Teaching Methods and Students' Academic Performance

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ABSTRACT: *The objective of this study was to investigate the differential effectiveness of teaching methods on students' academic performance. A sample of 109 undergraduate students from the College's Department of Economic and Business Sciences was used for the study. Using the inferential statistics course, students' assessment test scores were derived from the internal class test prepared by the lecturer. The differential effectiveness of the three teaching methods on student academic performance was analysed using the General Linear Model based univariate ANOVA technique. The $F_{(2, 106)}$ statistic (= 10.125; $p < 0.05$) and the Tukey HSD post-hoc results indicate significant differences on the effectiveness of the three teaching methods. The mean scores results demonstrate that teacher-student interactive method was the most effective teaching method, followed by student-centered method while the teacher-centered approach was the least effective teaching method.*

KEYWORDS: *teacher-centered, student-centered, teacher-student interactive and performance*

I. INTRODUCTION

The primary purpose of teaching at any level of education is to bring a fundamental change in the learner (Tebabal & Kahssay, 2011). To facilitate the process of knowledge transmission, teachers should apply appropriate teaching methods that best suit specific objectives and level exit outcomes. In the traditional epoch, many teaching practitioners widely applied teacher-centered methods to impart knowledge to learners comparative to student-centered methods. Until today, questions about the effectiveness of teaching methods on student learning have consistently raised considerable interest in the thematic field of educational research (Hightower et al., 2011). Moreover, research on teaching and learning constantly endeavour to examine the extent to which different teaching methods enhance growth in student learning.

Quite remarkably, regular poor academic performance by the majority students is fundamentally linked to application of ineffective teaching methods by teachers to impact knowledge to learners (Adunola, 2011). Substantial research on the effectiveness of teaching methods indicates that the quality of teaching is often reflected by the achievements of learners. According to Ayeni (2011), teaching is a process that involves bringing about desirable changes in learners so as to achieve specific outcomes. In order for the method used for teaching to be effective, Adunola (2011) maintains that teachers need to be conversant with numerous teaching strategies that take recognition of the magnitude of complexity of the concepts to be covered.

1.2 Research Problem
Suboptimal academic performance by the majority students at higher education level has largely been cited to be the result of ineffective teaching methods by lecturers.

1.3 Research Objective
The primary objective of this study was to investigate whether there are significant differences between the effectiveness of different teaching methods on students' academic performance.

1.4 Research Question
Are there any significant differences between the effectiveness of different teaching methods on students' academic performance?

1.5 Null Hypothesis
There exist significant differences between the effectiveness of different teaching methods on students' academic performance.

1.6 Significance of the Study
The results of this study will provide useful insightson the differential effectiveness diverse teaching methods have on students'academic performance.

II. LITERATURE REVIEW

2.1 Introduction

According to Ayeni (2011), teaching is a continuous process that involves bringing about desirable changes in learners through use of appropriate methods. Adunola (2011) indicated that in order to bring desirable changes in students, teaching methods used by educators should be best for the subject matter. Furthermore, Bharadwaj & Pal (2011) sustained that teaching methods work effectively mainly if they suit learners' needs since every learner interprets and responds to questions in a unique way (Chang, 2010). As such, alignment of teaching methods with students' needs and preferred learning influence students' academic attainments (Zeeb, 2004).

2.2 Teacher-Centered Methods

Under this method, students simply obtain information from the teacher without building their engagement level with the subject being taught (Boud & Feletti, 1999). The approach is least practical, more theoretical and memorizing (Teo & Wong, 2000). It does not apply activity based learning to encourage students to learn real life problems based on applied knowledge. Since the teacher controls the transmission and sharing of knowledge, the lecturer may attempt to maximize the delivery of information while minimizing time and effort. As a result, both interest and understanding of students may get lost. To address such shortfalls, Zakaria, Chin & Daud (2010) specified that teaching should not merely focus on dispensing rules, definitions and procedures for students to memorize, but should also actively engage students as primary participants.

2.3 Student-Centered Method

With the advent of the concept of discovery learning, many scholars today widely adopt more supple student-centered methods to enhance active learning (Greitzer, 2002). Most teachers today apply the student-centered approach to promote interest, analytical research, critical thinking and enjoyment among students (Hesson & Shad, 2007). The teaching method is regarded more effective since it does not centralize the flow of knowledge from the lecturer to the student (Lindquist, 1995).The approach also motivates goal-orientated behaviour among students, hence the method is very effective in improving student achievement (Slavin, 1996).

2.4 Teacher-Student Interactive Method

This teaching method applies the strategies used by both teacher-centered and student-centered approaches. The subject information produced by the learners is remembered better than the same information presented to the learners by the lecturer (Jacoby, 1978; McDaniel, Friedman & Bourne, 1978; and Slamecka & Graf, 1978). The method encourages the students to search for relevant knowledge rather than the lecturer monopolizing the transmission of information to the learners. As such, research evidence on teaching approaches maintains that this teaching method is effective in improving students' academic performance (Damodharan & Rengarajan, 1999).

II.   METHODOLOGY AND PROCEDURE

3.1 Introduction

This section describes the research design used in the study, population and sample, data collection, treatment of the experiment and statistical analytical techniques applied in the study.

3.2 Research Design

The research design for this investigation was an experimental study. The independent variables were teacher-centered method, student-centered method and teacher-student interactive method; and the dependent variable was student test scores.

3.3 Population and Sample

The population for this study was undergraduate students from three fields of specialisation; namely Human Resource Management (HRM), Accounting (ACC) and Marketing Management (MM). The students fall under the Department of Economic and Business Sciences; Kempton Park (Higher Education and Training) Campus; PC Training & Business College; South Africa. The sample consisted of one hundred and nine (n=109) students; from which 22.9% (n=25) were males and 77.1% (n=84) were females.

3.4 Data

The data for the study were generated from students' academic performance assessment test scores. The test was prepared by the lecturer from selected topics of inferential statistics; namely confidence interval estimation, hypothesis testing and chi-square distribution. The content validity of the test paper was ensured

through moderation in line with the institutional academic quality assurance system. The test was prepared based on the course exit level outcomes.

3.5 Treatment
The sample was categorised into three groups; Group 1 comprised of HRM (n=46) students, Group 2 comprised of ACC (n=38) students and Group 3 encompassed MM (n=25) students. During the teaching and learning process, teacher-student interactive, teacher-centered and student-centered methods were applied on HRM, ACC and MM groups; respectively.

3.6 Statistical Technique
The General Linear Model based univariate ANOVA technique was applied to examine the effectiveness of teaching methods on student academic performance; following the framework adopted by Cooper & Cohn (1997):

$$F\left(y_{ij}, x_{ij}\right) \leq C \qquad\qquad \text{----------------------------- (1)}$$

where: F represents the function which transforms x into y; y denotes academic performance test score of the ith student in group j; x represents the ith teaching method applied to group j; and C denotes the positive scalar; which overall further reduces to:

$$TS_{ij} = \varphi_j + \varphi_j TM_{ij} + \varepsilon_{ik}; \qquad\qquad \text{----------------------------- (2)}$$

where: TS represents academic performance test score of the ith student in group j; TM denotes the teaching method applied on the ith student in group j; and φ_j captures the effectiveness of the teaching method applied to a particular group.

The effectiveness of teaching methods was analysed using descriptive statistics and the ANOVA approach. Descriptive statistics were used to analyse the estimated marginal means, standard deviation and standard error estimates; while the ANOVA Tukey HSD post hoc test was applied to examine whether any significant differences existed between the students' performance mean scores of the three teaching methods.

III. RESULTS AND INTERPRETATION
4.1 Descriptive Statistics
The outcome variable was students' performance assessment test scores generated from the internal test prepared by the lecturer. Data were analyzed using descriptive statistics to examine the profile of the sample. From the sample of hundred and nine (n=109) students; 77.1% were female and 22.9% were male. Leaners' performance assessment test scores were recorded in the high, moderate and low band categories; upon which 30.3% (n=33), 67.0% (n=73), and 2.8% (n=3) were in the low, moderate and high classes; respectively. The test results were categorically scaled as: [75-100%] = high; [50-74%] = moderate;and [0-49%] = low (Figure 1).

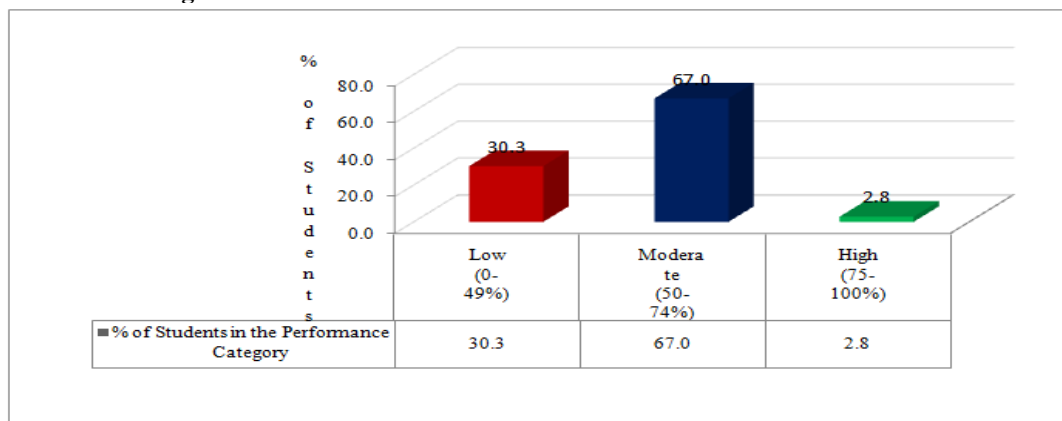**Figure 1: Students' Academic Performance Assessment Test Scores**

Table 1: Descriptive Statistics

Performance Assessment Test Scores Based On Teaching Method:	Estimated Mean	Standard Deviation	Standard Error	95% Confidence Interval	
				L.B.	U.B
Teacher-Student Interactive (n=46)	1.87	0.499	0.074	1.733	2.007
Teacher-Centered (n=25)	1.36	0.490	0.098	1.174	1.546
Student-Centered (n=38)	1.79	0.413	0.067	1.639	1.940

Based on the teaching method applied, the estimated marginal mean estimates reveal that teacher-student interactive approach produced the high mean score (mean=1.87), followed by the student-centered approach (mean=1.79) and the lowest mean score (mean=1.36) was recorded for the teacher-centered approach. The mean estimates for all the three teaching methods fall within the 95% confidence interval bands.

The results reveal that combining both teacher-centered and student-centered teaching methods in teaching learners is the most effective approach that produces best student results. This result is consistent with the finding by Wiggins (1987) who reported that interaction between the teacher and students during the teaching and learning process encourages the students to search for knowledge rather than the lecturer monopolizing the transmission of information to the learners. The estimated mean score (mean=1.79) recorded for the student-centered approach is marginally lower than that of the teacher-student interactive approach. This indicates that student-centered methods are also an effective teaching approach, which is consistent with the finding by Lindquist (1995) who indicated that student-centered methods promote greater mastery of the subject than centralizing the flow of knowledge as a one way channel from the lecturer to the student. Application of teacher-centered methods produced results that were significantly lower (mean=1.36) comparative to those derived when using teacher-student interactive and student-centered approaches. This confirms with the finding by Hake (1998) who reported that students' little or no active involvement in the learning process could lead them score poor academic achievement results.

4.2 Tests of Between-Subjects Effects
The results derived from the tests of between subjects effects (Table 2) indicated significant differences between performance test scores of the three teaching methods.

Table 2: Between-Subjects Effects Tests

Source	Type III Sum of Squares	df	Mean Square	F-Statistic	Sig.
Corrected Model	4.450[a]	2	2.225	10.125	0.000
Intercept	286.080	1	286.080	1.302E3	0.000
Teaching Methods	4.450	2	2.225	10.125	0.000
Error	23.293	106	0.220		
Total	352.000	109			
Corrected Total	27.743	108			
a. R Squared = 0.160 (Adj. R Squared = 0.145)					

The performance assessment scores of students differed significantly among the three teaching methods ($F_{(2, 106)}$ statistic (= 10.12) at 0.05 level of significance). Together with the SS, the corrected total of 27.743 indicates variability in the performance assessment test score variable. The R-Squared (0.160) equals the SS (Teaching Method)/SS (Corrected Total) = 4.450/27.743. To detect which of the three teaching methods assessment mean scores differed significantly from one another; the Tukey HSD post hoc test was applied for the analysis (Table 3). In light of the number of comparisons that were made, the Tukey post hoc approach was applied because of its power to control for alpha inflation.

Table 3: Tukey HSD Post Hoc Tests

(I) Teaching Method (J) Teaching Method	Mean Diff (I-J)	Std. Error	Sig.	95% CI	
				L.B	U.B
Teacher-Centered Student-Centered	-0.429*	0.121	0.002	-0.72	-0.14
Teacher-Student Interactive	-0.510*	1.116	0.000	-0.79	-0.23
Student-Centered Teacher-Centered	0.429*	0.121	0.002	0.72	0.14
Teacher-Student Interactive	-0.080	0.103	0.716	-0.32	0.16
Teacher-Student Teacher-Centered	0.510*	0.116	0.000	0.23	0.79
Interactive Student-Centered	0.080	0.103	0.716	-0.16	0.32

(*) indicates significance of mean difference at the 0.05 level.

The Tukey post hoc tests results indicated that student performance assessment scores of the teacher-centered approach differed significantly from student performance assessment scores of student-centered and teacher-student interactive approaches. No significant differences existed between performance scores of student-centered and teacher-student interactive methods.

IV. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In light of the fact that learning is a process that involves investigating, formulating, reasoning and using appropriate strategies to solve problems, teachers should realise that it becomes more effective if the students are tasked to perform rather than just asked to remember some information. A typical learning environment with a presentation from the course teacher accompanied by a lecture neither promotes learners' participation nor build the required level of reasoning among students. Students build a better understanding of the main concepts more effectively when they are engaged to solve problems during class activities.

5.2 Recommendations

McWhorter & Hudson-Ross (1996) found that without new approaches to instruction that connect to the learning needs of students, many will perform poorly and are likely to drop out of studies. Research evidence from previous studies indicates that a student-centered learning environment seems to produce higher-level learning outcomes more efficiently than a traditional teacher-centered environment (Tynjala, 1998). Hence, bias in selection of teaching methods by teachers in areas in which they possess exclusive monopoly knowledge should be avoided to improve students' academic performance (Adunola, 2011). Therefore, teachers should create an atmosphere conducive to learning in order to enhance the development of students' learning experiences. Moreover, teachers should also increase their knowledge of various instructional strategies in order to keep students engaged and motivatedthroughout the learning process.

REFERENCES

[1]. Adunola, O. (2011),"The Impact of Teachers' Teaching Methods on the Academic Performance of Primary School Pupils in Ijebu-Ode Local cut Area of Ogun State," Ego Booster Books, Ogun State, Nigeria.
[2]. Ayeni, A.J. (2011), "Teachers professional development and quality assurance in Nigerian Secondary Schools," *World Journal of Education*, 1(2):143-149.
[3]. Boud, D. & Feletti, G. (1999), "The challenge of problem-based learning," (2nd Ed.), London, Kogan Page.
[4]. Chang, W. (2002), "*Interactive Teaching Approach in Year One University Physics in Taiwan: Implementation and Evaluation,*"Asia-Pacific Forum on Science Learning and Teaching 3, (2002). Available on <http://www.ied.edu.hk/apfslt/v3_issue1/changwj/index.htm >
[5]. Collins, A. &Robert J. (2004),"Enhancing Student Learning Through Innovative Teaching and Technology Strategies,"Kogan Page.
[6]. Cooper, S.T. & Cohn, E. (1997), "Estimation of a frontier production function for the South Carolina Educational Process," *Economics of Education Review*, 16(3): 313-327.
[7]. Damodharan V. S. &Rengarajan .V (1999), "Innovative Methods of Teaching," NationalResearchCouncil, Educational Journal Publication.
[8]. Greitzer, F. A. (2002), "Cognitive Approach to Student-Centered E-Learning, Human Factors and Society," 46th Annual Meeting, Sept 30 – Oct 4.
[9]. Available on <http://availabletechnologies.pnnl.gov/media/33_97200670001.pdf>
[10]. Hake, R. R. (1998), "Interactive engagement versus traditional methods: A six thousand student survey of mechanics test data for introductory physics courses," Am. J. Phys. 66, 64-74.
[11]. Hesson, M. & Shad, K.F. (2007), "A student-centered learning model," *American Journal of Applied Sciences*, 628-636.
[12]. Hightower, A.M. (20110, "Improving student learning by supporting quality teaching: Key issues, effective strategies," Editorial Projects in Education.
[13]. Available on <http://www.edweek.org/med/aperc_qualityteaching_12.11.pdf>
[14]. Hudson-Ross, S. & McWhoter, P. (1996), Going back/looking in: A teacher educator and high school teacher explore beginning teaching together," *English Journal*, 84(2): 46-54.
[15]. Jacoby, L. L. (1978), "On interpreting the effects of repetition: Solving a problem versus remembering a solution," *Journal of Verbal Learning and Verbal Behavior*, 17:649-667.
[16]. Lindquist, T. M. (1995), "Traditional versus contemporary goals and methods in accounting education: Bridging the gap with cooperative learning,"*Journal of Education for Business*,70(5): 278-284.
[17]. McDaniel, M. A., Friedman, A., & Bourne, L. (1978), "Remembering the levels of information in words. Memory & Cognition," 6(2):156-164.
[18]. Slamecka, N. J., & Graf, P. (1978). The generation effect: Delineation of a phenomenon. *Journal of Experimental Psychology*: Human Learning and Memory, 4(6):592-604.
[19]. Slavin, R.E. (1996), "Research for the future- Research on cooperative learning and achievement: What we know, what we need to know," *Contemporary Educational Psychology*, 21(4): 43-69.
[20]. Tebabal, A. & Kahssay, G. (2011), "The effects of student-centered approach in improving students' graphical interpretation skills and conceptual understanding of kinematical motion," *Lat. Am. J. Phy. Edu*, 5(2): 374-381.
[21]. Teo, R. & Wong, A. (2000), "Does Problem Based Learning Create A Better Student: A Reflection?,"Paper presented at the 2nd Asia Pacific Conference on Problem Based Learning: Education Across Disciplines, December 4-7, Singapore.
[22]. Tynjala, P. (1998), "Traditional studying for examination versus constructivist learning tasks: Do learning outcome differ?," *Students in Higher Education*, 23(20): 173-190.

[23]. Wiggins, G. (1987), "Creating a thought - provoking curriculum," American Educator, Winter, 10-17.
[24]. Zakaria, E., Chin, C.L. & Daud, Y. (2010), "The effect of cooperative learning on student mathematics achievements and attitude towards mathematics, *Journal of Social Sciences*, 6(2): 272-275. Available on <http://dx.doi.org/10.3844/jssp.2010.272.275>

ANNEXURE

Question 1 [20]

1.1 A survey of 200 Johannesburg and 100 Pretoria residents was carried out by Joan Ganyaupfu and Amanda Sadzamari; analysts with Maxima Research Analytics in Pretoria. A sample of 104 residents from Johannesburg and 48 residents from Pretoria indicated that they would be happy to donate R100.00 once off to World Charity if asked to do so by their local governments. Is the proportion of Johannesburg residents willing to pay the special levy different from that of Pretoria at the 5% level of significance? (10)

1.2. The Director and Chief Economist of Research, Modelling and Data Analysis at Maxima Research Analytics; Dr Elvis found the average dividend yield of a random sample of 30 listed companies on the Johannesburg Stock Exchange to be 11.5% with a standard deviation of 3.5%. Assuming that the dividend yields are normally distributed, compute with 90% confidence interval, the actual dividend yield of all listed companies on the JSE last year. Interpret the findings in relation to the confidence interval you obtained. (5)

1.3. A team of research analysts at Maxima Research Analytics (Smicer, Ethan, Emmanuel, Nyasha, Kirsty and Rachel) want to determine the size of the population of the SADC region which buys a certain company's product. In a random sample of 10 000 people, 4 500 have made use of the product before. Calculate a 90% confidence interval for the proportion of people residing in the SADC who have used the product. (5)

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Question 2 [20]

2.1. An economist for a certain car manufacturing process indicates that the car manufacturing process takes an approximate average time of 35 minutes. However, the economist believes that a certain modification would reduce this time, and after being modified, the process is repeated 13 times, giving an average time of 33.3 minutes with a standard deviation of 2.4 minutes. Determine if there is any significant reduction in time taken in the manufacturing process at 5% level of significance. (5)

2.2. Mr. Simbarashe Brussels, the director of a pharmaceutical company claims that 90% of the workforce supports a new shift pattern that they have suggested. A random survey of 100 employees in the workforce finds 85 in favour of the new scheme. Test at 5% level of significance if there is difference between the survey results and the director's claim. (5)

2.3. The four members of the board of directors; Chido, Gloria, Thelma and Delia of an emerging retail giant wish to investigate the effect of the four-day week on absenteeism. Two random samples of 40 were selected; employees of group A worked 10-hour days (four-day week) and group B worked 8-hour days (five-hour week). If group A averaged 4 hours of absenteeism per week with a standard deviation of 1.2 and group B averaged 4.4 hours of absenteeism per week with a standard deviation of 1.5; should we conclude that the shorter work week reduces absenteeism at 5% level of significance? (10)

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Question 3 [20]

3.1 In order to compare if the performance of two training methods are the same, samples of employees using each of the methods were checked. For the 6 employees from method one, the mean efficiency score was 35 with a standard deviation of 6. For the 8 employees in method two, the mean efficiency score was 27 with a standard deviation of 7. Test the hypothesis at 1% significance level. (5)

3.2 A random sample of 100 journalist students was taken at a certain university in South Africa. From the observation given in the table below, are the preferences for the newspapers similar or different across gender at 5% level of significance? (5)

Gender	Sunday Telegraph	Daily Mirror
Males	10	30
Females	40	20

3.3 A machine is set to fire 30g of dried fruit into a box of cereal moving along the production line. A sample of 36 boxes revealed that the average mass of fruit inserted was 30.3g with a standard deviation of 0.5g. Test whether the increase in the amount of fruit inserted is significant at the 0.01 level of significance   (5)

3.4 The directors of Joan Asset Management (Pty) Ltd claim 90% of the workforce supports a new shift that they have suggested. A random survey of 100 people in the workforce finds 85 in favour of the new scheme. Test at 5% level if there is a significant difference between the survey results and the directors' claim.   (5)

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