



## ABSTRACT

This study was designed to investigate effects of instructional design models on teaching of students of Motor Vehicle Mechanics Work in Technical Colleges in Kwara State. The study was a pre-test, post-test, non-equivalent control group quasi-experiment which involved groups of subjects in their intact classes assigned to

# EFFECTS OF DICK AND CAREY AND MORRISON, ROSS AND KEMP INSTRUCTIONAL MODELS ON MOTOR VEHICLE MECHANIC'S WORK (MVMW) STUDENTS' ACADEMIC ACHIEVEMENT IN TECHNICAL COLLEGES IN KWARA STATE

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## Introduction

The 21<sup>st</sup> century era is regarded as an information age and usually conveyed to the learners via a demonstration by some forms of verbal instructions (Anees 2013). Williams and Hodges described instruction as attempts to provide practitioners with some guidelines as to how best to facilitate the skill acquisition process. Instruction is a plan of teaching and learning activities in which learning



treatment groups. Two research questions and two hypotheses tested at 0.05 level of significance guided the study. The population of the study consisted of 109 Technical Colleges (NTC II) students of Motor Vehicle Mechanics Work in Kwara State. No sampling technique was employed due to manageable size of the subjects, 42 subjects were assigned to the experimental group 1 and 37 to the experimental group 2 ). The instruments used for data collection were, Motor Vehicle Mechanics Work Achievement Test (MOVMEWAT) lesson plan for experimental group 1 and Motor Vehicle Mechanics Work Achievement Test (MOVMEWAT). The MOVMEWAT was trial tested for the purpose of determining the psychometric indices of the test. The Kuder–Richardson Formula 20 was used because the test items are dichotomously scored and administered only once. The reliability coefficient of 0.82 was found. The data collected were analysed using mean while the hypotheses formulated to guide the study were tested using Analysis of Covariance (ANCOVA) at  $p < 0.05$  level of significant. The statistical package for the social sciences (SPSS) was used for analysis of data. Mean was used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the null hypotheses that guided the study at 0.05 level of significance. The study found out that Motor Vehicle Mechanics Work (MVMW) students taught with Dick and Carey Model had a higher mean achievement score than those taught MVMW with Morrison, Ross and Kemp Model. Based on the findings the study therefore recommends among others that; Technical teachers of Motor Vehicle Mechanics Work should adopt the use of instructional design model in teaching of Motor Vehicle Mechanics Work subjects.

**Keywords:** Instruction, Model, Academic Achievement, Motor Vehicle Mechanic Work

is organized and serves as the pivot on which the wheel of teaching is anchored (Isman, 2011).

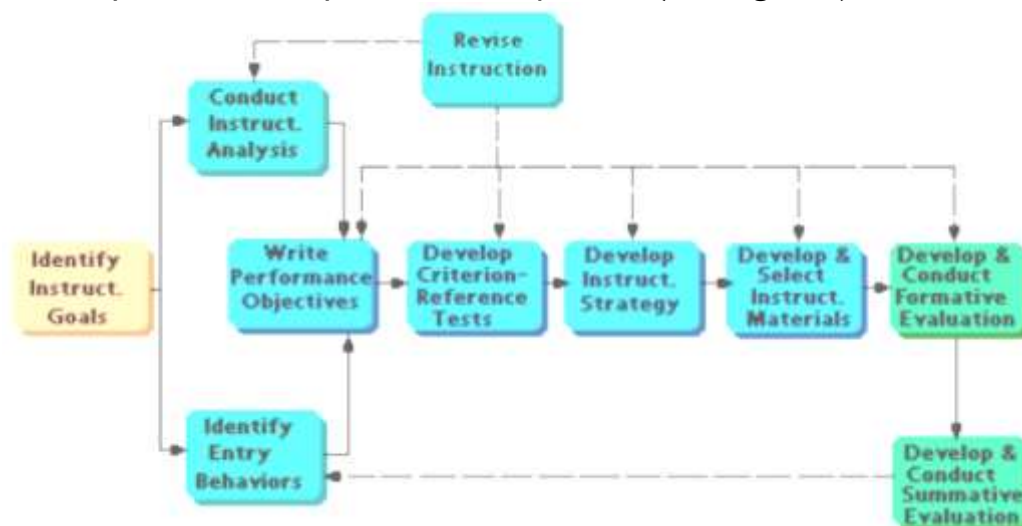


Sweetin (2005) defined instructional design as a systematic approach of developing instructional material. Smith and Ragan (2004) referred to instructional design as the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources and evaluation. This provides a framework or model for thorough planning, developing, and adapting instruction, based on learner's needs and content requirements. There are several models of the instructional design among which the basic one is the ADDIE model, a generic and simplified Instructional Systems Design (ISD) model. ADDIE is an acronym for Analyze, Design, Develop, Implement and Evaluate. Other instructional models as adopted in this study are: Dick and Carey Model, Morrison, Ross and Kemp Model etc.

### **Dick and Carey Model**

Dick and Carey Model is also known as Dick and Carey System Approach Model which is one of the most influential instructional design system oriented models. Brant (2001) stated that, the designers must end up with a product containing accomplished objectives and measureable outcomes. This process used in many businesses, government including military environments as well as performance technology and computer aided instructions reflects the fundamental design process (Gustafson & Branch, 2002).

The components for the model stated by Dick and Carey (2001) consist of nine procedural steps or linear sequences (See Figure 1).



**Figure 1: Dick and Carey Model (Source: Sherri Braxton's site on ID Models)**



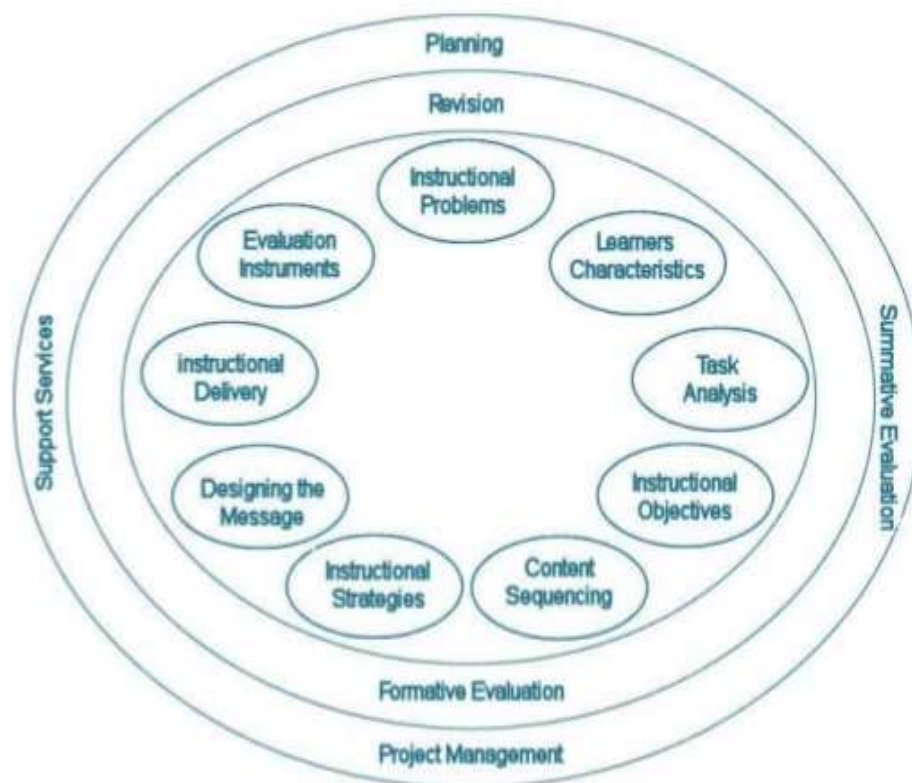
Each of these components is dependent upon one another indicated by the direction of solid arrow lines. Dotted lines presenting formative valuations points to instructional revisions that originates from reexamination of the instructional analysis' validity and entry behaviours of learners. The sequential steps of the design are as follows: (a) assess needs to help identify learning goals, (b) conduct instructional analysis and analyze learners and contexts, (c) write performance objectives, (d) develop assessment instruments (e) develop instructional strategies (f) develop and select instructional material (g) design and conduct formative evaluations, (h) revise instruction based from formative evaluation, (i) design and conduct summative evaluation (Dick, Carey & Carey, 2001; Gustafson & Branch, 2002).

The above descriptions clearly indicate the linear form for the Dick, Carey and Carey model. Each process cannot function as a stand-alone. Dick, Carey and Carey (2001), claims to say that the systematic approach of the model is an effective and successful approach because of its focus on learner's objectives and final achievement prior to the planning and implementation stage. There is a careful linkage between instructional strategy (targeted skill and knowledge) and desired learning outcomes (appropriate conditions must be supplied by instruction). The final and most important reason is the replicable and pragmatic design process where the product is useable for many learner and different occasions; time and effort revising the design product during the evaluation and revision process is recommended.

### **Morrison, Ross and Kemp Model**

Morrison, Ross and Kemp pounded this model in 2002. The Morrison, Ross and Kemp model is classroom-oriented and describes a holistic approach to instructional design that considers all factors in the environment. This model prescribes a process that is iterative and subject to constant revision. This extremely flexible model is designed to focus on content and appeal to teachers (Prester, 2002). The Morrison, Ross and Kemp model has three elements that differentiate it from some other models: instruction is considered from the perspective of the learner; the model takes a general systems view towards development (model components are independent of each other) with instructional

design being presented as a continuous cycle; and, the model emphasizes management of the instructional design process. Using this model (see Figure 2), the instructional designer begins by asking six questions related to the: (i) required level of learner readiness; (ii and iii) instructional strategies and media that are most appropriate for the content and the target population; (iv) level of learner support required; (v) measurement of achievement; (vi) strategies for formative and summative evaluation (Morrison, Ross, and Kemp, 2004). Using this classroom-oriented model, an individual with little instructional design skill could perform minimal front end analysis and develop a piece of instruction using few or no additional resources. The designer would select from existing instructional materials suited to a technically simple and non-distributed delivery media. They would perform little or no formative evaluation on the final materials (Gustafson and Branch 2002).



**Figure 2: Morrison, Ross and Kemp Model**

In contrast to other models, such as the Dick and Carey Model; the Kemp Design Model adopt as circular structure, rather than one that is linear. This circularity is achieved by viewing the nine core element of the model as interdependent rather than being designers a significant degree of





flexibility, because they are able to begin the design process with any of the nine components or stages, rather than being constrained to work in a linear fashion.

### **Nine Core Elements of the Morrison, Ross and Kemp Model**

In using Morrison, Ross and Kemp Model, the designer addresses the nine elements of the model. These elements are independent of each other in that they do not need to be considered in order nor must one start with a particular element. The nine elements are: identify instructional problems and specify goals for designing an instructional program; example learner characteristics that will influence your instructional decisions; identify subject content and analyze task components related to stated goals and purposes; specify the instructional objectives; sequence content within each instructional unit for logical learning; design instructional strategies so that each learner can master the objectives; plan the instructional message and develop the instruction; develop evaluation instruments to assess objectives; and, select resources to support instruction and learning activities. A more experienced designer, or one with access to more resources, could also use this model in the design of a complex and widely distributed program.

Motor Vehicle Mechanics Work students are usually taught the course using conventional teaching method of lecture delivery which seems inadequate; looking at NABTEB poor results in MVMW for the past six years. NABTEB Chief Examiner's report (2010-2015) highlighted the persistent poor achievement of Motor Vehicle Mechanics work students; this leaves one in doubt about the effectiveness of the mode of teaching used by the teachers of Motor Vehicle Mechanics Work. Tabotndip (2004) lamented that abstract teaching goes on today where teachers do not use apparatus and students are not using textbooks. This teaching method can hinder the development of individual student's active and creative abilities, and students who experience only this method of learning may no longer be considered sufficient for the needs of a future educated citizenry (Zhao, 2003). Ogbuanya and Owodunni (2014) stressed that teacher must react constantly to the immediate



events in the classroom despite having a basic plan of instruction that determines the important components of the lesson. Incorporating the use of instructional design models in the Nigerian education system could assist students to achieve better in their academic career.

Academic achievement can be described as the extent to which a student, teacher or institution has achieved their short or long-term educational goals (Anees 2013). The persistent poor academic achievement in Motor Vehicle Mechanic Work and other trade courses in technical colleges may be as a result of the inappropriate teaching methods adopted by teachers (Aina, 2000).

In spite of the changes in society due to advances in technology, Becker (2002) observed that traditional teaching methods are still predominantly used in schools. Hence, there is need to investigate effects of using instructional design models in teaching Motor Vehicle Mechanics Work in Technical Colleges in Kwara State.

### **Research Questions**

1. What is the effect of instructional models (Dick and Carey model and those taught with Morrison, Ross and Kemp Model) on students' academic achievement in Motor Vehicle Mechanics Work?
2. What is the effect of instructional models (Dick and Carey model and those taught with Morrison, Ross and Kemp Model) on students' retention Motor Vehicle Mechanics Work?

### **Hypotheses**

Ho<sub>1</sub>: There is no significant difference in the mean achievement scores of Motor Vehicle Mechanics Work students taught with Dick and Carey Model and those taught with Morrison, Ross and Kemp Model.

Ho<sub>2</sub>: There is no significant difference in the mean retention scores of Motor Vehicle Mechanics Work students taught with Dick and Carey Model and those taught with Morrison, Ross and Kemp Mode.



## METHODOLOGY

The design of this study is a quasi-experimental design; specifically, the pre-test and post-test non-equivalent group design. Quasi-experimental design according to Ali (2006) is a research design which uses non-randomized group and this option occurs when the researcher cannot randomly sample and assign the subjects. No control group was used because treatment was administered to the two groups. It is a quasi-experimental design because the two treatment groups were randomly assigned to two intact classes. The use of intact classes is to avoid disrupting normal class activities in the schools involved in the study. The research design is represented thus:

Group 1:      O X<sub>1</sub> O<sub>1</sub> O<sub>2</sub>  
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Group 2:      O X<sub>2</sub> O<sub>1</sub> O<sub>2</sub>

Where:

O = Pretest observations,      X<sub>1</sub>= Treatment 1 using Dick & Carey Model  
X<sub>2</sub> = Treatment 2 using Morrison, Ross and Kemp Model,      O<sub>1</sub> = Post Observation  
O<sub>1</sub> = Posttest observations,      O<sub>2</sub> = Retention test  
--- = Non-equivalent of the two groups

## Population of the Study

The population for this study comprised all 198 National Technical Certificate Year Two students (NTC II) offering Motor Vehicle Mechanics Work in all the five Technical Colleges in Kwara State. This data was obtained for 2016/2017 session from the Principals' Offices of all the Colleges. The reason for chosen NTC II student's class is that the students have been taught core areas of Auto Mechanic work and necessary skills on motor vehicle engine and fuel systems.

## Sample and Sampling Technique

The sample size for this study comprises 79 NTC II students (72 males and 7 females) drawn from two Technical Colleges in Kwara State . The sampling technique used was a multi-stage sampling technique. Purposive sampling technique was first used to select two Technical





Colleges with similar characteristics (in terms of poor performance in Auto Mechanic Work). Secondly, random sampling was used to select one intact class from each school. Finally, treatment was randomly assigned to each intact class, that is, one class was assigned Dick & Carey Model and Morrison, Ross and Kemp Model to the second class. At the third stage (that is within the selected clusters), no sampling was carried out because all the experimental subjects (students) in all the intact classes in the participating technical colleges was used for the study.

### **Instrument for Data Collection**

Two instruments were used for data collection in this study. They are the Motor Vehicle Mechanics Work Achievement Test (MOVMEWAT). Specifically, the questions were drawn from course outline of Motor Vehicle Mechanics Work. The MOVMEWAT was used for both pre-test and post-test to determine student's cognitive achievement in auto-mechanic trade. It consists of 30 items of multiple choice objective questions and adopted by the researcher from NABTEB past questions. Each objective question has 4 options A, B, C, D with a score of 1 mark each with a total of 30 marks. This test is designed to measure students' cognitive achievement during the lesson. The MOVMEWORT was used to determine the extent to which the experimental groups differed in remembering the contents taught and it was administered 2 weeks after the achievement test. The retention test was the same as the achievement test, except for the fact that, the items in the achievement test were re-organized.

### **Validation of the Instruments**

The Motor Vehicle Mechanics Work Achievement Test (MOVMEWAT) and a table of specification which guided the development of the test items was made available to the three validators (three lecturers from Industrial and Technical Education Department, University of Nigeria Nsukka) who were requested to validate the instrument based on the appropriateness of the instrument. Their suggestions and recommendations harmonized and used to produce the final copy of the instrument accordingly.



### **Reliability of the Instrument**

A trial test of the Motor Vehicle Mechanics Work Achievement Test (MOVMEWAT) was carried out using test-retest reliability technique. The instruments were administered on NTC II Motor Vehicle Mechanics Work students of Government Technical College, Okene, Kogi State because they did not form part of the respondents for the study. The Kuder–Richardson Formula 20 was used because the test items are dichotomously scored and administered only once. The reliability coefficient of 0.82 was obtained which indicated that the instrument is reliable.

### **Procedure for Data Collection**

Students' scores in the first administration of test items served as the pre-test scores of the study. After three weeks of lecture, after which the test items were re-arranged and re-administered to the students as post-test. The scores that were obtained from second administration served as post-test scores in the study. After 2 weeks, the items were rearranged and re-administered. The scores that were obtained from the third administration served as retention test scores in the study. Answer sheets were provided for the students to fill in the correct answer which was collected and marked to obtain the students' scores.

### **Method of Data Analysis**

The research questions were answered with the aid of descriptive statistic of mean and standard deviation, while the hypotheses were tested using inferential statistic of Analysis of Covariance (ANCOVA) using the Statistical Package for Social Sciences (SPSS) Version 20. The data collected from the pre-test, post-test and retention of Motor Vehicle Mechanics Work were analyzed using the mean of the test scores to answer the research questions. The pre-test post-test mean gain of each group (Dick and Carey Model group) and (Morrison, Ross and Kemp Model group) were compared to determine the group that performed better. The Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.



## PRESENTATION AND ANALYSIS OF DATA

### Research Question One

What is the effect of instructional models (Dick and Carey model and those taught with Morrison, Ross and Kemp Model) on students' academic achievement in Motor Vehicle Mechanics Work?

Data for answering research question 1 are presented in Table 1.

**Table 1**

**Mean and Standard Deviation of Pretest and Posttest Scores of the Experimental Groups in Motor Vehicle Mechanics Work Achievement Test**

Group	N	Pretest mean $\bar{x}$	SD <sub>1</sub>	Posttest mean $\bar{x}$	SD <sub>2</sub>	Mean Gain
Experimental Group 1 (Dick and Carey Model)	42	23.83	0.93	72.07	1.17	48.24
Experimental Group 2 (Morrison, Ross and Kemp Model)	37	22.95	1.01	70.24	1.36	47.29

N = No of student    SD<sub>1</sub> =Standard Deviation for the pretest    SD<sub>2</sub> = Standard Deviation for post-test

The data presented in Table 1 shows that the experimental group 1 had a mean score of 23.83 and standard deviation of 0.93 in the pre-test and a mean score of 72.07 and standard deviation of 1.17 in the post-test with a mean gain of 58.24. The experimental group 2 had a mean score of 22.95 and standard deviation of 1.01 in the pre-test and a post-test mean of 70.24 and standard deviation of 1.36 with a mean gain of 57.29. With this result, the students in the experimental group 1 taught Motor Vehicle Mechanics Work (MVMW) with Dick and Carey model improved more than experimental group 2 taught with Morrison, Ross and Kemp model. Hence, Dick and Carey Model is more effective than the Morrison, Ross and Kemp Model on students' academic achievement in MVMW.



### Research Question Two

What is the effect of instructional design models (Dick and Carey model and those taught with Morrison, Ross and Kemp Model) on students' retention in Motor Vehicle Mechanics Work?

Data for answering research question 2 are presented in Table 2.

**Table 2**  
**Mean and Standard Deviation of Posttest and Retention Scores of the Experimental Groups in Motor Vehicle Mechanics Work**

Group	N	Posttest mean	SD <sub>1</sub>	Retention test mean	SD <sub>2</sub>	Mean Loss
Experimental Group 1 (Dick and Carey Model)	42	72.04	1.17	65.89	0.51	6.15
Experimental Group 2 (Morrison, Ross and Kemp Model)	37	70.24	1.36	63.17	0.78	7.07

N = No of student    SD<sub>1</sub> =Standard Deviation for the pretest    SD<sub>2</sub> = Standard Deviation for post-test

Data presented in Table 2 shows that the Experimental group 1 had a mean score of 72.04 in the post-test and a mean score of 65.89 in the retention test with mean loss score of 6.15. While the Experimental group 2 had a mean score of 70.24 in the post-test and retention mean score of 63.17 with a post-test, retention mean loss of 7.07. With this result, the experimental group 1 retention of learning is higher than the retention of learning of the student in the Experimental group 2. The results therefore signify that students taught Motor Vehicle Mechanic Work with Dick and Carey Model retained their learning better than those taught with the conventional learning strategy.

### Test of Hypotheses

#### Hypothesis One

There is no significant difference in the mean achievement scores of Motor Vehicle Mechanics Work students taught with Dick and Carey Model and those taught with Morrison, Ross and Kemp Model



Analysis of hypothesis one was presented in Table 3.

**Table 3**

**Summary of Analysis of Covariance (ANCOVA) for Test of Significance of Effect of Treatment on Students' Achievement Test in Motor Vehicle Motor Work**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	274.023 <sup>a</sup>	2	137.012	9.963	.000
Intercept	186.098	1	186.098	13.532	.000
Pre-test	258.533	1	258.533	.518	.474
Treatment	7.125	1	7.125	18.799	.000
Error	1045.192	76	13.753		
Total	44642.000	79			
Corrected Total	1319.215	78			

a. R Squared = .053 (Adjusted R Squared = .012)

The data presented in Table 3 shows F-calculated values for mean scores of experimental groups in Motor Vehicle Motor Work achievement test. The F-calculated value for group is 18.799 with a significance of F at .000 which is less than .05 ( $p < 0.05$ ). Hence, the null hypothesis of no significant difference in the mean achievement scores of Motor Vehicle Mechanics Work students taught using Dick and Carey model and those taught with Morrison, Ross and Kemp Model is therefore rejected at 0.05 level of significance. With this result, there is significance between the mean achievement scores of students taught Motor Vehicle Mechanic Work with Dick and Carey Model and those taught with Morrison, Ross and Kemp Model.

### **Hypothesis Two**

There is no significant difference in the mean retention scores of Motor Vehicle Mechanics Work students taught with Dick and Carey Model and those taught with Morrison, Ross and Kemp Model.

Analysis of hypothesis three was presented in Table 4.





**Table 4**

**Summary of ANCOVA for Test of Significance of Effect of Treatment on Students' Retention in Motor Vehicle Work**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	90394.925 <sup>a</sup>	5	18078.985	370.089	.000
Intercept	67502.861	1	67502.861	1381.830	.000
Post test	265.215	1	265.215	18.923	.000
Group	64.034	2	32.017	.655	.521
Error	7425.252	152	48.850		
Total	451558.000	158			
Corrected Total	97820.177	157			

a. R Squared = .053 (Adjusted R Squared = .012)

The data presented in Table 4 shows that F calculated for the group is 0.655 with a significance of F at .000 which is greater than .05 ( $p=.521$ ,  $p>0.05$ ). The null-hypothesis is accepted at .05 of significance which implies that there is no significant difference in retention achievement score of students that used Dick and Carey Model and students that used Morrison, Ross and Kemp Model in learning Motor Vehicle Mechanics Work. Therefore, the use of both instructions had effective retention.

### **Findings of the Study**

The following findings emerged from the study based on the data collected and analyzed and hypotheses tested.

1. Motor Vehicle Mechanics Work (MVMW) students taught with Dick and Carey Model had a higher mean achievement score than those taught MVMW with Morrison, Ross and Kemp Model.
2. Motor Vehicle Mechanics Work students taught with Dick and Carey Model had retention of learning higher than the students than those taught with Morrison, Ross and Kemp Model.



3. There is significance between the mean achievement scores of students taught Motor Vehicle Mechanic Work with Dick and Carey Model and those taught with Morrison, Ross and Kemp Model.
4. There is no significant difference in retention achievement score of students that used Dick and Carey Model and students that used Morrison, Ross and Kemp Models

### **Discussion of the Findings**

The findings of this study shows that the students in the experimental group that is those taught Motor Vehicle Mechanics Work (MVMW) with Dick and Carey model improved more than experimental group. The result revealed that there is significance between the mean achievement scores of students taught Motor Vehicle Mechanic Work with Dick and Carey Model and those taught with Morrison, Ross and Kemp Model. The implication is that instruction model of Dick and Carey is more effective than Morrison, Ross and Kemp Model.

Data presented in Table 3 shows that students taught Motor Vehicle Mechanic Work with Dick and Carey Model retained their learning better than those taught with the Morrison, Ross and Kemp Model. Therefore, the use of both instructional design models leads to effective retention. This finding is in tandem with what Enohuan (2015) study found out that there was significant difference in the mean retention scores of students taught with instructional materials and those taught without instructional materials.

### **Conclusion**

The need for appropriate and adequate learning outcomes at all education levels is crucial in this contemporary world more than ever before. Educators are often tasked with developing courses and curricula that teach learners how to perform certain procedures by given instructions to learners. This instruction must be designed to provide an optimal, uniform learning experience for all learners. Instructions are often structured or modeled to present the abstract knowledge to learners. The use of model in teaching is usually discipline-specific as representation of a reality to learners. This study found out that



students taught Motor Vehicle Mechanics Work students taught with Dick and Carey Model had a higher mean achievement score than those taught with Morrison, Ross and Kemp Model. The mean difference was found to be significant. The study here was an effect of gender on the achievement of Motor Vehicle Mechanics Work students taught with Dick and Carey Model and those taught with Morrison, Ross and Kemp Model. The gender effect was found to be significant which favours the male in both models than female. These results therefore showed that instructional design model is more supportive in teaching technique to technical college students.

### **Recommendations**

Based on the findings of this study, Technical teachers of Motor Vehicle Mechanic Work are advised to:

1. adopt the use of instructional design model in the teaching of Motor Vehicle Mechanics Work subjects.
2. prepare their lessons in line with instructional design model guidelines to allow students to interact with them so as to improve their academic achievement.
3. Workshops, seminars and conferences should be organised for Administrators of Technical Colleges to enlighten technical them on the use of instructional design model in order to utilise it for improving students' academic achievement, retention and interest in Motor Vehicle Mechanics Work.

### **REFERENCES**

- Aina, O. (2000). Nigerian technical and vocational education in the near future in Federal Ministry of Education (2001). The National Master-Plan for Technical and Vocational Development in Nigeria in the 21st Century with the Blue Print for the Decade 2010. Abuja, FME.
- Ali, A. (2006). *Conducting research in education and social sciences*. Enugu: Tashiwa Networks Ltd.
- Anees, A. (2013). A study of academic Achievement in relation to intelligence of class VII students. *Excellence International Journal of Education and Research*, 1(3), 239-248.



- Becker, K. (April 2002). Constructivism and the use of technology. *The Technology Teacher* (electronic journal), TTTe. Retrieved from [http://digitalcommons.usu.edu/ete\\_facpub](http://digitalcommons.usu.edu/ete_facpub)
- Brandt, D. (2001). Information technology literacy: Task knowledge and mental models. *Library Trends*, 50(1), 73-84. Retrieved from Master FILE Premier database.
- Dick, W., Carey, L., & Carey, J. (2001). *The systematic design of instruction* (5th ed.). Boston: Allyn & Bacon.
- Federal Government of Nigeria. (2004). *National Policy on Education* (4th ed.). Lagos: Federal Ministry of Education Press.
- Gustafson, K. L. & Branch, R. M. (2002). *Survey of instructional development models* (4th ed.). Retrieved from [http://eric.ed.gov/ERICDocs/data/eridocs2/content\\_storage\\_01/0000000b/80/22/2d/58.pdf](http://eric.ed.gov/ERICDocs/data/eridocs2/content_storage_01/0000000b/80/22/2d/58.pdf)
- Morisson, G. R., Ross, S. M., & Kemp, J. E. (2004). *Designing effective instruction* (4th ed.). Hoboken, NJ: John Wiley & Sons Inc.
- NABTEB. (2012). May/June 2012) National Technical Certificate (NTC) and National Business Certificate (NBC) Examinations: Chief Examiner's Report.
- National Board for Technical Education. (2004). About Us. Retrieved August 21, 2019 from <https://net.nbte.gov.ng/about%20us>
- National Business and Technical Examinations Board (NABTEB), Fiesta Printing Press Ltd., Benin City, Edo State, Nigeria.
- Ogbuanya, T.C & Owoduni, S.A (2014).. Effects of relative inquiry technique on students' academic achievement and ability level in electronic work trade in technical colleges. Accepted for publication by Journal of Education and Practice.
- Okoro, O. M. (2006). *Principles and methods of vocational and technical education*. Nsukka, Nigeria: University Trust Publisher.
- Prester, Gus. (2002). *Instructional Design Models* [on-line]. Available: [http://www.personal.psu.edu/users/g/e/gep111/html/M4/L1%20-%20ISD/M4L1P1.htm#m4l1p1\\_intro](http://www.personal.psu.edu/users/g/e/gep111/html/M4/L1%20-%20ISD/M4L1P1.htm#m4l1p1_intro).
- Sweetin, J. (2005). *Instructional design: Basics instructor guide*. Pitt Community College. Retrieved from [http://www.pittcc.edu/distance-learning/faculty-resources/manuals/Instructional\\_Design\\_Basics\\_Instructor\\_Guide.pdf](http://www.pittcc.edu/distance-learning/faculty-resources/manuals/Instructional_Design_Basics_Instructor_Guide.pdf)
- Tabotndip, J.E. (2004). *Classroom practices in the Nigerian Educational Industry: A need for Redirection Secondary Education Management Board*. Owerri. Imo State.



Zhao, Y. (2003). The use of constructivist teaching model in environmental science at Beijing normal university. *China Papers*, 78-83.