EFFECTS OF MASTERY LEARNING APPROACH ON ACHIEVEMENT OF RADIO, TELEVISION AND ELECTRONIC WORKS STUDENTS IN TECHNICAL COLLEGES IN ANAMBRA STATE, NIGERIA

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Abstract
This study found the effects of the Mastery Learning Approach (MLA) on Achievement of Radio-Television and Electronic (RTVE) Works Students. The study was Quasi-experimental, and Solomon Four Non-equivalent Control Group Design was used. The target population comprised Radio-Television and Electronic Works Year II Students in Technical Colleges in Anambra State, Nigeria. Each Technical college provided RTVE Works Year II for the study; hence a total of 141 students were involved. The students were taught the same RTVE Works on Radio and audio-frequency amplifiers. The MLA teaching method was used in the experimental groups, while the Regular Teaching Method (RTM) was used for the control groups. The researchers trained the teachers in the experimental groups on the technique of MLA before the treatment. The pre-test was administered before treatment and a post-test after three weeks of treatment. The instrument used in the study was RTVE Achievement Test (RTVEAT) to measure students' achievement. The instrument was pilot tested to ascertain its reliability. The reliability coefficient α was 0.77. Experts ascertained their validity before being used for data collection. Data was analysed using t-test, ANOVA and ANCOVA. Hypotheses were accepted or rejected at significant level of 0.05. The study results show that MLA teaching method resulted in higher achievement. The researchers conclude that MLA is an effective teaching method, which RTVE Works teachers should be encouraged to use and implemented in all Technical College programmes in Nigeria.

Keywords: Mastery Learning, RTVE Works Achievement, Technical College

Introduction

Science is recognized widely as being of great importance for nations' economic well-being due to the many challenges facing them. These challenges include emergences of new drug-resistant diseases, effects of genetic experimentation and engineering, the ecological impact of modern technology, dangers of nuclear war and explosions, and global warming, among others (Alsop and Hicks, 2011; Minishi, Muni, Okumu, Mutai, Mwangasha, Omolo and Munyeke, 2004). As a result, rapid changes are taking place in the industry, communication, agriculture, and medicine. Electronics as an instrument of development plays a

dominant role in bringing about these changes by promoting national wealth industrialization, improving health, and advancing technological development.

Technological development in the workplace and industries has necessitated a need to equip students of Radio, Television, and Electronic (RTVE) Works with workplace basic and thinking skills, making them adaptable to the present and envisaged future changes. Electronics as a Science course has been regarded as the bedrock of modern-day technological breakthroughs. Electronic devices encompass all aspects of modern-day activities. For example, cars, computers, televisions, radio sets, and cell phones are experiencing fast, innovative electronic developments. According to Ogbuanya and Onuoha (2015), electronics is a field where power is used to activate other components such as diodes, resistors, transistors, and micro-chips on gadgets like radios and televisions stereos, video compact discs, and of course, computers. Electronics has many applications, for example, in medicine, where throughout this century, advances in electronics and medicine have gone hand in hand. The medical community has rapidly exploited the most fundamental discoveries in electronics to devise new techniques for diagnosing and treating a variety of illnesses. Even in the continuing research necessitated by the challenges posed by diseases such as COVID 19, Ebola, and HIV/AIDS, the development of high precision equipment employing principles of electronics remains necessary (Minishi et al., 2004).

There is need that requires a radical change from instructional approaches that are teacher-centred which are based on behavioural learning theories to those that are students-centred, which are based on cognitive psychological learning theories (Ogwo and Oranu, 2006). The teaching approach that a teacher adopts is one factor that may affect students' achievement (Mills, 1991). Therefore the use of appropriate teaching methods is critical to the successful teaching and learning of RTVE Works. In an attempt to achieve the objectives of technical college education and improve on achievement, various strategies of teaching have been researched, though in other subjects. This study aimed at finding the effects of the mastery learning approach (MLA) on achievement in RTVE Works.

Mastery Learning Approach (MLA) is an instructional method where students are allowed unlimited opportunities to demonstrate mastery of content taught (Kibler, Cegala, Watson, Barker and David, 2001). MLA involves breaking down the subject matter into units of learning, each with its objectives. The strategy allows students to study material unit after unit until they master it (Dembo, 2014). Mastery of each unit is shown when the student acquires the set pass mark of a diagnostic test. MLA helps the student to acquire prerequisite skills to move to the next unit. The teacher also is required to do task analysis and state the objectives before designating the activities. MLA can help the teacher know students' areas of weakness and correct it, thus breaking the cycle of failure. Results from research studies carried out on MLA suggest that MLA yields better retention and transfer of material, yields greater interest and more positive attitudes in various subjects than non Mastery Learning Approaches (Kibler et al, 2001). Other research studies report

similar findings (Wambugu & Changeiywo, 2013; Wachanga & Gamba, 2004; Hon, 1990). This teaching method had not been tried out in RTVE Works teaching and learning in Anambra State, where achievement in the subject has continued to decline. The study was meant to contribute to understanding the effects of MLA on academic achievement in the Technical colleges in Anambra State, Nigeria. Although RTVE Works is an important subject in economic, scientific and technological development most technical colleges do not offer it at all due to students' poor achievement in the subject. Often the teacher is blamed for the poor achievement among other factors such as availability of teaching facilities and the attitude of the students towards the subject. Teaching methods therefore are a crucial factor that affects the academic achievement of students (Mills, 1991).

After graduation students are expected to maintain electronic equipments. Umunadi (2009) notes that technical college graduates' skill achievement in electronics is on the decline which calls for immediate attention in order to arrest the situation. This unsatisfactory achievement has been partly blamed on inadequate teaching methods adopted by technical college teachers (Yalams and Fatiku, 2007). Student academic achievement according to Forum on Education and Technology (2001) is the attainment of articulated objectives by students, measured through a variety of identified instruments, which result in excellence and the ability to thrive in the rapidly changing world. This implies that academic achievement is a measure of what a student knows or can do after training. Students' achievements need to be improved in order to prepare them to succeed in the rapidly changing world. This may be achieved through the use of Mastery Learning Approach (MLA) instructional guide for instruction. The available research does not indicate any research on the effectiveness of Mastery Learning Approach in RTVE Works in Technical colleges in Anambra State, Nigeria. This research study was therefore intended to fill this gap in the body of knowledge. The study provides empirical evidence on the effects of MLA on students' achievement in RTVE Works in Technical colleges in Anambra State.

The purpose of the study was designed to investigate the effect of using MLA on students' achievement in RTVE Works. The specific objective of the study was to compare the achievement of students' taught RTVE Works through MLA with that of students taught through regular teaching methods.

Research Hypothesis

The following null hypothesis was tested in this study at a significance level of 0.05.

Hypothesis One: There is no significant difference in achievement in RTVE Works between students exposed to MLA and those not exposed to it.

Methodology

Quasi-experimental research involving Solomon's four Non-Equivalent Control Group Design was used for the study. This is because there was a non-random selection of students to the groups. RTVE Works classes exist as intact groups, and school authorities do not usually allow the classes to be dismantled and

reconstituted for research purposes. This design has the advantage over others since it controls the significant major threats to internal validity except those associated with interaction and history, maturity, and instrumentation (Borg and Gall, 2009; Fraenkel and Wallen, 2000). The conditions under which the instruments were administered were kept as similar as possible across the technical colleges to control instrumentation and selection. The technical colleges were assigned to the control and treatment groups. O1 and O3 were pre-tests; O2, O4, 05, 06 were the post-test; X was the treatment where students were taught using MLA.

The Research design may be represented as shown in fig1

Group I	O1	X	O2
Group II	O3	-	O4
Group III		X	O5
Group IV		-	O6

Figure 1. Solomon Four Non-Equivalent Control Group Research Design. Source: Fraenkel and Wallen (2000)

There was no sampling since the population is manageable. Hence all the RTVE Works Year Two students in the four Technical colleges out of the eight technical colleges in Anambra State were used for the study because they offer RTVE Works. The Technical colleges in each group are shown below.

Group 1 Federal Science and Technical College Awka (Experimental group) N= 35
Group 2 Government Technical College Nkpor (Control group) N=32
Group 3 Government Technical College Onitsha (Experimental group) N=45
Group 4 Government Technical College Umuchu (Control group) N=29
Therefore, the population in the research was 141 RTVE Works Year Two students.

For data collection, a twenty (20) item RTVE Works Achievement Test (RTVEAT) of multiple-choice questions was used to measure the students' achievement. The instrument was given to three experts for validation. The pilot-test was tested using technical colleges that were not included in the study but had similar characteristics. This ascertained the test reliability. The reliability coefficient was calculated using Kuder-Richardson formula 21. This method is suitable when test items can be scored correct or incorrect. The reliability coefficient of the RTVEAT instrument was 0.7670, which rounds of to α=0.77. According to Fraenkel and Wallen (2000), an alpha value of 0.7 or above is considered suitable to make group inferences that are accurate enough. The content used in the class instruction was developed based on the revised National Board for Technical Education (NBTE, 2004) syllabus. A guiding manual was constructed for the teachers involved in administering Mastery Learning Approach that was used throughout the treatment period. The teachers of the experimental groups were trained by the researcher on how to use the manual. These teachers were taught using MLA on Radio and audio frequency amplifiers for one week to enable them to master the skills.

For this study, RTVEAT was used to collect data. The pre-test was administered to the two schools in group 1 and group 2. Then treatment took three weeks and was given to the two experimental groups, after which posttests were administered to all the groups. The researchers scored the pre-tests and post-tests and generated quantitative data, which were analysed. ANOVA was used to analyse differences in the four means of the post-test scores. It was used to determine whether the differences were significant. ANCOVA was used to establish initial differences in the treatment and control groups. It reduces experimental error by statistical rather than experimental procedure (Borg and Gall, 2009; Coolican, 1994). A t-test was used when dealing with two means because of its superior power to detect differences between two means. Significance level of 0.05 was used to test the Null Hypotheses.

Table 1: RTVEAT Post-test Means

Group	N	Mean
1	35	15.56
2	32	7.077
3	45	16.03
4	29	7.81
Total	141	11.77

Results

The Solomon four-group design used in this study enabled the researchers to have two groups sit for pre-tests as recommended by Borg and Gall (2009). This enabled the researchers to assess the effects of the pre-test relative to no pre-test and assess if there was an interaction between the pre-test and the treatment conditions. The results of the pre-test scores on RTVEAT for groups 1and 2 showed a statistically significant difference $t(65) = 0.056$, $p > 0.05$. This means that the p-value was large, and therefore the obtained difference between the sample means is regarded as insignificant. This indicated that the groups used in the study exhibited comparable characteristics. Therefore, the groups were suitable for this study.

Effects of MLA on Students' Achievement in Radio-Television and Electronic Works.

To determine the relative effects of the MLA teaching method on students' achievement in Radio-Television and Electronic Works, an analysis of Students' Post-test RTVEAT was carried out.

Hypothesis

Table 2: Analysis of Variance (ANOVA) of the Post-test scores on the RTVEAT

Group	Sums of Squares	df	Means Square	F	p-value
Between groups	2602.83	3	867.54	68.44	0.005 (S)
Within groups	1987.19	137	12.55		
Total	4590.13	140			

* ($P < 0.05$, df = 3, F=68.44)

Table 3. Scheffe's Comparisons of the RTVEAT Post- Test means

	I Group	J Group	Mean Difference (I -J)	P-value
Scheffe's	1	2	7.78*	0.00
		3	-0.46	0.55
		4	7.74*	0.00
	2	1	-7.78*	0.00
		3	-8.25*	0.00
		4	-3.44 E-02	0.00
	3	1	0.46	0.96
		2	8.25*	0.55
		4	8.22*	0.00
	4	1	-7.74*	0.00
		2	-3.44 E-02	0.78
		3	-8.22*	0.00

*p < 0.05. Note. Values enclosed in the parentheses represent a statistical sign ificant difference

Table 4. Analysis of Covariance (ANCOVA) of the Post-test score with JSCE as a covariate

	Sum of Squares	df	Mean Square	F	p-value
JSCE	486.96	1	486.96	50.62	0.00
GROUP	2456.023	3	818.67	85.11	0.00
ERROR	1500.32	136	9.61		

* (F=85.11, df=3, p<0.05)

Table 5. ANCOVA of the RTVEAT Pre-test Score

	Sum of Squares	df	Mean Square	F	p-value
RTVEAT (Pretest)	5671.30	1	5671.30	444.52	0.00
GROUP	1092.05	1	1092.05	85.50	0.00
ERROR	880.31	64	12.75		

* (F=85.11, df=1, p<0.05)

Table 1 shows the students' post-test mean score for RTVEAT in the four groups. An examination of the table 1 shows that the mean scores for Groups 1and 3, the experimental groups, were higher than those of Groups 2 and 4. This shows that Mastery Learning Approach had an effect of improving performance compared to the Regular Teaching Method. Although a conclusion of whether to reject or accept the hypothesis cannot be made based on these results. Further analysis on an ANOVA was done as shown on Table 2.

Table 2 shows the results of the ANOVA post-test scores on RTVEAT. The table shows that there was a statistically significant difference between the means F (3,137) = 68.44, p <0.05. This means that the F factor is significant at p <0.05 level and between means square is statistically significantly greater than within means square. This shows that there is a highly significant overall treatment effect. That is, the null hypothesis could be rejected and can also conclude that there is probably at least one significant difference among possible comparisons of two means in the four groups. There was therefore, need to find out where this experimental effect was located. This made it necessary to carry out Scheffe's test of significance for a difference between any two means. The results are shown in Table 3.

Table 3 shows the results of Scheffe's test of significance for a difference between any two means. Table 3 show that the pairs of RTVEAT mean of groups 1 and 2, groups 1 and 4, groups 2 and 3 and groups 3and 4 were statistically significant different at the 0.05α-level. However there was no statistically significant difference in the mean between Groups 1and 3 and Groups 2 and 4. This study involved non-equivalent control group design there was therefore, need to confirm these results by performing analysis of covariance (ANCOVA) using the students' Junior School Certificate Examination (JSCE) scores as covariate. JSCE scores correlate closely with the scores used in this study.

Table 4 shows the ANCOVA of the post-test RTVEAT scores with JSCE scores as covariate. Table 4 shows a statistically significant difference in the RTVEAT mean scores of the four groups F (3,136) =85.11, p< 0.05. This confirms that the differences between the means are statistically significant at 0.05α-level. And therefore, the differences were a result of the treatment effect. This could be further confirmed by using ANCOVA with pre-test as a covariate, as shown in table 5.

An examination of Table 5 shows that the difference between groups 1 and 2 is highly statistically significant F (1, 64) = 85.50, P<0.05. This implies that the treatment condition affected Group 1 only. Since Group 1 was taught using MLA while Group 2 was the control; therefore the MLA teaching method gave higher achievement than the Regular Teaching Method. This confirms the results of the ANOVA and ANCOVA with JSCE as covariate, therefore Ho1 was rejected.

Discussion of Findings

The researchers found out that the students who were taught through the MLA teaching method achieved statistically significantly higher scores in the RTVEAT even when the students had no prior knowledge on the topic to be taught compared to those were taught through the RTM. This implies that MLA teaching method is more effective in enhancing students' achievement therefore concurs with the findings of previous research.

Bloom (1984) in his research on group instruction, showed scores of students taught through MLA were around the ninety-eighth percentile or approximately two standard deviations above the mean. A study conducted by Block (1971) showed that

students with minimal prior knowledge of material had higher achievement when taught MLA teaching method than those taught through regular teaching method. (Mevarech, 1985) showed that Mastery Learning was the indicator that significantly increased achievement. Wentling (1973) when comparing Mastery Learning and non Mastery Learning as to how feedback relates to achievement found that students who received feedback in MLA had higher achievement scores for both immediate achievement and long-term retention. The findings of this study concur with these results.

RTVE Works as a science subject fits in this category. The RTVE Works syllabus as recommended by the NBTE is orderly and sequential. This makes MLA an effective method of teaching in Nigerian Technical Colleges.

Conclusions

Based on the results of this study it can be concluded that MLA facilitates students learning in RTVE Works better as compared to RTM.

Recommendations

1. The use of MLA in the teaching of RTVE Works at technical college level can address the poor performance and the low enrolment in the subject. Therefore supplement the government's efforts to improve RTVE Works education in Nigerian technical colleges.
2. Curriculum developers will find the study helpful in designing appropriate instructional strategies involving Mastery Learning, which would enhance the learning of RTVE Works.
3. Teacher educators will find the study useful in developing programs aimed at producing teachers capable of structuring learning environment that can equalize their interaction with learners enabling greater learner participation, satisfaction and further academic aspirations.

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