing and the student progress through the programme at his own pace. With programmed instruction, the fast learner is not held back by the slow one, and the slow learner is not left behind in a state of helplessness and confusion. There is every indication that programmed instruction will eventually be used to a greater extent in the classroom, especially if good programs become available, and teachers learn to select and use them.

Just as in programmed instruction, online pedagogy diminishes the role of "the teacher" in the teaching/learning equation. The student is, for the most part, in charge of what gets learned. During online discussions, students locate a website which deals with content relevant to the chapters currently being discussed. **Students help each other learn (peer assistance).** In a traditional classroom, interaction requires listening and talking, while online interactivity requires reading and writing. Reading and writing impart better than listen and

talking in sentence constructions and spelling (Maria, 2017). The findings also showed the importance of teaching students practical projects using simulated machines projected from multimedia.

Simulated machines focus on specific tasks. As a technique for instruction, simulated machines allow students to deal in a realistic way with matters of vital concern but without dire consequences should they make wrong choices. For instance, Praise (2019) has noted that in simulated machines, students have opportunities to receive supplemental contact with the variables tested in real experiences or dangerous ones. The pursuit of simulated machines in an educational context is worthwhile for several reasons. Simulated machines potentially offer students opportunities to explore situations that may be impossible, too expensive, difficult, or time-consuming to accomplish with actual laboratory or real-life experiences. Even if real-life exploration is feasible, such experimentation can be supplemented by simulated machines that offer students the opportunity to explore a wider range of variables more rapidly.

Students should go to relevant excursion and field trip. These should be recorded. The recorded excursion and field trip can also help the students who would want to construct a product, machine or facility, or embark on any project at that which they saw during such trip, to ascertain its feasibility (feasibility study) before embarking on them or otherwise look for another project to construct. According to the dual coding theory propounded by Allan Paivio in 1969, visual and verbal information impart better than only verbal information. The greater the number of multimedia in teaching, the greater it imparts in the learning experience. Therefore, using video to record the technical information imparts better learning.

Instructional videos constitute a virtual guide to the experiments that the student will carry out. Approaching workshop practices sequentially in an instructional video can optimize both the available material resources and the available time. Video can facilitate the students' preparation prior to their actually doing the workshop practices by describing the basic theoretical concepts related to the experiment they are going to see. This virtual laboratory does not mean that real workshops should be phased out. Instead, there should be an integration of the two laboratories in teaching practice. Indeed, it forms part of a teaching methodology which foresees increasing use of a wide range of learning tools. The purpose of using video is their application to e-learning platforms as complements to traditional teaching, and not as replacements for real workshops where such workshops are available. Nonetheless, when a real laboratory is unavailable or inaccessible, video can of course be very useful indeed. Computer is another multimedia used in complex instruction which enables retention in Personalized action learning.

In a complex instruction, the computer assists the instructor or the teacher to explain technical information to the students. When these students learn and relearn these technical information and attempt the exercises in programmed instruction and online pedagogy, and discover why they could not answer correctly to the ones they could not; through the law of exercise, they become perfected to the information and thereby retain the previous non retained technical information.

The hypothesis shows that there is no significance difference in the mean responses of teachers with varying educational qualifications on the competences possessed in the use of ICT in Personalized

action learning teaching strategies in teaching vocational subjects in Abia State. This implies that all teachers, irrespective of their teaching qualifications can improve in Personalized action learning teaching strategies using ICT. The educational implication of this study is that Personalized action learning teaching strategies facilitate students' academic achievement and retention in vocational subjects using ICT.

Conclusion

Based on the analysis of data, it is concluded that ICT which has been introduced in Nigerian educational system can be implemented in Technical and Vocational Education(TVE) to improve the study of vocational subjects, which is imparted in Technical Colleges. There is therefore an urgent need to implement ICT, where they have not been implemented, in Nigerian educational system especially in TVE. This is necessary in order to pursue, if not catch up with, the more advanced countries in their educational development. From this study, competency improvement needs of teachers in Personalized action learning teaching strategies using ICT in technical colleges have been identified to enable appropriate in-service trainings, in order to promote the ICT policy of the federal government of Nigeria in schools.

Recommendations

Based on the findings of the study, Personalized instruction through action learning teaching strategies using ICT should be implemented in vocational education to improve students' academic achievement and retention in vocational subjects. These instructional strategies and improvement of study in technical and vocational education using ICT can be implemented through:

1. Providing the teachers ICT devices as instructional materials and tools.
2. Providing free internet facilities in the school system.
3. Information and communication facilities should be provided in school libraries for students.
4. Educational policy implementers should conduct competence assessment of teachers, at various level of academic qualifications, on using Personalized action learning teaching strategy.
5. There should be in-service on-the-job training for practicing teachers using the Personalized action learning teaching strategies as a teaching tool.

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