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Attitude and Achievement of Undergraduate Education Students Taught Statistics in Cooperative Learning Groups

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Abstract: This study examined the fear of students towards statistics. The meaning and the benefits of Cooperative Learning Instruction was reviewed. The construct of attitude was briefly defined. The study design was an Expo Facto design. Thirty students [fifteen B.Sc (Ed) and fifteen B.A(Ed)] participated in the study. An instrument, Cooperative Learning Attitude Scale (CLAS) was used to generate the data. Achievement was measured with the students' achievement scores in the end of the semester examination. The result was analyzed using descriptive statistics and t- test statistical analysis at 0.005 level of significance. The result revealed no significant variation in the attitude of both BA(Ed) and the BSc (Ed) students. They both showed positive attitude toward statistics and cCooperative Learning Instructional Strategy. It was concluded that Cooperative Learning Instructional Strategy could bring about positive transformation of student attitude toward statistics. It was recommended however, that the study be repeated using an experimental design for a stronger basis for generalization.

Keywords: Cooperative Learning, Statistics, Sule Lamido

1. INTRODUCTION

In today's society, statistical skills have become increasingly more important and many countries have been placing more emphasis than ever before in the curriculum for teaching statistics (Koparan & Güven, 2014). Ridgway, Nicholson, and McCusker (2007) noted that statistics is the one central science used in social science and education.In fact, it is challenging to consider a discipline in which some level of statistics is not used. One common problem that instructors in the area of statistics face is that many, if not most, of the students are frightened of taking such courses. Many researchers like Dunn (2000), Laher, Israel, & Pitman (2007) posited that most students view a required statistics course as a formidable obstacle. Experience has revealed thatF the fear seems to be higher among students of non-science discipline. Obviously, Personal interaction with students also revealed that, many of these anxieties are the result of erroneous perceptions about how sophisticated mathematics proficiencies have to be in order to achieve reasonable competence in elementary statistical procedures.

Prior research has identified cognitive and demographic factors related to student performance in statistics courses including gender, prior knowledge, mathematical ability, spatial ability, and pedagogical approaches (e.g., Derry, Levin, Osana, Jones, & Peterson, 2000; Elmore & Vasu, 1980as cited in Griffith et al, 2012). However, many researchers (Mills, 2004; Mulhern & Wylie, 2004; Onwuegbuzie, 2000; Onwuegbuzie & Seaman, 1995) are of the view that in addition to demographic, cognitive, and pedagogical factors, affective and attitudinal factors among students should also be taken into consideration by instructors teaching statistics.

The construct of attitudes has been broadly defined as "not directly observable, inferred aspects, consisting of beliefs, feelings, and behavioural predispositions towards the object to which they are directed." (Auzmendi, 1992, as cited in Mondejar-Jimenez & Vargas-Vargas, 2010). Attitude, according to Ayanniyi (2011) is positive or negative evaluation of people, objects, ideas, or events.

Students' attitudes toward statistics have long been identified as a special problem for statistics educators (Bendig & Hughes, 1954 as cited in Nolan et al., 2012). Of recent, there has been much interest in assessing students' attitudes to predict academic performance in statistics courses and monitor attitudinal changes resulting from educational practices (Nolan et al., 2012).

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It becomes necessary therefore, that a lecturer select an instructional strategy that not only targets students achievement but also their attitude.

According to Garfield1(1993),current recommendations for reforming statistics education include the use of cooperative learning activities as a form of active learning to supplement or replace traditional lectures. Cooperative learning is a highly structured form of group work that focuses on problem solving that can lead students, when directed by a teacher, to deeper learning and genuine paradigm shifts in their thinking (Mills, 2009). According to Abubakar (2015), Cooperative Learning Instructional Strategy is an instructional strategy where students work together in group to attain goals that might not be attained by working alone or competitively- while the teacher takes the position of a facilitator**.** Attitudes and values of learners are formed through social interaction. Borich (2004) noted that most of our attitudes and values are formed by discussing what we know or think with others.

This study investigated the attitude and achievement of undergraduate (B.Sc Ed and B.A Ed) students taught Educational statistics in cooperative learning groups. The study is carried out with the hope that the interactions-sharing of ideas that goes on in the group- will affect cognition and attitude which will eventually lead to better achievement scores.

Theoretical Framework

Cooperative Learning Instructional Strategy is anchored to Vwgotsky theory of social interaction. Lev Vygostky, (1962), A Russian teacher and psychologist, first stated that we learn through our interactions and communications with others. He further examined how our social environments influence the learning process. He suggested that learning takes place through interactions students have with their peers, teachers and other experts.The major theme of Vygotsky's theoretical frame work is that social interaction plays a fundamental role in the development of cognition. Vygotsky (1978) states "Every function in the child's cultural development appears twice: First, on the social level and later on the individual level, first between people (inter-psychological) and then inside the child (intra-psychological).

A principle that is cardinal in Vygotsky theory, is the principle of More Knowledgeable One (MKO).He explained that the MKO refers to someone who has better understanding or highly ability level than the learner, with respect to a particular task, process or concept. He however, posited that, the MKO must not necessarily be a teacher or an older adult. He could be a child's peers with more knowledge or experience. It can be deduce therefore that, student interaction with group members in a cooperative learning group will undoubtedly leads to cognitive restructuring which leads to better learning.

Research Question

1. What is the difference in mean attitude score of the B.Sc (Ed) and the B.A(Ed) students toward statistics after being taught Educational Statistics in a cooperative learning group?
2. What is the difference in the mean achievement score of the B.Sc (Ed) and B.A(Ed) students after being taught Educational Statistics in a cooperative learning group?

Research Hypotheses

1. There is no significant variation in the attitude scores of the B.Sc (Ed) and B.A(Ed) students.
2. There is no significant variation in the achievement score of the B.Sc Ed) and the B.A (Ed) students

METHODOLOGY

This study explored the attitude and achievement of Education undergraduate students of Sule Lamido University, Jigawa State, North West, Nigeria. The design for the study is ex post facto design, no pretest, no control. Here the researcher simply takes two groups that differ (i.e., BS.c (Ed) and B.A (Ed) students) and tries to determine the consequences of the difference (Ary et al., 2006). The entire 200 level Education student who registered for the 2014/2015 academic session participated in the study. They were thirty (30) in numbers: fifteen from B.Sc (Ed) programme and fifteen from the B.A(Ed) programme. The course taught was EDU 205, Educational Statistics. The students were taught statistics in cooperative learning groups. Three features of cooperative learning (positive interdependence, individual accountability and face to face interaction) were emphasized throughout the learning period. Achievement was measured as the students' scores in the second semester examination. The attitude of the students was measured using a Cooperative Learning Attitude Scale (CLAS). CLAS is designed in the form of a Likert scale. CLAS was validated by a team of experts. The reliability coefficient of the instrument using Cronbach alpha is 0.83.

Results and Discussion

The mean and the standard deviation of the attitude scores as measured by the CLAS instrument are presented below.

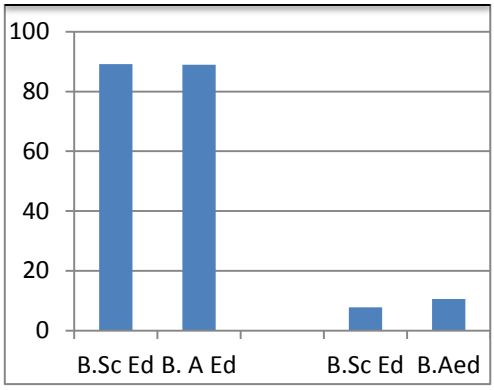

Figure 1. Mean Attitude and Standard Deviation Scores of B.Sc (Ed) and B.A (Ed) Students

The results show the mean attitude score of the B.Sc (Ed) students to be 89.2 while that of the B.A(Ed) students is 88.9.The standard deviation for B.Sc (Ed) and B.A (Ed) is 7.83 and 10.58 respectively. The above results also show that both B.Sc (Ed) and B.A(Ed) students showed positive attitude toward statistics and cooperative learning instructional strategy.. These results agree with Olorookoba (2001) and Dyell (2011). According to Johnson, Johnson & Smith (1991) as cited in (Lord, 2001), students who were provided in-class opportunities to interact actively with classmates and instructors were happier, enjoyed the lesson more, and were more satisfied with their learning experiences than were students who were taught exclusively by lecturing. In addition, just like Kessler, Price and Wortman (1985) as cited in (Lord, 2001) reported, when a teacher calls upon a student in a traditional classroom, the student becomes the focus of attention of the entire room. A mistake can become the subject of ridicule by the whole group. This will lead to frustration, embarrassment and anxiety in many students. In a cooperative learning situation, however, the focus of attention is diffused among the whole group. When an answer is given to the class, it represents the work of the team and, therefore, no single individual is held up to criticism. In addition, the group produces a product that its members can review prior to it being presented to the whole class. This diminishes the prospect that a mistake will occur. If a correction is warranted, it becomes a teaching tool instead of a public admonishment. As a consequence, the class attitude becomes one of cooperation, not condemnation.

The attitude scores were subjected to t – test analysis. The results are shown in table 1 below.

Table 1: t- test analysis of the Attitude Scores of B.Sc. (Ed) B.A (Ed) Students

Subject	N	Mean	Std. Deviation	Std. Error	t-value	DF	P- Value
B.SC Ed	15	89.200	7.830	2.054	0.174	28	0.863
B.A Ed	15	88.600	10.58	2.759			

P- Value higher than 0.05

The results revealed a p value less than 0.05. This indicates no significant difference in the attitude of both B.A (Ed) and B.Sc. (Ed) students. This can be attributed to the fact that cooperative learning is a student-centered learning, where students have the opportunity to interact with one another through discussion, questioning and possibly debates. This active involvement can lead to cognitive restructuring which can lead to positive attitudes in students irrespective of their course of study.
The mean and the standard deviation of the student achievement scores are shown in figure 2. The mean achievement scores of the B.Sc Ed and B.A Ed students are 56.8 and 47.9 respectively.
The standard deviations are 10.4 and 10.9 respectively.

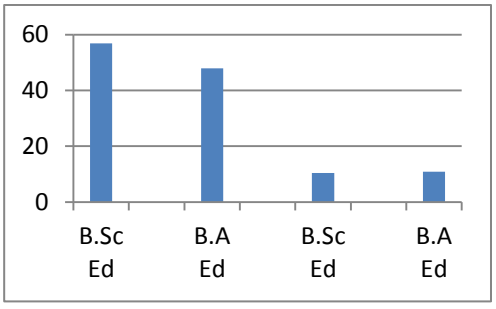

Figure 2. Mean Achievement and Standard Deviation Score of B.Sc. (Ed) and B.A (Ed) Students

From the results above, the majority of the B.A Ed students with a mean score of 47.9 passed the course. This might be attributed to the active participation of the students as they interact with the learning materials and with one another. This agrees with the report of Cooper (1994) as cited in (Lord, 2001) that cooperative learning provides an effective means of helping students achieve.

With respect to null hypothesis 2, which states that there is no significant difference between the mean achievement score of B.Sc. Ed and B.A Ed student, the t-test analysis shown below in table 2 reveal a p value higher than 0.05.

Table 2: t- test analysis of the Achievement Scores of B.Sc.(Ed) and B.A(Ed) Students

Subject	N	Mean	Std. Deviation	Std. Error	t-value	DF	P- Value
B.Sc. Ed	15	47.93	11.329	2.925	- 2.297	28	0.029
B.A. Ed	15	57.20	10.758	2.778			

P- Value less than 0.05

This shows that there is a significant difference between the achievement of BS.c(Ed) students and the B.A (Ed) education undergraduate students. The above hypothesis is therefore rejected. This could be attributed to the fact that the two groups might not have been equivalent in terms of their ability to solve statistical problems. In other words, the B.Sc Ed students might be academically better than the B.A(Ed) students. However, the above result also showed that both groups achieved better – as almost all the students passed the course with at least a D grade. This agrees with results reported by many researchers that used cooperative learning to instruct students in various subject domains, like: Mathematics (Kolawole, 2007; Effandi, 2003; Wang, 2001, and Fengfeng & Barbara, 2007); Chemical Kinetics (Adesoji & Ibrahim, 2009); Chemistry (Samuel & John, 2004); and Biology (Pandian, 2004). According to Van Boxtel (2000), cooperative learning gives learners the opportunity to verbalize their individual knowledge, which may lead to higher cognitive elaboration, deeper reflections, awareness of individual knowledge and misconceptions, and expansion of knowledge. Bowen (2000) reported that cooperative learning enhances academic achievement, persistence, and attitudes among undergraduate students in the subject areas of science, mathematics, engineering, and technology courses.

Cooperative Learning Instructional Strategy provides a non-competitive learning environment devoid of fear and anxiety. In a cooperative learning group, members help each other to understand the learning material better and a failure of an individual group member is considered a group failure. This, coupled with the fact that the students are actively involved in the learning process leads to a more positive attitude towards learning. Any instructional strategy that affects the attitude of students positively can lead to better achievement. Cooperative learning instructional strategy had positive impact on the attitude and achievement of 200 level undergraduate education students.

Recommendations

- In addition to the yielded results of this study, the following recommendations could be made: Cooperative Learning Instructional Strategy should be utilized by teachers and instructors in alleviating the fear of students toward statistics and also to enhance academic performance
- Similar studies should be carried out using different designs like either experimental or quasi experimental ones with pretest and control; since such studies will give a much stronger base for generalizations.

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