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Affective and cognitive learning outcomes of radiography students in a Nigerian university

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Abstract

This study investigated the affective and cognitive learning outcomes of radiography students in a Nigerian university with particular reference to the Nnamdi Azikiwe University, Nnewi Campus. The study employed a case study research design. A non-structured questionnaire was developed and used to obtain information for the study. A sample of students selected through purposive sampling technique drawn from year 2 and year 3 students was used for the study. Using means, standard deviations, t-test and correlation coefficient, the study revealed that radiography students fit into their programme of study. In addition, year 2 and year 3 students differ in their perceptions about their future in the profession. A positive relationship between the affective and cognitive learning outcomes of radiography students was revealed in many instances, but not in all. The study recommended that adequate and modern facilities should be provided for radiography students in Nigerian universities. Also, radiography students should be exposed to counseling to enable them to adjust meaningfully in their chosen career.

Introduction

One of the major concerns of university education in Nigeria as outlined in the National Policy on Education is to enable students to develop intellectually and acquire skills that can enable them to be self-reliant and useful members of the society [1]. According to Ozioko [2] university education delves into conducting research, teaching and learning: extension of the frontiers of knowledge and community services. Nigerian universities therefore embark on the pursuit, promotion and dissemination of knowledge through teaching [3]. University education in Nigeria intensifies and diversifies programmes for high level manpower development. It contributes to national development by developing professional course contents to reflect national requirements.

It is in realization of the above that some Nigerian universities are accredited to train medical health workers, for example training professionals that can handle radiography education. Radiography is a practice-based profession where students learn how to become competent in a clinical environment. Radiography students, like their counterparts in arts, humanities, social sciences and other science related fields, are often faced with certain variables that impede their cognitive learning outcomes. Many radiography students, as observed by the researchers over the years, are usually faced with adjustment problems and other affective variables while pursuing their course. As Delcourt, and co-authors [4] put it, affective outcomes encompass students' self-perception and their intrinsic and extrinsic motivation. Affective skills are values, beliefs, needs, interests, emotional adjustments, habits, life style and attitudes [5].

Cognitive skills involve learning how to learn to adapt [6]. By implication, this involves actual performance in an academic exercise. The West African Examinations Council [7] is of opinion that cognitive processes, namely: problem solving, drilling and attention to rubrics while writing examinations are good enough in enhancing academic achievement of students. Agbi [8] opines that needs, interests, motivation and abilities are affective variables that determine students' academic achievement.

The choice of radiography as a course in a university by any student is a function of career decision occasioned by his/her cognitive and affective abilities. A more proximal index of the efficacy of career decisions or interventions among college students is satisfaction with one's field of study [9]. Not every student admitted to study radiography completes the program as many drop out along the line or enter another course of study. Hence, there is the need to investigate the relationship between affective and cognitive learning outcomes of radiography students in Nigerian universities.

This is necessary as studies available have been on cognitive and effective learning outcomes of students in medicine, nursing and education. Schwind *et al.* [10] studied the variables that influence medical students' learning in the operating room and revealed that affective variables are highly favoured. Chan [11] investigated nursing students' perceptions of hospital learning environments in Australia and discovered a significant relationship between cognitive competence and affective outcomes in hospital settings among nursing students. Delcourt *et al.* [4] studied cognitive and affective learning outcomes of gifted elementary school students and revealed differences in cognitive and affective outcomes across programme types. Ukwueze [12] studied learner variables that influence students' cognitive competence and adjustment in Nigeria and revealed that affective variables have significant influence on students' academic performance and adjustment. None of the above studies attempted to look into the affective and cognitive learning outcomes of radiography students in Nigerian universities. This gap called for the present study.

Research questions

The following research questions guided the study.

1. What are the responses of second year radiography students to both affective and cognitive learning outcomes?
2. What are the responses of third year students of radiography to both affective and cognitive learning outcomes?

Research hypotheses

The following hypotheses were formulated and tested at 0.05 percent level of significance for the study.

1. Affective learning variables of second year students of radiography have no significant influence on their cognitive learning outcomes.
2. Affective learning variables of third year students of radiography have no significant influence on their cognitive learning outcomes.

Methodology

This study employed the case study research design which is an intensive study geared towards a thorough understanding of a given social unit [13]. The study population consisted of forty five students studying radiography at the Nnamdi Azikiwe University, Nnewi Campus, Nigeria. The sample for the study was made up of thirty three students in year two and twenty two students in year three selected through the purposive sampling technique.

A semi-structured questionnaire was developed and used to assess the affective outcomes of the students studied. The questionnaire was made up of modified Likert scale statements with four response options ranging from strongly agree to strongly disagree. The responses were assigned values thus: strongly agree (SA) = 4; agree (A) = 3; disagree (D) = 2; and strongly disagree (SD) = 1. The responses of the negative statements were reversed. A mean of 2.5 shows positive response for a statement.

The students' cognitive outcomes were assessed using their examination results in introductory radiography procedures. Their scores were extracted directly and recorded at the end of the marking exercises.

For the validity and reliability of the instruments used, a test re-test procedure and Cronbach alpha respectively were used. In the test re-test approach, twenty students not meant for the study were administered the questionnaire twice after an interval of two weeks. A correlation co-efficient of 0.72 was obtained when the scores obtained were correlated to ascertain the stability or validity of the instrument. On the other hand, a Cronbach alpha of 0.88 as obtained attested to the internal consistency of the instrument (semi-structured questionnaire). The questionnaire then became a valid and reliable instrument that was used in extracting information from the students about their affective learning outcomes. Their responses to the 20 statements from a batch of 30 that survived screening were collated, analyzed and used.

The cognitive scores of the students were obtained from already validated examination questions approved by the departmental board of examiners.

Data analysis and results

The data obtained were analysed and presented in line with the research questions and the null hypotheses that guided the study. Spearman rank correlation was done. SPSS (version 11.0 version) was used with $P<0.05$ indicating statistical significance.

Table 1 presents responses of the second years students to affective statements. Number 1 shows that the students perfectly fit into their studies. Number 3 has a mean score of 3.29 in terms of the tasks related to courses in the department being too demanding which invariably

Table 1: *Mean and standard deviations (SD) of second year students' responses to affective statements.*

Number	Statement	Mean	SD
1	I perfectly fit into the present study that I am undergoing	3.59	0.60
2	My personal abilities are in agreement with my studies	3.14	0.69
3	The tasks in the department are too demanding for my liking	3.29	0.67
4	The programmes in the department are enough for self-sustenance in the future	3.00	0.59
5	I am ill-equipped for the courses in my present study	2.53	0.98
6	I can do better even without adequate facilities	1.88	0.90
7	My interest in the department is dwindling because it is like I have no future	3.65	0.76
8	I see myself self-actualising in this course of study	3.65	0.59
9	My mates see me a rallying point which makes me proud	3.06	0.73
10	Working as an expert in my present field is quite uncertain	3.29	1.02
11	I now see myself as a dull student unlike in the past when I was a shining example in the class	3.24	0.73
12	The poor grades I often get discourage me	2.94	2.13
13	I get motivated each time my mates come to me for group discussion and assistance	3.65	0.59
14	Some course content in the department are obsolete	3.24	1.00
15	The facilities in the department stimulate effective teaching and learning	3.24	1.39
16	I depend mainly on internet services for my assignments	2.18	0.71
17	Lack of facilities in the department makes me feel reluctant in doing my assignments	3.06	0.65
18	Each time I think of the financial gains at the end of the course, I study harder	3.41	0.60
19	Most course contents in the department are theoretical	2.65	0.76
20	The urge to excel in my chosen career makes me work harder	3.61	0.95

means that many students are not finding the tasks in the department easy. Numbers 6 and 16 have low responses indicating that most second level radiography students cannot perform without adequate facilities and do not necessarily depend on internet services for their assignments. Higher than the mean responses are evident for all the other numbers.

The responses of the third year students are presented in Table 2. The third year students have low responses to statements 6, 7, 10, 15, 16, 17 and 19. Responses to number 10 reveal that most third year students are uncertain about being experts in radiography. Their interest is also dwindling despite that many of them would like to self actualize in the field. The third year students do not believe that their courses are theoretical.

Table 2: *Means and standard deviations of the third year students' responses to affective statements.*

Number	Statement	Mean	SD
1	I perfectly fit into the present study that I am undergoing	3.67	0.60
2	My personal abilities are in agreement with my studies	3.13	1.20
3	The tasks in the department are too demanding for my liking	2.87	0.96
4	The programmes in the department are enough for self-sustenance in the future	2.60	1.14
5	I am ill-equipped for the courses in my present study	2.73	0.93
6	I can do better even without adequate facilities	1.88	0.90
7	My interest in the department is dwindling because it is like I have no future	1.93	0.93
8	I see myself self-actualising in this course of study	3.53	0.50
9	My mates see me a rallying point which makes me proud	2.23	0.96
10	Working as an expert in my present field is quite uncertain	2.33	1.35
11	I now see myself as a dull student unlike in the past when I was a shining example in the class	3.07	1.12
12	The poor grades I often get discourage me	2.53	1.63
13	I get motivated each time my mates come to me for group discussion and assistance	3.47	0.50
14	Some course content in the department are obsolete	2.60	1.14
15	The facilities in the department stimulate effective teaching and learning	2.47	0.96
16	I depend mainly on internet services for my assignments	1.93	1.29
17	Lack of facilities in the department makes me feel reluctant in doing my assignments	2.20	0.83
18	Each time I think of the financial gains at the end of the course, I study harder	2.40	0.67
19	Most course contents in the department are theoretical	1.67	1.01
20	The urge to excel in my chosen career makes me work harder	3.87	0.34

In Table 3 the t- calculated is greater than the critical t- value of 1.96 at 0.05 percent level significance. The null hypothesis which states that affective learning variables of second year students have no significant influence on their cognitive learning outcome is hereby rejected.

In Table 4 the t- calculated (0.29) is less than the critical t value of 1.96 at 0.05 percent level of significance. The null hypothesis which states that affective learning variables of third year students have no significant influence on their cognitive learning out comes is therefore accepted.

As observed in Table 5, the correlation coefficient (r) calculated using Spearman's correlation coefficient formula is 0.25 while the critical value of r at 0.05 percent (%) level of significance is 0.138. This implies that the r calculated is greater than the critical value of r on the table thus by implication, the null hypothesis, which states that affective learning variables of radiography students have no significant relationship with their cognitive learning outcomes, is hereby rejected. Note the mean cognitive score of 57.82% obtained from validated examination questions and affective score of 54.36% obtained from the questionnaire as shown in the Table 5.

Discussion

The students in year 2 and year 3, respectively, all agreed that facilities in their department are not adequate enough to stimulate effective teaching and learning. This finding regarding facilities is similar to previous studies conducted among non radiography students by Mckay *et al.* [14] and Rosie and Murray [15]. Hence, no meaningful teaching and learning can take place where facilities necessary to aid learning in particular are in short supply.

The study also revealed that affective learning variables of second year students have significant influence on their cognitive learning outcomes (Table 3) but that is not the same for the third year student (Table 4). This is compared to the result of the study by Ukwueze [12] which showed that affective learning variables influence students' cognitive competence and adjustment. It is also observed that the year 2 students and the year 3 students differ in seeing themselves as future experts of radiography. While the year 2 students agree that their working as experts in radiography is quite uncertain, the year 3 students believe otherwise.

The observed variations between the responses of year 2 and year 3 students (Tables 3 and 4) could be attributed to the fact that year 2 students are not yet fully oriented and adjusted as some of them are still contemplating whether to change course or not. The year 3 students are more or less stabilized having acquired more knowledge about the profession than the second year students. Nauta[9] observed that major satisfaction increases with proximity to graduation regardless of whether a student remains in the

Table 3: *Means and standard deviations of second year students in affective and cognitive learning outcomes.*

Learning outcomes	Mean	SD	t-Cal	t-Val
Affective	66.25%	4. 8	3.42	1.96
Cognitive	53.44%	15.18		

P < 0.05, degree of freedom = 1.98
Where: SD = standard deviation; t- Cal = t calculated; t- Val = Critical t value at 0.05 level of significance

Table 4: *Means and standard deviations of third year students in affective and cognitive learning outcomes.*

Learning outcomes	Mean	SD	t-Cal	t-Val
Affective	64.25%	7. 64	0.29	1.96
Cognitive	63.07%	13.68		

P < 0.05, degree of freedom = 1.98
Where: SD = standard deviation; t- Cal = t calculated; t- Val = Critical t value at 0.05 level of significance

Table 5: *Relationship between affective learning variables and cognitive learning outcomes of radiography students*

Learning outcomes	N	Mean	SD	r-Cal	r-Val
Affective	45	54.36%	6. 92	0.25	0.138
Cognitive	45	57.82%	15.29		

P < 0.05, degree of freedom = 1.98
Where: N = Number of students; SD = standard deviation; r- Cal = Correlation coefficient calculated; r- Val = Critical t value of correlation coefficient

original course or changes to another.

This study also revealed that affective learning outcomes of radiography students have significant relationship with the cognitive outcome. This finding is similar to a study by Oladunni [15] which showed that students' attitude and interest (affective variables) are significantly related to their academic achievement.

Conclusion

Students' affective domain needs to be regularly assessed by lecturers to enable them to get the best out of their students cognitively. There is a need for appropriate counseling to enable radiography students, especially first level entry students, to assess their interests, abilities, attitudes and capabilities so that they can adjust meaningfully in their chosen career.

The authors suggest that radiography departments need to be equipped with modern facilities to enable students to learn effectively what they are supposed to learn.

Despite the fact that radiography students fit into their course of study, their cognitive competences have been seriously undermined by affective variables, such as interest, need, attitude, value and motivation.

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