BRIDGING THE GAP AMONGST VISUAL, AUDITORY AND KINESTHETIC LEARNERS IN BIOLOGY THROUGH THE USE OF DICK AND CAREY INSTRUCTIONAL MODEL

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Abstract. Students with different learning styles are lumped in a classroom for instruction which resulted to poor academic achievement. To bridge the gap among them, Dick and Carey instructional model was employed. Therefore, the study examined the effect of Dick and Carey instructional model for bridging the gap amongst different categories of students' learning style in biology. Pre-test, post-test, control group, switching replication quasi-experimental design, involving 2x3 factorial matrix was adopted. The sample consisted one hundred and two (102) SS 2 students offering biology in four purposively selected secondary schools, two schools each, from Odogbolu and Ijebu North Local Government Areas of Ogun State. Three hypotheses were formulated and tested at 0.05 level of significance. Three instruments were used to gather required data: Biology Achievement Test (r=0.85), Learning Styles Self-Assessment Test (r=0.64) and Dick and Carey Instructional Guide. Data were analyzed inferentially by Analysis of Covariance (ANCOVA). The results revealed that Dick and Carey instructional model had significant effect

on achievement in biology. However, no significant main effect of students' learning style was found on students' achievement in biology. No significant 2-way interaction effect of students' learning style was found in students' achievement in biology. It is recommended that curriculum planners/policy makers should encourage biology teachers to use Dick and Carey instructional model in secondary schools in Nigeria in order to bridge the gap among visual, auditory and kinesthetic students during classroom instruction.

Keywords: Dick and Carey instructional model, students' achievement, biology, learning style

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Introduction

Science education is very important to the development of any nation in both technologically and economically. Many of the developed worlds were able to achieve so much in science and technology because of science education. Science education in Nigeria concentrates on the teaching of science concepts, method of teaching and addressing misconceptions held by learners regarding science concepts (Alebiosu, 2017). Consequently, the students are being encouraged to take up science and technology-related disciplines.

Science education comprises three subjects namely biology, chemistry and physics. Biology is the science of life that studies living matter, structure, function and behaviours of organism and it is being taught at the senior secondary school level in Nigeria.[1)] The teaching of biology starts from nursery through primary to secondary and also to tertiary institutions. It is the basis for science-related courses like medicine, biotechnology, microbiology, zoology, botany, nursing, forestry, pharmacy, anatomy and so on.

Research results have shown that despite the importance attached to biology, the performance of Nigerian students in science and biology in particular has been unsatisfactory over the years (Adebanjo, 2020; Raji, 2017).

West African Examinations Council (WAEC) has also repeatedly reported poor performance of students in biology[1)] and this has been a concern to stakeholders. This can be attested to from the results of students in biology between 2016 and 2020.

Table 1. Students' achievement in the May/June biology between 2016 and 2020 in Nigeria

	Year	Total Entry	No of Passes	% of Passes	No of Failure	% of Failure
1.	2016	1,340,206	383,112	28.59	957,094	71.41
2.	2017	1,675,440	541,956	32.34	1,133,484	67.65
3.	2018	1,433,440	371,624	26.11	1,051,812	73.89
4.	2019	1,442,096	560,014	38.83	882,082	61.17
5.	2020	1,249,635	415,261	33.23	834,374	66.77

Source: WAEC Chief Examiner's Reports[2)]

Table 1 revealed that for the five years reviewed, the percentage of students that passed biology in senior school certificate examination at credit level and above (A1 – C6) was consistently less than 50% for the past 5 years (2016 -2020) and this has become a great concern to biology educators in Nigeria (Raji, 2017). The implication of the trend in performance is that only a few students would eventually be able to pursue biology related courses in the higher institutions (Adebanjo, 2020).

However, this scenario has been linked to many factors such as: negative attitudes of students towards Biology, inappropriate teaching methods, poor presentation mode, inadequate coverage of the syllabus, poor instructional strategy, social and economic influences (Alebiosu, 2017; Awobodu, 2016; Raji, 2017). In Nigerian secondary schools, different categories of students with different learning styles (visual, auditory and kinesthetic) are lumped in the same class and taught with the same concepts, under the same condition without considering their individual learning style (Gisanrin, 2019; Olurinola, 2017). The teaching and learning of biology at the senior secondary school

level should take care of the visual, auditory and kinesthetic learners. Raji (2017) stated that instructional practices in the biology classroom in Nigerian secondary schools, seems to favour only the visual learners. Gisanrin (2019) asserted that with the traditional method of teaching, the gap between the achievements of auditory and kinesthetic learners continue to widen.

Thus, there is need to explore approaches that will improve students' achievement at all levels of their learning styles. Raji (2017) reported that there is a positive correlation between good teaching approach and students' achievement at all levels in biology. According to Adedapo (2017), only the auditory students benefit from the conventional method of teaching. Therefore, Alebiosu (2017) opined that the most appropriate strategy for teaching any subject should depend on the nature of the subject and the needs of the students. There are ways to plan instruction in order to produce good results. One of such ways is by adopting Dick and Carey system instructional model.

Dick and Carey instructional model is an outlined methodical design and developmental process of system instructional design (ISD). It is a system-oriented ISD that breaks down into smaller components of instruction for easy transmission of instruction. The model describes instruction as a systematic process that includes balancing of all components such as the teacher, materials, students and learning environment to provide successful learning. It is a learner-centred model that inspires to learn and continues to learn. This is because once inspired, students are likely to have the zeal for learning. Dick & Carey (2001) contended that their model has goal-direct interdependence of all the components in the system, feedback mechanism to determine whether stated goals are met, and is self-regulating, i.e., modifying the steps until the desired goals are attained.

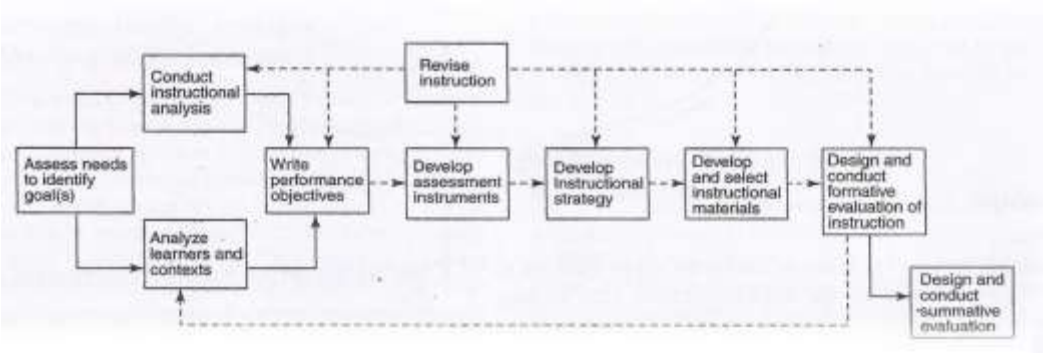

Figure I. Dick & Carey instructional model (Reiser & Dempsey, 2012)

Dick and Carey instructional model consists of ten connected main steps. They are as follows: (i) *Identifying Instructional Goal* – The instructional goal to be achieved is to make biology easier and fun to learn and understand by learners and less stressful for teachers to teach; (ii) *Conducting Instructional Analysis* – Lesson plans of biological concepts was written which contained an introduction, the content of instruction to be delivered with relevant instructional materials. Each lesson plan ends with a summary of the content of instruction and this is followed by interactive questions from students and thereafter the teacher will now evaluate his lesson; (iii) *Analyzing Learner & Context* – The learners' previous knowledge should be taken into consideration before learning new biological concepts. In determining the learning styles of students, the teacher administered an instrument called "Learning Style Self-Assessment Test (LSSAT)" on them and data collected were analyzed and used to categorize the learners into Visual, Auditory and Kinesthetic; (iv) *Writing Performance Objectives* – At the beginning of each lesson plan, the behavioural objectives were stated which measured Knowledge, Comprehension, Analysis, Application, Synthesis and Evaluation levels of the learner as regards the content of instruction using measurable terms; (v) *Developing Assessment Instruments* – At the end of lesson plan, multiple choice

questions, short quiz, oral test, group discussion/work, paper and pencil test, True/False questions were set parallel to the behavioural objectives stated in step (iv) above; (vi) *Development Instructional Strategy* –Student-centered instructional strategy that allowed active participation/ engagement of the learners was used by the teacher. The teacher also used illustration strategy that helped the learners to acquire knowledge, skills and ideas of the presented material; (vii) *Development and Selection of Instructional Materials* – Having realized the needs of the students based on the objectives stated, the teacher used real objects, specimens, model and coloured pictorial chart that were needed to be labeled during the lesson. The materials may be improvised or purchased so that effective teaching and learning can be promoted in the class-room; (viii) *Design and Conduct Formative Evaluation* – The teacher gave the practice test to the students in form of multiple choice questions, short quiz, oral test, paper and pencil test, True/False questions in order to determine their weaknesses. The practice test was meant to see what the students had and had not learned and to let both the students and the teacher know where more work was needed for revision. This was the step that provided the feedback needed for the teacher to identify the problems encountered by the students during in-struction; (ix) *Revise instruction* – data from the formative evaluation are summarised and interpreted, in an attempt to identify difficulties experienced by learners in achieving the objectives, and to relate such difficulties to specif-ic deficiencies in the materials; (x) *Summative evaluation* – This is an inde-pendent evaluation to judge the worth of the instruction. The teacher evaluated the students' progress towards achieving the stated instructional objectives.

Effectiveness of the model has been examined in Physics and Mathe-matics (Mohammad, 2012, Al-Khateeb, 2012). Their results showed that there was an improvement in students' achievement when taught with Dick & Carey instructional model. The effectiveness of Dick and Carey model in other teach-ing subjects should be of concern to researcher. Not only this, the effects of

students' learning styles on academic achievement in biology is worthy of further investigation.

Empirical studies on students' learning style have been conflicting. Some reported that visual learners performed better than auditory learners, while some reported otherwise. For instance, Adebanjo (2019) revealed that students' learning style have no influence on academic performance of the learners, while Gisanrin (2019) reported that auditory learners performed better than visual and kinesthetic when taught computer science using blended learning. However, Olurinola (2017) reported that visual and kinesthetic learners benefited than auditory learners when taught cultural and creative art using power point and multiple mouse presentation media.

In Nigeria, emphasis has not been laid on innovative strategies that can bridge gap amongst the achievement of visual, auditory and kinesthetic learners. In addition, very few empirical studies exist in Nigeria regarding the use of Dick and Carey instructional model (DCIM) in biology. Thus, much remains to be empirically studied on the effects of Dick and Carey instructional model (DCIM) on students' learning style in biology education in Nigerian secondary schools.

Statement of the problem

Biology is one of the springboards for technological and scientific development of all nations. But the incessant poor performance of students in both internal and external examinations vindicates that students find biology difficult. Difficult in learning biology has been associated with poor teaching methods teachers use in teaching the topics which failed to cater for learners' needs and also students' learning style in learning the subject. Literature searches reiterated that efforts should be geared towards employing new strategies in teaching generally and in biology particularly so as to bridge the gap amongst the achievement of visual, auditory and kinesthetic learners and make

the learning easy, interesting and enjoyable to students. Despite the benefits inherent in the adoption of Dick and Carey instructional model to instructional delivery, it has been observed that there is not much evidence that biology teachers have integrated this into instructional process. To what extent would the use of Dick and Carey instructional model (DCIM) be effective in improving students' achievement in biology irrespective of different students' learning style?

Hypotheses

The following hypotheses were generated to guide the study and tested at 0.05 level of significance.

H_{01}: There is no significant main effect of Dick and Carey instructional model on students' achievement in biology.

H_{02}: There is no significant main effect of students' learning style on students' academic achievement in biology.

H_{03}: There is no interaction effect of instructional strategy and students' learning style on students' academic achievement in biology.

Methodology

Research design

The study adopted a pre-test, post-test, control group switching replication quasi-experimental design with 2 x 3 factorial matrix. Switching replication quasi-experimental design was used in order to increase the internal validity of the study and to re-establish the efficacy of the treatment.

Design notation for pre-test, post-test, control group switching replication quasi-experimental design

N O_1 X O_2 O_3

N O_1 O_2 X O_3

O_1 = Pre-test for both groups

X = Treatment (Dick and Carey Instructional Model)

O_2 = Post-test for first phase in both groups

O_3 = Post-test for second phase in both groups

Population

The population for the study consisted of all SS 2 students offering biology in public secondary schools in Ogun State, Nigeria.

Sample and sampling technique

One hundred and two (102) students offering Biology forty-five (45) students in experimental group and fiftyseven (57) students in control group) participated in the study. A two-stage sampling technique was employed in selecting the sample. Firstly, a purposive sampling technique was used in selecting four public senior secondary schools (two schools each) from a total of twenty five (25) in Odogbolu Local Government Area and nineteen (19) public senior secondary schools in Ijebu North Local Government Area of Ogun State, Nigeria using the following criteria: they are public co-educational school; schools not very close to another school participating in the study in order to prevent subject interaction effect that could affect the internal validity of the study and experienced biology teachers. Secondly, a simple random sampling was used in assigning the two selected schools in each local government areas to either experimental or control group in the first phase. In the second phase, a switch over occurred in which the initial control group was given the treatment while the initial experimental group served as the "control". Four Biology teachers in the selected schools served as research assistants.

Research instrument

The research instruments used were Learning Styles Self-Assessment Test (LSSAT), Dick and Carey Instructional Model Guide (DCIMG) and Biology Achievement Test (BAT).

Test instrument

Learning Styles Self-Assessment Test (LSSAT) is an adapted version of Clark (2011). It was designed to help identify how students prefer to learn. The instrument was used to categorize students into of the three groups identified in the study (visual, auditory and kinesthetic). The inventory contains 30 items whose answers provide students with an indication of what their personal learning preference might be. The students were asked to respond to the thirty items to detect their learning style. Ten items each, representing the three categories, visual, auditory and kinesthetic were developed, and shuffled to control against respondents' fixation on any of the categories. The statements required respondents to indicate how each applied to him or her. Specifically, *1* means Not Like Me, *2* means A Little Like Me, *3* means Like Me, *4* means A Lot Like Me. Scores were totaled to determine students' learning style preference. Copies of LSSAT were administered on a sample of 20 SS 2 students outside the main study but similar in characteristics to the students for whom the instrument was intended in order to re-establish its reliability for the present study. A Cronbach alpha coefficient of 0.64 was obtained. LSSAT was administered to both experimental and control groups in the first phase. Means scores on the LSSAT was used to categorized students into three learning style groups (visual, auditory and kinesthetic).

Biology Achievement Test (BAT) was a multiple choice test consisting of 30-items with four options per item. The BAT was meant to measure students' achievement in biology. The items selected were from the past questions of Senior School Certificate Examination (WAEC and NECO) from

2018 to 2020. The validity of the BAT was ascertained by two experts in biology for face and content validity. The researcher also made use of table of specification. Necessary corrections arising from their advice was effected before the final draft of the instrument. The 30 –item BAT was then administered on a sample of twenty-five SS 2 students different from the main study and the result using split-half reliability was 0.85. The design involved replication and there was switching over. Some contents (transport and digestive systems) were taught before and also other contents (excretory and respiratory systems) were taught after replication. The researcher divided 30-item BAT into two equal parts based on the contents taught in each phase i.e. 15 items of BAT in phase one and the remaining 15 items of BAT in second phase.

The data were collected by administering the BAT at the pre-test and the post-test stages with two research assistants.

Treatment instrument

Dick and Carey Instructional Model Guide (DCIMG) was developed by the researcher and also a guide for the experimental group. It is a student-centred instructional strategy that promoted active learning so that the interaction between the teacher and the students could be optimal. Teaching in the two groups strictly followed the ten stages outlined in the Dick and Carey instructional model.

Experimental procedure

Teachers in both the experimental and control groups were given training and also informed of the dual roles they would be playing in the study (both experimental and control). In the first phase, 15 items from BAT representing the contents taught before switching replication was administered to both experimental and control groups as pre-test scores (O_1). The teachers in the experimental group taught the contents following (strictly) the steps prof-

fered in the DCIM when designing instruction while the teachers in control group were left to teach the contents in his/her own conventional way but following the contents of instruction as in experimental group. The treatment lasted for three weeks. At the end of teaching in both experimental and control groups, the teachers administered the BAT as post-test (O_2).

In the second phase, a switch over occurred where the initial control group served as experimental and the treatment was given, while the initial experimental group served as the "control" in order to re-establish the efficacy of the treatment. The teachers were given the other contents to teach. At the beginning of the second phase, the remaining 15 items from BAT representing the content taught after switching replication was administered to the experimental and control groups as pre-test. Treatment lasted for another three weeks in the second phase. At the end of teaching, the remaining BAT was rearranged and administered as post-test (O_3). Scores from the post-tests in the first (O_2) and second phases (O_3) as well as those from already collected pre-tests were collated for data analysis.

Data analysis

Data analysis was done using the analysis of covariance (ANCOVA) and multiple classification analysis (MCA). The analysis was done at two levels (before and after switching replication) and at 0.05 level of significance.

Results and discussion

H_{01}: There is no significant main effect of Dick and Carey instructional model on students' achievement in biology.

Table 2. Summary of analysis of covariance of students' achievement towards Biology according to treatment and learning style (before switching replication)

Source of Variation	Type III Sum of Squares	Df	Mean Square	F	Sig.
Main Effects	**305.110**	**1**	**305.110**	**131.527**	**0.000**
Explained	**1990.797**	**12**	**166.107**	**46.332**	**0.000**
Covariates (pre-test)	149.303	1	149.303	47.185	0.000
Treatment	581.001	1	581.001	194.686	0.001*
Learning Style	5.431	2	2.437	0.461	0.355
Treatment *Learning Style	6.452	2	3.125	0.544	0.587
Residual	**375.590**	**90**	**21.594**		
Corrected Total	**1602.883**	**102**			

* indicate significant F at 0.05 level R Squared = 0.766 (Adjusted R Squared = 0.722)

The result in Table 2 shows significant main effect of treatment ($F_{(1, 90)} = 194.686$, $P < 0.05$) in the first phase of the experiment. This implies that there is significant difference in the mean post-test achievement scores of the students after exposure to the two levels of instructional model. As a result, the null hypothesis one (H_{01}) is rejected.

The result in Table 3 shows that with a grand mean of 14.62, the students exposed to Dick & Carey instructional model (DCIM) recorded higher adjusted mean post-test achievement score of 17.72 (i.e. 14.62 + 3.10) than the students exposed to conventional method who recorded adjusted mean post-test achievement score of 16.87 (i.e. 14.62 + 2.25). This outcome reveals that Dick & Carey instructional model, with the higher adjusted mean post-test achievement score appears to be a better strategy for improving students' achievement in learning biology than the conventional method.

For a confirmation of this finding, the result of the ANCOVA test conducted on the post-test achievement score of the students after switching replication is presented next.

Table 3. Multiple classification analysis of students' achievement towards Biology according to treatment and learning style (before switching replication), grand mean = 14.62

Variables + Category Instructional strategies	N	Unadjusted Deviation	Eta	Adjusted for Independent + Covariates	Beta
Dick & Carey (DCIM)	45	-1.35	**0.07**	3.10	**0.25**
Conventional Method	57	-2.61		2.25	
Learning Style					
Visual	38	-0.62	**0.06**	1.77	**0.18**
Auditory	34	-1.73		0.88	
Kinesthetic	30	-0.82		1.85	
Multiple R					**0.83**
Multiple R squared					**0.91**

Table 4 presents the summary of the analysis of covariance (ANCOVA) test on the effect of treatment and learning style on the students' achievement scores in biology after switching replication. The result in table 4 shows significant main effect of treatment ($F_{(1, 90)} = 245.602$, $P < 0.05$) in the second phase of the experiment. This implies that there is significant difference in the mean post-test achievement scores of the students after exposure to the two levels of instructional model. As a result, the null hypothesis one (H_{01}) is rejected.

Table 4. Summary of analysis of covariance of students' achievement towards Biology according to treatment and learning style (after switching replication)

Source of Variation	Type III Sum of Squares	Df	Mean Square	F	Sig.
Main Effects	**1036.035**	**1**	**1036.035**	**111.220**	**0.000**
Explained	**2002.797**	**12**	**560.002**	**52.530**	**0.000**

Covariates (pre-test)	391.225	1	391.225	25.075	0.000
Treatment	890.123	1	890.123	245.602	0.000*
Learning Style	322.173	2	322.173	2.144	0.075
Treatment *Learning Style	8.222	2	8.222	3.437	0.766
Residual	**851.005**	**90**	**105.426**		
Corrected Total	**6005.356**	**102**			

* indicate significant F at 0.05 level R Squared = 0.766 (Adjusted R Squared = 0.722)

Table 5. Multiple classification analysis of students' achievement towards Biology according to treatment and learning style (after switching replication), grand mean = 20.05

Variables + Category	**N**	**Unadjusted Deviation**	**Eta**	**Adjusted for Independent + Covariates**	**Beta**
Instructional strategies					
Dick & Carey (DCIM)	45	2.50	**0.09**	8.09	**0.47**
Conventional Method	57	-1.18		3.50	
Learning Style					
Visual	38	-2.68	**0.06**	3.22	**0.22**
Auditory	34	-1.99		0.90	
Kinesthetic	30	-2.27		2.55	
Multiple R					**0.83**
Multiple R squared					**0.91**

The result in Table 5 shows that with a grand mean of 20.05, the students exposed to Dick & Carey instructional model (DCIM) recorded higher adjusted mean post-test achievement score of 28.14 (i.e. 20.05 + 8.09) than the students exposed to conventional method who recorded adjusted mean post-test achievement score of 23.55 (i.e. 20.05 + 3.50). This outcome reveals that Dick & Carey instructional model, with the higher adjusted mean post-test achievement score appears to be a better strategy for improving students' achievement in learning biology than the conventional method.

The significant effect of Dick & Carey instructional model on students' achievement in biology is an indication that students' interest was aroused during classroom instruction and this led to improved students' performance. The finding corroborated earlier findings of Adebanjo (2019). A plausible reason for this outcome might be due to the fact that students exposed to Dick & Carey instructional model participated actively in the learning process than the conventional group.

H_{02}: There is no significant main effect of students' learning style on students' academic achievement in biology.

The result of the main effect of students' learning style in tables 2 and 4 shows non-significant main effect of students' learning style on the students' achievement scores in biology ($F_{(2, 90)} = 0.461$, $P > 0.05$) in first phase and ($F_{(2, 90)} = 2.144$, $P > 0.05$) in the second phase. This outcome implies that there is no significant difference in the achievement scores obtained by the visual, auditory and kinesthetic learners in biology. As a result, the null hypothesis two (H_{02}) is retained. The non-significant outcome obtained after switching replication (the second phase of the experiment) for the main effect of students' learning style further confirms the finding that there is no significant main effect of students' learning style on the students' achievement in biology.

The result of the multiple classification analysis (MCA) on students' learning style in table 3 (the first phase of the experiment) shows a grand mean of 14.62 for the kinesthetic learners with adjusted mean post-test achievement score of 16.47 (i.e. 14.62 + 1.85) recorded the highest mean achievement score, followed by the visual learners with adjusted mean post-test achievement score of 16.39 (i.e. 14,62 + 1.77) while the auditory learners with adjusted mean post-test achievement score of 15.50 (i.e. 14.62 + 0.88) recorded the lowest mean achievement score.

This outcome shows that the kinesthetic learners recorded the highest achievement scores in the first phase of the experiment, although the obtained difference is not statistically significant. The result of the multiple classification analysis (MCA) on ability level in Table 5 (the second phase of the experiment) showed that with a grand mean of 20.05, the visual learners with adjusted mean post-test achievement score of 24.50 (i.e. 20.05 + 4.45), followed by the kinesthetic learners with adjusted mean post-test achievement score of 22.58 (i.e. 20.05 + 2.53) while the auditory learners with adjusted mean post-test achievement score of 20.95 (i.e. 20.05 + 0.90) recorded the lowest mean achievement score. This outcome shows that visual learners recorded the highest achievement scores in the second phase of the experiment (i.e. after switching replication), although the obtained difference is not statistically significant.

The results of the main effect of students' learning style on the students' achievement scores in biology shows that there is no significant main effect of students' learning style on achievement in biology. The finding is in consonance with Adebanjo (2019) who reported students' learning style have no influence on academic performance of the learners. The result however contradicts the finding of Olurinola (2017) reported that visual and kinesthetic learners benefited than auditory learners when taught cultural and creative art using power point and multiple mouse presentation media. Furthermore, it also contradicts the finding of Oyesanyen (2021) reported that only the visual learners benefited from vee diagram instructional strategy when taught practical chemistry

H_{03}: There is no interaction effect of instructional strategy and students' learning style on students' academic achievement in biology.

The results of the 2-way interaction effect of instructional model and gender in tables 2 and 4 show no significant interaction effect of the instructional model and students' learning style on the students' achievement scores

in biology ($F_{(2, 90)} = 0.544$, $P > 0.05$) in the first phase of the experiment and ($F_{(2, 90)} = 8.222$, $P > 0.05$) after switching replication (i.e., in the second phase of the experiment). This means there is no significant difference in the mean post-test achievement scores among visual, auditory and kinesthetic learners after exposure to the two learning strategies (Dick & Carey instructional model (DCIM) and conventional method teaching (CMT)) before and after switching replication. Hence, the null hypothesis three (H_{03}) is retained which revealed no significant interaction effect of the instructional model and students' learning style on the students' achievement scores in biology. The reason is that students tend to show more interest in what they did and this supports the findings of Gisanrin (2019) who reported that the performance of students would improve when they were delighted in what they are doing.

Conclusion

The study concluded that Dick and Carey instructional model enhanced students' academic achievement in biology. Therefore, the use of Dick and Carey instructional model improved visual, auditory and kinesthetic students' achievement in biology equally. This can serve as a medium of bridging the gaps among visual, auditory and kinesthetic students in biology.

Recommendations

In view of the findings, the following recommendations are made: (1) In order to enhance interesting, qualitative and effective teaching and learning, Dick and Carey instructional model should be employed in teaching biology so as to arouse the interest of the auditory and kinesthetic students during classroom instruction; (2) Curriculum planners/policy makers should encourage biology teachers to use Dick and Carey instructional model in secondary schools in Nigeria in other to bridge the gap among visual, auditory and kinesthetic students during classroom instruction; (3) Conferences, workshops and

seminars should be organized to biology teachers on effective usage of Dick and Carey instructional model.

NOTES

1. http://www.waecgh.org/examiners-report
2. https://www.waeconline.org.ng/e-learning/Biology/Biomain.html

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