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Disparity in Learning Approaches and Academic Performance among Science Education Students in Colleges of Education in Katsina State

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Abstract

This research investigated the disparity in learning approaches and academic performance of NCE students of colleges of education in Katsina state. Ex post facto design was used. The study used 166 students as samples drawn from three tertiary institutions. The Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) was adopted to measure learning approaches, while academic performance was measured by students' cumulative grade point average (CGPA). The t-test for independent sample statistical tool was used to analyze data. Two hypotheses were formulated and tested. The study did found significant difference in the academic performance of NCE students of deep learning approach and NCE students of surface learning approach in pure science-based courses. The study did not find any significant difference in the academic performance of NCE students of deep learning approach and NCE students of surface learning approach in applied science-based courses. It was recommended that lecturers should use R-SPQ-2F to determine the students' learning approach so as to give good academic guidance and counseling and teachers should use assessment tools that measure higher order cognitive skills.

Keywords: Learning approaches, deep approach, surface approach, revised two-factor study process questionnaire (R-SPQ-2F), pure science, applied science, NCE students.

Introduction

Higher education has for long been seen as key not only for overall national development, but also as means through which citizens of a nation can change their destinies. Science education which is gives greater chances for citizens to improve their life, has received greater attention through various measures. Several measures have been put in place to ensure our student teachers are given scientific orientation to prepare them well in both science and technology-based courses in institutions to teach both at primary, post-primary schools levels. More laboratories, workshops and equipments and other facilities have been provided by both state and federal governments.

However, in Nigeria and indeed in many developing countries, there is a growing and critical shortage of well-groomed and qualified teachers in the field of teaching science. Taiwo (as cited in Usman, 2014) lamented that the situation is more pathetic in teaching science and mathematics fields where the workforce is plague with an insufficient supply of qualified teachers and retention difficulties most especially at primary and post-primary school levels.

Teacher preparation programme shave been ongoing in Colleges of Education and faculties of education in Nigerian Universities and sister institutions. Student-teachers are receiving training both in content, methodology and professional attitude to equip them to work in schools diligently. Despite these measures there are still cries all over the country over the declining of the standard of education across different levels.

The newly discovered approach that ensures quality learning among students is students' learning approaches. Students Learning Approach (SLA) explains how students process information which subsequently affects the learning outcome. It was discovered through empirical research that students would either use deep learning or surface learning approach in the course of their studies (Lublin, 2003).

The work of Maryon and Saljo (1976) regarded as the pioneer research of the concept of learning approaches. They categorized students into deep or surface. They revealed that students may take to deep learning approach, where the intention was to understand the meaning of the material under review and link it to previous experiences or knowledge. On the other side, students are also found of adopting a surface learning approach where the intention was to reproduce the information verbatim.

Abraham, Vinod, Kamoth, Asha and Ramnarayan (2008) reported that students adopting the deep approach are mostly motivated by an interest in the subject materials and/or recognition of its vocational value, while studying the subject, the intention is to understand its meaning and relate it to previous knowledge and personal experience. In addition, the deep learning approach was also found to facilitate the retention of factual details more effectively. Students adopting the surface learning approach are predominantly motivated by either a desire to complete the course or fear of failure. Their intention is to fulfill the course requirements by memorizing and reproducing the material they believe is likely to come up in the examinations. The outcome of the surface approach is just a superficial level of understanding.

Several studies acknowledged the influence of learning approaches has an academic performance of science-based courses. Mayya Rao and Ramnarayan (2004) revealed that some physiotherapy students using deep approach are motivated by interest in the subject matter and/or recognition of its vocational relevance. While other physiotherapy students were discovered to be adopting surface approach. These students are predominantly motivated by either the desire to

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simply complete the course or a fear of failure.

In another study by Tomanek and Montplaisir (2004) used 240 Biology student to determine the influence of deep learning and surface learning on studying biology. In this study, the researchers conducted that good teaching could induce deep learning approach among students. Students interviewed revealed that they tried to understand rather than take notes and their professor explained ideas, especially when he used diagrams or other visual representation in his explanations.

Tomanek and Montplaisir (2004), also discovered that students used variety of resources and operations in studying for the examinations. Students used resources and cognitive operations, which were compatible with surface learning approach. Most of them relied heavily on the past question papers as resources for studying tasks. The attempted these past questions papers and then going to the key to check their answers. When their answers were incorrect, several of them would return to their notes, to review the section in question.

In addition, Tarabashkina and Lietz (2011) support the same view that learning approaches could influence academic performance of tertiary students. They used 177 international students in Bachelor of Arts and Bachelor of Science Degree Programme at a University in Germany, and found that the more students displayed strategies and motives that characterized deep learning, the better their Grade Point Average (GPA) was. The surface approach, in contrast, resulted in lower performance of students who identified more with this learning approach.

In another development, Rowe (2011) conducted a study on electrical and mechanical engineering students at Sheffield Hallam University, United Kingdom to measure the relationship of students' learning approaches and end of the year grades. The result of the study showed that surface approach subscale correlate significantly low with end of the year grade. The result was also disappointing as no positive association was found between deep learning approach and final grade.

Dincer and Akkeriz (2008) investigated 108 Turkish University science student-teachers' learning approaches. The result of the study indicated that deep learning approach of the science students teachers increased from the third year to the fourth year. It can be thought that the students-teachers' consciousness of responsibility rises during the fourth year. This was generally attributed to the use of process-based educational approaches instead of knowledge-based educational approaches in the university.

Jerkins, Edwards, Nepal and Bolton (2011) used revised two-factor study process questionnaire (R-SPQ-2F) on 801 civil engineering students to determine the influence of learning approaches on university students at Griffith University, Australia. The result obtained from the study showed academic performance of deep approach score exceeding the surface approach score among 1st year, 2nd year and 3rd year civil engineering students.

A similar study conducted by Wilson, Georgakis and Sharma (2012) used 2,030 sampled students to investigate approaches to learning of first year physics students of university of Sydney, Australia. Their findings reported that advanced students had highest levels of deep learning approach, while he regular students showed high on surface approach scale. This has invariably showed that advanced students clearly used deep learning approach, which explained their high performance in examinations. Regular first year students who were found to be using surface learning approach score low in examinations.

Students these days have been observed to consistently record low performance especially

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in West African Examination Council and National Examination Council examinations in 2011 and 2012 in Katsina state especially in the sciences. Many a times the few brighter students will proceed to universities, leaving the weak students to be admitted into NCE I and Pre-NCE programmes of the Colleges of Education in the state. As a result of this, many of these students will not make any appreciative progress due to the challenges of the learning environment and assessment tools used. Many employers of teachers were not happy with the level of performance of many of these teachers and their commitment to service. Therefore, there is need to investigate what causes the difference on deep learning approach (DLA) and surface learning approach (SLA) dimension. These issues make the research worthwhile as it will empirically solve the issues under investigation.

Objectives of the study

1. To find out if there is difference in academic performance of NCE students of Deep Learning Approach (DLA) and Surface Learning Approach (SLA) of pure science-based courses in colleges of education in Katsina state.
2. To examine if there is difference in academic performance of NCE students of Deep Learning Approach (DLA) and Surface Learning Approach (SLA) of applied science-based courses in colleges of education in Katsina state

Hypotheses

1. There is no significant difference in the academic performance of NCE students of Deep Learning Approach (DLA) and Surface Learning Approach (SLA) of pure science-based courses in colleges of education in Katsina state.
2. There is no significant difference in the academic performance of NCE students of Deep Learning Approach (DLA) and Surface Learning Approach (SLA) of applied science-based courses in colleges of education in Katsina state.

Methodology

The population of this research consisted1334 science-based Nigeria Certificate in Education regular students in Colleges of Education in Katsina state. Out of the population, one hundred and sixty-sixty (166) NCE students were sampled (Research Advisors, 2006). They were drawn from NCE-Awarding Institutions of Federal College of Education, Katsina; Isa Kaita College of Education, Dutsinma and Yusuf Bala Usman College of Legal and General Studies, Daura. Multi-stage sampling technique was employed in the research. Proportionate sampling technique was used to select the participants by institution, while simple random sampling technique (hat-and-draw) was employed in selecting the actual participants of the study.

The instrument used to identify deep learners and surface learners in this study was the 20-item Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) developed by Biggs, Keber and Leung (2001) which was adopted. The instrument has Section A, which required the participants to provide demographic information themselves and Section B, which contains the 20-item 5-point Likert Scale loaded with deep/surface learning approaches items. The instrument was used to measure the learning approaches of NCE students of Colleges of Education in Katsina State. For reliability the Cronbach Alpha, Spearman-Brown Coefficient and Guttman Split-Half Coefficient values of Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) were .51, .68

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and.68 respectively. The content validity of the instrument was determined by panel of experts at the Department of Educational Foundations, Usman Danfodiyo University, Sokoto and at the Department of Education, Bayero University, Kano. These experts concluded that the instrument has good content validity.

Data about students' learning approaches was obtained via Revised Two-Factor Study process questionnaire (R-SPQ-2F) developed by Biggs, Kember and Leung (2001). Students' academic performance records were obtained from the Office of the Dean, School of Education, Office of the Registrar and Office of the Head of School, School of Education, for Federal College of Education, Katsina; Isa Kaita College of Education, Dutsinma, and Yusuf Bala Usman College of Legal and General Studies, Daura, respectively. The students' academic performance was assessed by the overall result the students obtained up to NCE II Cumulative Grade Point Average (CGPA).

The researcher used one day in each institution to administer the questionnaire with the assistance of the lecturer holding lectures at the time of the visit. The subjects were then requested to fill in and submit the questionnaire within the lecture period. The data collected were at the interval and each of the hypotheses was tested using t-test for independent sample. The t-test statistical tool was used to analyze the data of pure science-based and applied science-based NCE students' learning approaches and academic performance. The null hypotheses were tested at a 0.05 level of significance.

Results

Hypothesis 1
There is no significant difference in the academic performance of NCE students of Deep Learning Approach (DLA) and Surface Learning Approach (SLA) of pure science-based courses in colleges of education in Katsina state.

Table 1: Difference in the Academic Performance of NCE Students of Deep Learning Approach (DLA) and NCE tudents of Surface Learning Approach (SLA) of Pure Science-based Courses (N=108)

Variables	N	Mean	Std.	t-cal	t-crit	Decision
Deep	95	2.9074	.84121			Significant
Surface	13	2.3108	.86966	2.389	.08	

Table 1 reveals the result of t-test for independent sample analysis of pure science-based NCE students. The analysis indicates that NCE students of Deep Learning Approach (DLA) *(M = 2.91, SD = .84)* was greater than the mean academic performance of Surface Learning Approach *(M = 2.31, SD = .87), t (106) = 2.39, p = .02)*. The table also establishes that t-calculated was higher than t-critical. The table further shows that the difference was significant (t-calculated 2.39>1.96. The result support the rejection of the null hypothesis, which predicted no significant difference in the academic performance of NCE students of deep learning approach and NCE

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students of surface learning approach of Pure science-based courses in colleges of education

Hypothesis 2

There is no significant difference in the academic performance of NCE students of Deep Learning Approach (DLA) and Surface Learning Approach (SLA) of applied science-based courses in colleges of education in Katsina state.

Table 2: Difference in the Academic Performance of NCE Students of Deep Learning Approach (DLA) and NCE Students of Surface Learning Approach (SLA) of Applied Science-based Courses (N=58)

Variables	N	Mean	Std.	t-cal	t-crit	Decision
Deep	53	2.5555	.89578			Not significant
Surface	5	3.0480	.84609	-1.180	1.96	

Table 2 displays the result of the t-test for independent sample analysis of applied science-based NCE students. The result surprisingly indicated that surface applied science-based students *(M = 3.05, SD = .85)* performed better in academic performance more than their deep applied science-based students counterpart *(M = 2.56, SD = .89), t (56) = -1.18, p = .24).* This unexpected result might be because the lecturers in these courses were rewarding reproduction of ideas and the fewer number of surface learners in the group. However, the result of the analysis shows t-calculated (-1.18) was lower than t-critical (1.96). In addition, the p-value indicated that the difference between the two groups was not significant at 0.05 (p > 0.05). Therefore, this support the retention of the null hypothesis which foresaw no significant difference in the academic performance of NCE students of deep learning approach and NCE students of surface learning approach of applied science-based courses of colleges of education in Katsina state.

Discussion of Findings

This study investigated differences in the academic performance of students of deep learning approach and surface learning approach of pure science-based courses. The findings of the study revealed that deep learning pure science students were significantly better than surface learning students. The result was somewhat similar with the findings od the studies of Wilson, Geogakis and Sharma (2012) and Tomanik and Montplaisir (2004). These researches indicated that deep learning approach was positively related with academic performance. However, low academic performance was associated with surface learning approach.

Pure science students of these colleges must be adhering strictly to the expectations of the teachers here. Students under these departments were encouraged to learn to understand. They clearly understood what the learning environment/activities expect from them. One other reason is that these students do also used higher order cognitive skills to ensure better understanding of the scientific concepts, laws, and procedures. Moreover, part of the reasons for good performance of these students might be due to the use of teaching strategies that were interesting and encourage understanding. Teachers here were fond of using laboratory method, co-operative learning and problem-based learning. These techniques of teaching are good in ensuring deep learning in students.

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This study also investigated differences in the academic performance of students of deep learning approach and surface learning approach of applied science-based courses. The findings of the study was contrary to wider expectation as surface learning applied science students were uttermost better than deep learning applied science students in academic performance. However, the difference was not significant. This was likely due to few surface learners in the group.

The finding of the study found support with that of Rowe (2011) who equally reported a rather disappointing result which found no high association between deep approach and final grade and no low correlation between surface approach and final grade of university engineering students.

On the other hand, the finding of the study did not concur with many other studies conducted in applied science courses like that of Mayya, Rao and Ramnarayan (2004), Subasinghe and Wanniachchi. Jerkins, Edwards, Nepal and Bolton (2011). These studies reported that applied science deep learning students exceed applied science surface learning students in acacdemic scores.

Recommendations

Based on the findings of this study, the following recommendations were made for the improvement of students' learning approaches and academic performance in tertiary institutions in Nigeria:

1. Lecturers should use Revised Two-Factor Study Process Questionnaire to determine students' learning approaches so as to provide necessary academic guidance and counseling to fresh students.
2. In order for lecturers to be able to help students on evaluation using higher order cognitive domain, class size need to be manageable and feasible for lecturers to strengthen students' learning. They should equally be mobilized through workshops to adopt teaching strategies that ensure deep learning approach among students.

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