

Effects of Kolb Learning Styles Model on Immediate and Delayed Retention of Motor Vehicle Mechanics Work Students in Technical Colleges

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Abstract -- This study was conducted in Benue State, Nigeria in order to establish the effects of the Kolb learning styles model on immediate and delayed retention of motor vehicle mechanics work students in technical colleges. Two research questions and two hypotheses led to the study in which 151 participants participated in quasi-experimental design involving pre-test post-test group design that was not equivalent. For data collection, the Kolb Learning Style Inventories version 3.1 and Motor Vehicle Work Achievement Test (MVMWAT) were used. The research questions were answered by mean, while null hypotheses was tested using Analysis of Covariance (ANCOVA). The research has shown that the group taught using Kolb learning styles significantly outperforms the group taught using a lecture method in both immediate and delayed retention. The conclusion was that the model of Kolb learning styles can improve retention for students than the usual lecture method.

Keywords -- Motor Vehicle Mechanics Work, Technical Colleges, Kolb Learning Styles Model, Retention.

1. Introduction

Motor vehicle mechanics work (MVMW) is one of the engineering trades offered at the Nigerian technical college level. MVMW is designed to produce craftsmen with sound technical know-how, knowledge of the working principles of automobiles and sound safety practices in automobile service (NBTE 2001). Learning MVMW trade is so complex because it involves identification of component parts, understanding of the working principles of the automobile systems, diagnosis and service skills as well as knowledge of safety practices. It has been observed the lecture and demonstration methods of teaching which is dominantly used in the technical colleges would not yield the desired success. In this regard, the crux of the matter has been the variations between learning styles and teaching methodologies which are said to be one of the factors influencing learning (Jalbani, 2014). This truly makes investigating the effects of learning styles concerning MVMW an indispensable endeavour.

The role of learning styles in education has been the subject of researchers for a number of years. This has led to the development of models of learning styles over the years in which Kolb learning styles model of experiential learning strategy features prominently (Manolis. Burns, Assudani & Chinta, 2013; Engel & Gara, 2010). The Kolb learning styles model is unique due to its default 4-stage training cycle as a teaching strategy, and the Kolb Learning

Style Inventory (LSI) for assessing learning styles preferences (Jilardidamavandi & Elias, 2011). Kolb learning styles model suggests that the analysis of experience can assist in the formation of the concept. After assimilating the concept and organizing it, it can then be applied to new experiences. This means that learning can be viewed as a pathway by which the conversion of experience contributes to knowledge development. Four key learning modes are used for learning in the Kolb model. This includes concrete experience (CE - feeling), abstract conceptualization (AC - thinking), reflective observation (RO - watching), and active experimentation (AE - doing) (Kolb, 1984). The learning style of the individual is, therefore, a combination of two of the four learning modes (Kolb, 2005). The four main learning types are thus: diverging (CE/RO), converging (AC/AE), assimilating (AC/RO), and accommodating (CE/AE). The 4-stage training cycle provides a leaning exercise where in CE, learners acquire experience by feeling; whereas in RO, learners make a review of what is happening by watching; similarly, in AC, learners interpret the event by thinking; and in AE, learners experiment by doing. This builds awareness by creating interactions that improve retention. (Healey & Jenkins, 2000; Engel *et al.* 2010).

Retention is the degree to which new memory experience can be held and reproduced whenever required. The role of retention is to store encoded events, experiences

and information so that they can be accessed in response to external stimuli (Hafeez & Aamir, 2014). Retention could be considered in terms of immediate or delayed retention. Although there is immediate retention of knowledge after a given instruction, there is a delayed retention of knowledge as to how much knowledge is remembered after a fairly long time after instruction (Fong and Nisbett, 1991). In this context, Karpicke (2016) found that teaching in a way that correlates to student learning styles boosts memory and allows a long-lasting, cohesive and well-organized transfer of information to increase immediate retention and success in general. However, scholars including Anat (2014); Yilmaz-Soylu & Akkoyunlu (2002) opposed that learning styles have no significant effect on immediate retention. Similarly, delayed retention is one of the robust learning measures and can be justified by the recall of knowledge after two weeks of instruction or more (Mathan & Koedinger, 2005). In this regard, some scholars such as Aydintan, Sahin & Uysal, (2012); Bas & Beyhan, (2013) reported that a substantial increase in delayed retention occurs when students receive instruction in an environment of learning that corresponds to their preferences. Jahanbakhsh (2012) and Onder (2012), on the other hand, maintained that learning styles had no significant impact on delayed retention.

There have been important studies to establish if preferential learning style has any relation with academic achievement. A lot of these previous researches have attempted to determine the relationship between the two variables: learning styles, and academic achievement.

The understudy on the impact of learning styles on the functional efficiency of the 4-step Basic Life Support (BLS) course has taken place in Schroder, Stieger, Henke, Biermann, Rossaint and Sopka (2017). The result showed that students who received instruction via Kolb learning styles model significantly outperformed their counterparts taught with different approach. It was concluded that the Kolb 4-Stage Learning Cycle addresses all types of learners with no difference in performance.

In a like manner, Soghra, Ali and Mohammad (2013) also carried out learning styles and academic results of English students as second-language courses in Iran. The findings showed that the level of retention of students taught according to the Kolb learning styles model was higher than that taught using lecture form. Therefore, it means that Kolb learning styles can be considered a strong indicator of any second language academic success, and attention should be given to improving the performance of the students specifically in second language learning and teaching.

Equally, Seyede and Kian (2017) conducted an investigation into the relationship between Kolb's learning styles and learning idioms among Iranian ELT students. The findings showed the strong, important and high association between the learning style and the learning of idioms in Kolb.

The relationship between experiential learning methods and the immediate and delayed retention of collocations between English as foreign language (EFLs) students was determined by Mohammadzadeh (2012). The results showed that student learning styles increase retention instantly and gradually, but with the statistically significant gap between the four classes.

The research involving the students' various types of learning and vocabulary retention have been the work of Hekmat, Ggaseem and Alireza (2015). The study showed a strong correlation between learning styles and vocabulary education and retention, especially when learning styles matches.

Similarly, Okafor, (2014) has carried out an analysis of the effects of the Kolb 4 stage learning model on the success and interest of students in vegetable crop production at High Schools in the State of Anambra, Nigeria. The result showed that students who had been trained with a 4-stage course outsmart students with a teaching technique with a significant difference in the mean output test. However, the experimental group taught during the four-stage training course of Kolb had substantially higher ratings than those taught using the teaching process. It was concluded that the 4-stage Kolb experiential learning model was an effective method for improved learning. It has been concluded that the 4-stage Kolb experience learning model is an effective method that enhances the immediate and timely retention of students as well as enhancing their interest in practical farming.

It is therefore imperative to explore more facts. Besides, the lack of literature on the effects of learning styles on the immediate and delayed retention of MVMW students makes further research relevant.

2. Statement of the Problem

It is no longer news that the incidence of low academic performance of technical college students has recently flooded scholarly literature and has thus become a source of concern for various stakeholders. It is sufficient to note that MVMW students are not spared from low academic performance. The Chief Examiner's report showed that while students' performance in the general education subjects improved significantly, the MVMW trade component recorded low performance (NABTEB 2015; 2016).

Earlier, Adebayo and Jimoh (2015) reported that high failure rates of MVMW students in May/June 2012 were due to inappropriate teaching strategies used by teachers. Naturally, most students subscribe to learning in particular ways with each learning style enhancing success in retaining what is learned. Research indicate, in addition, that students remembered 10% of what they have read, 26% of what they said, 30% of what they saw and heard, 70% of what they said and 90% of what they did (Chuah, cited in Abidin *et al.* 2011, p. 144). Since the Kolb learning styles model provides the opportunity to learn by seeing, hearing, watching, and doing, it would be sufficient to find out if the Kolb learning styles model has effects on the immediate

and delayed retention of MVMW students in Benue State, Nigeria.

3. Purpose of the Study

In particular, the study is to achieve the following aims:

1. Determine the difference in immediate retention of MVMW students taught with Kolb learning styles model and those taught with lecture method.
2. Determine the difference in delayed retention of MVMW students taught with Kolb learning styles model and those taught with lecture method.

4. Research Questions

The analysis was motivated by the following questions:

1. What is the difference in immediate retention of MVMW students taught with Kolb learning styles model and those taught with lecture method?
2. What is the difference in delayed retention of MVMW students taught with Kolb learning styles model and those taught with lecture method?

5. Research Hypotheses

The following null hypotheses were formulated and tested at 5% level of significance:

- Ho₁. There is no significant difference between the immediate retention of MVMW students taught with Kolb learning styles model and those taught with lecture method.
- Ho₂. There is no significant difference between the delayed retention of MVMW students taught with Kolb learning styles model and those taught with lecture method.

6. Research Method

This research was carried out using quasi-experimental design with allocated intact classes as the experimental and control groups. Of the six Technical

Colleges in Benue State, a total of 151 National Technical Certificate level two (NTC II) MVMW trade students constituted the population. The entire population was used without sampling, of which 93 were in the experimental group and 58 were in the control group.

The Kolb Learning Style Inventory Version 3.1 and a 30 multiple-choice test items Motor Vehicle Mechanics Work Achievement Test (MVMWAT) were used for data collection. The KLSI, V 3.1 was used only to obtain data on students' learning styles distribution, while MVMWAT was used to obtain data on the pre-test, immediate, and delayed retention tests scores of the experimental and control groups.

During the pre-test, the control and experimental groups were administered with the KLSI, V 3.1 and MVMWAT, during which the experimental group was taught using Kolb learning styles model (Kolb4-stage training cycle/teaching cycle), while the control group was taught using traditional lecture form. After the intervention, the immediate retention test on both the experimental and control groups were performed, followed by the delayed retention test after two weeks.

The research questions were answered using mean, while ANCOVA was used to check the significance level of null hypotheses at 0.05. There was no dismissal of the hypothesis where the P-value was greater than the alpha point ($P > 0.05$). On the other hand, the retention test grading was based on NABTEB specification, where any total marks $< 40\%$ means fail.

7. Results and Discussion

7.1 Research Question 1

What is the difference in immediate retention of MVMW students taught with Kolb learning styles model and those taught with lecture method?

Table 1: Mean difference in Immediate Retention of MVMW Students in the Experimental and Control Group

LEARNING STYLES	GROUPS				Mean diff.
	Experimental N = 93	\bar{X}	Control N = 58	\bar{X}	
Accommodating	28	64.36	11	43.36	
Assimilating	16	57.25	11	38.09	
Converging	7	75.71	3	39.00	
Diverging	42	65.19	33	33.52	
Group Mean		65.63		38.49	27.14

N = Number of Respondents; \bar{X} = Mean.

The data presented in Table 1 shows immediate mean retention scores $\bar{X} = 64.36$, $\bar{X} = 57.25$, $\bar{X} = 75.71$, $\bar{X} = 65.19$ and group mean $\bar{X} = 65.63$ for the experimental group, $\bar{X} = 43.36$, $\bar{X} = 38.09$, $\bar{X} = 39.00$, $\bar{X} = 33.52$ and group mean $\bar{X} = 38.49$ for the control group. Considering the group means, it shows that the difference in immediate retention of

MVMW students taught with Kolb learning styles model and those taught with lecture method is 27.14.

7.2 Research Question 2

What is the difference in delayed retention of MVMW students taught with Kolb learning styles model and those taught with lecture method?

Table 2: Mean difference in Delayed Retention of MVMW Students in the Experimental and Control Group

LEARNING STYLES	GROUPS				Mean diff.
	Experimental N = 93	\bar{X}	Control N = 58	\bar{X}	
Accommodating	28	61.71	11	41.55	

Assimilating	16	61.31	11	35.45	
Converging	7	64.71	3	28.67	
Diverging	42	64.79	33	35.45	
Group Mean		63.13		35.28	27.85

N = Number of Respondents; \bar{X} = Mean.

Statistics presented in Table 2 indicate delayed retention mean scores \bar{X} = 61.71, \bar{X} = 61.31, \bar{X} = 64.71, \bar{X} = 64.79, and group mean \bar{X} = 63.13 for the experimental group, \bar{X} = 41.55, \bar{X} = 35.45, \bar{X} = 28.67, \bar{X} = 35.45, and group mean \bar{X} = 35.28 for the control group. Considering the group means, it shows that the mean difference in delayed

retention of MVMW students taught with Kolb learning styles model and those taught with lecture method is 27.85.

7.3 Hypothesis 1

There is no significant difference between the immediate retention of MVMW students taught with Kolb learning styles model and those taught with lecture method.

Table 3: Analysis of Covariance of the Immediate Retention of MVMW Students taught with Kolb Learning Styles Model and those taught with Lecture Method

Dependent Variable: Post-test

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	29604.092 ^a	2	14802.046	94.533	.000
Intercept	35275.541	1	35275.541	225.287	.000
Pre-Test	1870.816	1	1870.816	11.948	.001
Group	26383.894	1	26383.894	168.501	.000
Error	23173.894	148	156.580		
Total	488140.000	151			
Corrected Total	52777.987	150			

($P < 0.05$)

ANCOVA in Table 3 contrasted the mean immediate retention of MVMW students taught with the Kolb learning styles model (Experimental Group) and those taught with the pre-test system (Control Group). Levene's test and tests of normality were performed and the expectations met. The immediate retention difference [F (1, 148) = 168.501, P= 0.000] was significant. The related likelihood (P = 0.000) < alpha level ($\alpha = 0.05$) was rejected according to the decision law, hence the null hypothesis.

This means that the immediate retention of MVMW students taught using the Kolb learning styles model and those taught using the lecture approach is substantially different.

7.4 Hypothesis 2

There is no significant difference between the delayed retention of MVMW students taught with Kolb learning styles model and those taught with lecture method.

Table 4: Analysis of Covariance of the Delayed Retention of MVMW Students taught with Kolb Learning Styles Model and those taught with Lecture Method

Dependent Variable: Retention Test

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	26127.779 ^a	2	13063.890	100.443	.000
Intercept	46657.429	1	46657.429	358.730	.000
Pre-Test	87.620	1	87.620	.674	.413
Group	25619.484	1	25619.484	196.978	.000
Error	19249.307	148	130.063		
Total	467736.000	151			
Corrected Total	45377.086	150			

($P < 0.05$)

ANCOVA in Table 4 contrasted the mean delayed retention of MVMW students taught with the Kolb learning styles model (Experimental Group) and those taught with the pre-test system (Control Group). Levene's test and tests of normality were performed and the expectations met. The delayed retention [F (1, 148) = 130.063, P = 0.000] was significantly different. The related likelihood (P = 0.000) < alpha level ($\alpha = 0.05$) was rejected according to the decision law, hence the null hypothesis. Therefore it means that there is a major difference between the delayed retention of

MVMW students taught using the model of Kolb learning styles and those taught using the lecture method.

8. Discussion of Findings

The finding from this study shows that the immediate retention of MVMW students taught using the model of Kolb learning styles model was higher than their counterparts taught using the lecture method. The hypothesis one test using ANCOVA revealed that the mean difference in favour of the experimental group was statistically significant between the immediate retention of

MVMW students taught using the Kolb learning styles model and the ones taught using the lecture method. This significant difference in the immediate retention recorded by the experimental group could be due to the exposure to varieties of learning experiences contained in the Kolb 4-stage training cycle. The Kolb learning styles model go a long way to enhancing learning process because; learning by feeling enables description, learning by watching enables explanation, learning by thinking enables creativity, and learning by doing enables mastery of procedural skills. Therefore, this result is in line with the results of Schroder, Henke, Stieger, Beckers, Biermann, Rossaint and Sopka (2017), whose analysis of the impact of learning styles on functional success following the four-step Basic Life Support (BLS) training approach: an empirical longitudinal study established that students who received instruction via Kolb learning styles model significantly outperformed their counterparts taught with different approach. The finding is further consistent with Soghra, Ali and Mohammad (2013) whose findings on learning styles and academic performance of second-language English-language students in Iran showed that the level of retention of students taught in accordance with the Kolb learning styles model was higher than that taught using the lecture method. This finding also upholds the finding of Okafor, (2014) whose study on the effects of Kolb's 4-stage cycle model of experiential learning on the output of students and involvement in vegetable crop production in senior high schools in Anambra State, Nigeria maintained that those taught with the 4-stage training process significantly outsmarted those taught using the lecture system.

Similarly, this study established that the delayed retention of MVMW students taught with the Kolb learning styles model was higher than their counterparts taught with the lecture method. The test of hypothesis 2 using ANCOVA demonstrated that the mean difference between the delayed retention of MVMW students taught with the Kolb learning styles model and those taught using the lecture method was statistically significant in favour of the experimental group. This finding may not be far from the fact that the use of Kolb learning styles model takes learners through a 4-stage training cycle of experiential learning, thus assisting them to learn which needs their realistic involvement in the learning process. The model also exposes students to different learning environments from which they interpret and thus establish a successful transfer of information to increase the retention of the educational process. This finding finds favour with Okafor, (2014) whose study revealed that students taught vegetable crops using the Kolb 4-stage training cycle demonstrated substantially higher delayed retention than their counterparts taught using lecture method. The finding is also in consonant with the result of Mohammadzadeh (2012) which revealed that students' learning styles improve immediate and delayed retention. It is further consistent with Hekmat, Ghasem and Alireza (2015) whose exploration of the relation between different styles and

vocabulary retention of the students was found to be strong, particularly in matching learning styles. The finding equally agrees with Seyede and Kian (2017) whose study demonstrated the relationship between the Kolb learning style and language learning is positive, important and high.

Earlier, Karpicke (2016); Aydin, Şahin & Uysal, (2012); Bas & Beyhan, (2013) forwarded that teaching in a professional way that matches student learning styles improves memory and creates a long-lasting, coherent and well-organized transfer of knowledge to enhance immediate retention and overall performance. However, scholars including Anat (2014); Yilmaz-Soylu & Akkoyunlu (2002); Jahanbakhsh (2012); and Onder (2012) opposed the absence of any important effect on immediate and delayed retention of learning styles.

9. Conclusion and Recommendations

Indeed, the study's results, which prove that the Kolb learning styles model has superior effects on the immediate and delayed retention of MVMW students in technical colleges in Benue State, Nigeria, are reliable. This has been possible as a result of the 4-stage training cycle in the Kolb learning styles model which provides the opportunity for experiencing, reflecting, thinking, and acting thus enhancing knowledge construction which is the main thrust of learning. Sequel to the results of this research; the following are recommendations:

1. Teachers at the Technical Colleges are encouraged to create different learning tasks that match learning styles for students and that benefit group learning to teach students within a unit lesson.
2. School administrators are encouraged to ensure that their teachers receive training on the use of the Kolb learning styles model for enhanced instruction that targets all learners regardless of individual learning differences.
3. Curriculum planners are encouraged to emphasize the application of Kolb learning styles models in curriculum implementation.

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