Turkish Journal of Computer and Mathematics Education *Vol.12 No.13 (2021), 6438 - 6446*
Research Article

Comparison between the Use of Lecture and Workbook in Improving the Academic Performance of Students in Ecology

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Article History: *Do not touch during review process(xxxx)*

Abstract: This study aimed to compare the effectiveness of lecture and workbook in improving the academic performance of students in ecology in Don Mariano Marcos Memorial State University, Philippines. This an action research that made use of actual scores and interventions to improve the academic performance of 44 students enrolled in Ecology. There were 22 students in the A group (lecture) and another 22 students in B group (workbook). The use of pure lecture was applied to group A (lecture) and workbook was utilized to group B. The frequency, percentage and average mean were utilized to compare the performance of both groups in the pre-test and post-test. T-test was used to determine the difference of students' performance. Both groups, group A (lecture) and group B (workbook) performed poorly (59%) before the utilization of lecture to group A and workbook to group B as interventions. The average performance of group A (lecture) after the implementation of lecture as intervention was very good (89%) with 21.38% progress while group B (workbook) got (90%) equivalent to very good performance with 23.09% progress. Both groups have improved in their academic performance in ecology after the utilization of interventions but the use of workbook was more advantageous.

Keywords: Academic performance, ecology, improve, lecture, workbook

1. Introduction

This time, a big breakthrough is happening to the educational system worldwide. 21st century education focuses on learner centeredness. Effective teaching, student engagement and academic performance (**Delfino, 2019**) in the context of 21st century learning (**Ke-Du, 2018**) has become the spotlight of educational studies. The theory of constructivism is used by the educators wherein teachers' role is to manage the learning environment and to act as guide, facilitator, and coach since the role of a constructivist teacher is not to transmit knowledge (**Pelech, 2010**). **Jones and Brader-Araje** (**2002**) thought that for many educators, student learning is prioritized in a constructivist-type of instruction. **Splitter** (**2009**) embraced the idea that cultivation of dialogue should be a fundamental priority in classrooms that leads to "authentic" learning. Moreover, it is also crucial to understand students' perception on various pedagogical approaches when academic performance is to be addressed (**Mohammed et al., 2020**).

As we narrow down the concept of constructivism, we focus on the use of a student workbook as an educational material. These instructional materials include components that support learning and help guarantee knowledge acquisition in various teaching programs. They should satisfy the different learning styles and necessities of students (**Ulu Kalin, 2017**). Using a workbook for example, can lead students to generate their own conclusions in the activities. Moreover, 21st century teaching and learning process encourages constructivism where students should do some activities in order for them to understand the lessons. According **Pritchard and Woollard** (**2013**), constructivism is a theory founded on the premise that humans construct their knowledge and understanding of the world by reflecting on their own experiences but we cannot deny the fact that most of the learners are exposed to the lecture method. In fact, lecture is found out to be the most frequently utilized pedagogy in the study conducted by **Aban et al.** (**2020**). The same result was found by **Sicat** (**2015**) in his study on the effectiveness of traditional method (lecture method) in his study. Furthermore, **Broadwell** (**1980**) affirmed that lecture is used down through the years as a means of transmitting cognitive / factual data from a teacher to a group of students. The teacher is the expert, with all the data of access in the classroom.

2.Significance Of The Study

Educators' role is to conduct formative assessment or diagnostic test to detect the weaknesses of the learners at the start of the class. The result obtained from the formative assessment will serve as a guide to create an appropriate intervention that will address the problem on the teaching and learning process in the classroom. The

success of the teaching and learning process in the classroom is a great indicator of triumph. A Science News (**Boston College, 2019**) disclosed the assessment conducted by Boston College which revealed that students from East Asian countries outperformed in Mathematics, Science and reading at both the fourth and eighth grades. **Martin et al.** (**2004**), revealed the result of Trends in International Mathematics and Science Study (TIMMS) in the year 1999 and 2003 when Philippines is one among the countries underperformed in the assessment. The quality of education in the Philippines is deteriorating (**Vizconde, 2006**). Indeed, the performance of students needs special attention.

According to **Tobin** (**1993**), traditional practices have served us well and should be maintained, others have argued for a change in epistemology and have endeavored to break away conventional practice. Many educators nowadays are trying to address the low performance of their students in the classroom. In fact, **Arangco** (**2019**) discussed how the Philippines Republic Act (RA) 9155 mandates the Department of Education (DepEd) to require all school divisions to engage in educational research and studies. Gathering evidences of the problem at the national level helps administrators find ways to remedy the situation. But interventions can also start at the classroom level. Teachers can also do their share of investigation and exploration of the problems that students are facing. Identifying the specific problem in every class should be conducted so that the solution will really address the target problem. In essence, this is true because every subject, class, year level and school have various academic problems in different degrees of intensity. In view of these reasons, the researchers were encouraged to assess the effectiveness of the lecture method which is the most utilized teaching technique (**Aban et al., 2020**) and the use of workbook as an instructional material to authentic learning in improving the academic performance of the students in ecology. The findings of this study would provide information to educators regarding the effectiveness of lecture and the use of workbook to address the low performance of the students in the classroom.

3.Review Of Related Studies

3.1. The Lecture Method

In the 21st century of teaching and learning, the traditional lecture method is still the most preferred teaching pedagogy (**Aban et al., 2020**), however, most of the knowledge acquired through the lecture method is forgotten rapidly (**Danaei et al., 2011**). Though this may be the case, **Behr** (**1988**) reiterated that lecture method is still the most common form of teaching in higher education institutions throughout the world and this might continue to be so in the coming years. To address the monopolizing nature of this method, **Covill** (**2011**) mentioned that many professors and educators are being encouraged to use various type of teaching pedagogies, those which are active or student-centered in nature. **Safari et al.** (**2006**) tried to compare the perceived effect of lecture method to that of an active-discussion-type approach to see its impact on students' learning and satisfaction. They found out that students' learning increased during the discussion method, hence, they have recommended that in order to increase the learning in the classroom, student participation should also be increased by applying active teaching pedagogies.

Lecture method has survived a long pace of many technological advancements. One of the known strengths of this pedagogy is to teach an organized body of knowledge which is an essential constituent and an integral part of a school's curriculum. Therefore, this pedagogy is still a proliferating form of instruction in state universities, colleges, even in private institutions worldwide **(Kaur, 2011**). **Jones** (**2007**) investigated whether lecture method is an outmoded medium or an instrument of inspiration. He mentioned that although the method has been subjected to criticisms by educational constructivists, its strength lies on its immediacy and presence. It means that the lecture method has the quality of brining a learner or a student into direct and instant involvement, though at times in a passive way. On the other hand, **Shakarian** (**1995**) presented active teaching pedagogies that work beyond the utilization of the lecture method. Active learning strategies were encouraged by calling for learner participation and using a self-directed and independent approach (**Phillips, 2005**). In doing so, these active learning strategies were expected to promote critical thinking (**Walker, 2003; Youngblood and Beitz, 2001**) and achieve ability-based educational outcomes (**Gleason et al., 2011**).

3.2. The Use of Workbook

Traditional educators use the chalkboard method for their lecture. Advancements have replaced the chalkboard by using a PowerPoint presentation. Several studies tried to compare the effectivity of these two approaches (**DeSa and Keny, 2014; Bamne and Bamne, 2016**). The weakness of the latter approach in the perspective of the students is the difficulty in taking down notes while the lecture is going on. This may consequently affect learning. **Marsh and Sink** (**2010**) resolved this by investigating the effectivity of students' access to handouts of presentation during lecture. On the other hand, this was resolved by **Witecki and Nonneke** (**2015**) by suggesting the mobile device probably to photo-capture the essential PowerPoint slides during lecture. It seems that taking down notes or using the mobile phone to capture the essence of the teacher's lecture may lead to poor learning

efficiency. **Abadzi** (**2006**) therefore suggests that rather than copying from the blackboard or taking down notes, it is critical that learners be allowed to take books home. To even improve learning efficiency, **Utami et al.** (**2020**) pointed out the development of learning resources such as workbooks for themselves and the students which can be one effort that educators can do to enhance students' learning. This was also acknowledged by **Howard** (**2001**) by mentioning the potential of a course-designed workbook. Such workbook material can also be used as an educational aid (**Naden, 1984**). Workbook to enhance educational learning is agreed upon in various fields and specialization: for service learning (**Howard, 2001**), in learning ARCGIS (**Kennedy, 2013**), on the use of cooperative learning (**Cooper, 1990**), for dialectical behavior therapy skills (**McKay et al. 2019**), and for student essay writing (**Thurstun, 1997**). Furthermore, there have also been substantial workbooks used in the study of various ecological fields of study: in plant ecology (**Curtis, 1956**), in mathematical modelling in ecology (**Jeffries, 2012**), in ecological methods of behaviour and welfare (**Rees, 2015**); and in developmental ecology (**Bronfenbrenner and Morries 1998; Bronfenbrenner, 1995**). Despite substantial evidence in having workbooks in ecology, there was never a mention of an educational workbook in ecology to address students' performance, hence, this present study was pursued.

4. Methodology

4.1 Research Design and Sampling Method

To achieve the research purposes quantitative research was utilized. Descriptive research includes attributes identification of a specific phenomenon in a way that it can be observed as a basis of its interpretation. Furthermore, descriptive research also involves the exploration of correlation between two or more phenomena (**Williams, 2007**). The descriptive method was used to evaluate students' performance. Correlation was also utilized to compare the performance of groups A and B. The researchers considered total enumeration or 100 percent of the total population. This sampling method was similar to the published descriptive research of **Mehdipour et al.** (**2018**) where they identified the learning styles of students in Iran.

The respondents were the 44 third year teacher education students enrolled in Ecology. There were 22 students in both groups with 3 male respondents in group A and 2 male respondents in group B. Both groups are heterogeneous in terms of academic performance, a mixture of achievers and underperformed students. However, both groups are homogenous in terms of their performance before the interventions with a mean of 48.14 and 48.18 respectively. Moreover, using standard deviation the computed values were 9 and 10 respectively for the two groups which means they are almost of the same level of variation. Furthermore, the median of the age of the respondents are 20 years old, hence, two comparable groups were selected in the conduct of the study. Pure lecture was utilized to both groups before the use of workbook to group B.

4.2 Data Gathering Instrument

The researchers constructed the tests which were utilized to measure the performances of the students in Ecology using the lecture and the use of workbook. The test questions administered contained fifty objective type of questions for the pre-test and post-test. The questions constructed were based from the Ecology syllabus prepared by the teacher in Ecology. The table of specifications (TOS) was prepared for content validity.

4.3 Analysis of Data

The tests constructed were validated by the science teachers and the instruction facilitator of the College. Pilot testing was conducted to test the reliability of the items. There were 11 Biological Sciences major of the college of education as respondents for the pilot testing. The reliability coefficient was computed using the Kuder-Richardson 21 formula. The computed coefficient was 0.52 which indicated that the test was reliable. The researchers conducted this study for one semester. The researchers utilized the results of the pre-test and post-test of the students who were enrolled in Ecology. They recorded accurately and treated properly the scores of the two groups.

The following descriptive scale was used to interpret the means or averages in the pre-test and post-test given to the students: (1) students who scored above 94 have a descriptive equivalent of excellent; (2) students whose scores ranged from 89 to 93 have a descriptive equivalent of very good; (3) students whose scores ranged from 82 to 88 have a descriptive equivalent of good; (4) students whose scores ranged from 75-81 have a descriptive equivalent of fair; and (5) students whose scores were below 75 have a descriptive equivalent of poor. On the other hand, the scale below was used to interpret the scores in pre-test, and post-test in their transmuted equivalent: (1) the students who scored 75 percent or higher have a descriptive equivalent of passing; and (2) the students who scored below 75 percent have a descriptive equivalent of failing.

5. Findings and Results

Table.1. showing the level of performance of students in their pretest**.**

	Group A (lecture)			**Group B (workbook)**		
Scores /Equivalent	**Frequency**	**Percentage**	**Description**	**Frequency**	**Percentage**	**Description**
Above 94 - Excellent	0	0%	-	0	0%	-
89-94 - Very Good	0	0%	-	0	0%	-
81-88 - Good	3	13.64%	Passed	2	9.09%	Passed
75-80 - Fair	6	27.27%	Passed	8	36.36%	Passed
Below 75 - Poor	13	59.09%	Failed	12	54.55%	Failed
TOTAL	22	100% 40.91% 59.09%	9 Passed 13 Failed	22	100% 45.45% 54.55%	10 Passed 12 Failed
MEAN (Score/Equivalent)	**23.18 = 59 (Poor)**			**22.64= 59 (Poor)**		

Interpretation of table-1.

Table 1 indicates the level of performance of students in their pre-test. The ranges of scores were chronologically arranged in the leftmost column, from highest to lowest. Group A were the students who were to use the lecture method as an intervention. Consequently, Group B were those students who were to learn the ecology concepts through an ecology workbook as an intervention. As gleaned from the table, students from both groups did not achieve scores that is higher than 88. Similarly, before the interventions have been implemented, most of the students failed the test. The average mean of group A (lecture) was 23.18 and 22.64 for group B (workbook) this means that both of the groups' initial performance were comparably low. This indicates the necessity for educators to implement a certain teaching pedagogy so that students will be able to capture the hardcore scientific and technical concepts in ecology. It also implies that without any teaching intervention, learning will not be effective and quality education may not be achieved.

Table.2. showing the performance of the groups after the implementation of intervention

	Group A (lecture)		**Group B (workbook)**	
	Post Test		**Post Test**	
Score / Equivalent	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Above 94 - Excellent	1	4.55%	5	22.73%
89-94 - Very Good	16	72.73%	9	40.91%
81-88 - Good	4	18.18%	7	31.82%

75-80 - Fair	1	4.55%	3	13.64%
Below 75 – Poor Total	0	-	1	4.55%
Total	22	100%	22	100%
Mean (Score/Equivalent)	**39=89 (Very Good)**		**40=90 (Very Good)**	

Interpretation of table-2.

Table 2 shows the performance of the groups after the implementation of the lecture and workbook as interventions. Post-test of both groups A and B were comparable, with a mean score of 39 and 40 which is equivalent to 89, 90 respectively. This implies that lecture and the use of workbook can improve the academic performance of students in ecology. Whether the medium of teaching and learning process is on the use of lecture or workbook the students can still improve their academic performance as long as the teacher is doing his/her tasks strategically. The table also shows some interesting numerical observations. It appears that more students (22.73%) were able to get scores higher than 94 percent (excellent) when using an ecology workbook than those students who learned only through the lecture method (4.55%). This is a potential evidence that the ecology workbook used as an intervention in this study has the capability to promote learning in ecology.

Table.3. showing the comparison between the pre-test and post-test of group A (lecture) and group B (workbook).

Group	Mean Diff.	T value	p-value	Decision	Remark
Group A (lecture)	15.59	14.09	3.5E-12	Reject Ho	Significant
Group B (workbook)	16.91	14.19	3.11E-12	Reject Ho	Significant
Difference	1.32				

Interpretation of table-3.

Table 3 confirms the comparison between the pre-test and the post-test of group A (lecture) and group B (workbook). For group A(lecture) the t-value is equal to 14.09 and the p-value is 3.5E-12 while group B (workbook) the t-value is equal to 14.19 and the p-value is 3.11E-12. The remarks are both significant because the p-value is way less than 0.05. The smaller the p-value, the stronger is the evidence that the null hypothesis must be rejected. This further implies that there is a significant difference on the performance of group A (lecture) and group B (workbook) after the implementation of the interventions. In addition, the performance of group A (lecture) and group B (workbook) after the implementation of the interventions was comparable, and both groups have improvement. It can be deduced that the lecture method is still preferred technique used in this 21st century teaching and learning.

6. Discussions

6.1 The perceived learning effect using the lecture method versus using a workbook

Ngema (**2016**), found out that the medium of instruction and resources used in the classroom are some of the factors that contributed to the poor performance of the science students at the Ingwavuma Circuit. This implies that intervention should be done to improve the performance of the learners. This denotes that there is a need to improve the performance of the students using varied teaching methodologies/pedagogies.

The results of the study that showed an increased performance of students in the use of lecture and workbook support the suggestion of **Theroux** (**2002**) that lesson content and delivery are considered to be most important and students' master knowledge through drill and practice content need not be learned in context, lecture method was also supported by the study conducted by **Aban et al.** (**2020**), that students are used to lecture method. Teachers should evoke that lecture is also a good method to improve the academic performance of the students. On the other hand, **Bilbao et al.** (**2014**) teaching and learning must be supported by instructional materials. Considering the teaching methodologies and learning styles, the different support materials should be varied.

This will ensure that the individual differences will be considered. In addition, analysis of final test scores proves the effectiveness of using workbook on improving the critical thinking skills of college freshmen (**Wallace and Jefferson, 2015**). Experiential tasks and learning packages used within the lecture format were also perceived by the students as effective (**Butler, 1992**).

Since both interventions were effective in improving the academic performance of the groups, the combination of these two (lecture and workbook) could be better. Various ways to improve the lecture strategy has immersed in fact, **Huxham** (**2005**), made use of interactive windows to enhance the lecture method, **Robertson** (**2000**) made use of a computerized audience response system. Lecturers have made use of combined strategies towards interactive lecture method of instruction (**Maphosa and Ndebele, 2014**). Other lecture enthusiasts have used emerging technologies to make lecture teaching strategy more effective (**Ronchetti, 2010**). In fact, Digital natives have been exposed to computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age. Computer games, email, the Internet, cell phones and instant messaging have become integral parts of their lives (**Prensky, 2001**).

6.2 The reason why the lecture method is still a preferred teaching pedagogy

The main probable reason as to why the lecture method is still a preferred pedagogy even today is its focus on acquiring knowledge by efficiently and effectively using class time (**Ardalan, 2013**). **Aban et al.** (**2020**) found out that lecture method stood out to be the most frequently utilized pedagogy this statement supports the result of this study since students are used to lecture method there was an improvement in the performance of group A, who utilized the pure lecture furthermore, their study disclosed the need to utilize not only the lecture method but also the five other student-centered approaches so that authentic learning will transpire and quality education can be achieved so the result of their study is congruent to the result of group B (workbook) since this group used the workbook as intervention and they performed slightly higher than group A (lecture). In addition, the traditional teaching method (lecture) was advantageous to the respondents as seen in the result conducted by **Sicat** (**2015**). However, the use of lecture method compromises student-centeredness, interactive discussion and student enjoyment (**Covill, 2011**).

The study of **Thatcher et al.** (**2007**) suggested that the frequency of lecture attendance is significantly, but moderately, related to better academic performance and that 'always' attending lectures is the best indicator of academic performance. This denotes that at the start of the outcomes-based education students are seeking for more activities to perform. With loads of requirements and school activities, for them to improve their academics, they need more and varied activities as well as the lecture from the teacher that will inspire them to learn better. Instructional materials such as workbook utilization can help improve the performance of the learners. Authentic learning is eventually translated to quality education according to **Lombardi and Oblinger** (**2007**). **Hadzimehmedagic and Akbarov** (**2013**) suggested that the choice of method either traditional or modern teaching are the learners' need and character. The teacher in the class should also be aware on the type of learning style his/her students have.

7.Conclusion

The performance of students in Group A (lecture) and group B (workbook) was poor before the start of the class. Group B (workbook), who utilized the workbook in the subject had slight better performance than the students who received the pure lecture. The use of workbook has a positive impact in improving the performance of the students in Ecology. Both interventions were effective but the use of workbook is more advantageous in improving the academic performance of students in teaching ecology.

8. Recommendations

Based on the conclusions, the researchers offer the following recommendations: (1). The use of instructional materials such as workbook should be realized to heighten students' performance, (2). Teachers provide diverse activities to inspire students to be passionate and attentive in the classroom undertakings; (3). Utilization of the learning activities or workbook in ecology must be adopted especially this time of pandemic; and (4). Similar researches should be conducted using other variables to determine the performance of the students and the effectiveness of instructional materials and other strategies.

9. Recommendations

The researchers are very grateful to the Don Mariano Marcos Memorial State University for their support in this study.

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