EXPLORING THE INTERDISCIPLINARY BASE KNOWLEDGE OF UNDERGRADUATES SCIENCE EDUCATION STUDENTS OF SULE LAMIDO UNIVERSITY KAFIN HAUSA, JIGAWA STATE

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Abstract

The aim of this study was to explore the interdisciplinary base knowledge of undergraduate science education students of Sule Lamido University. The study employed a mixed design of ex post facto and correlational design. The target population was all the 300-level registered undergraduate students in the department of science education, at Sule Lamido University. The sample comprises seventy (70) students. A test instrument Titled Undergraduates Science Education Students Interdisciplinary Base Knowledge Test (USESIBK) was used in collecting the data. Data analysis was done using, descriptive statistics, t-test statistical analysis, and Pearson Moment Correlation at a 0.05 level of significance. Results revealed a significant difference between male and female undergraduate science education students. However, there is a weak but positive relationship between the student's CGPA and their Interdisciplinary test scores. It is recommended that classroom instruction and evaluation should be geared toward improving the Interdisciplinary knowledge base of undergraduate students.

Keywords: Exploring, Interdisciplinary Base Knowledge, and Undergraduates

Introduction

Interdisciplinary according to Mariam Webster dictionary (2023) means between two or more academic, scientific, or artistic disciplines. However, the concept had grown to mean different things to different authors. For instance, interdisciplinary learning according to Klein (1990) is the synthesis of two or more disciplines, establishing a new level of discourse and integration of knowledge. It is the process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with by a discipline or specialization" (Newell, Kaittani,et al,2016). However, Jacobs (cited in Kanmaz, 2022) posited that the Interdisciplinary approach is a concept in which subjects from several disciplines are brought together in an effort to illuminate an event or a complex phenomenon that comes to the fore. Interdisciplinary fields evolve due to the realization that real-world problems are not discipline specific in nature. In the word of Dezure (1999) life itself is interdisciplinary. While it is true that Interdisplinary from the aforementioned has to do with team solving problems -It seems logical to posit that a procedure that brings more than one discipline together can be termed Interdisplinary. For instance, Interdisciplinary competence (2020), Interdisciplinary learning (Klein, 1990), Interdisciplinary approach (Jones, 2010), Interdisciplinary thinking (Spelt et al., 2009) and Interdisciplinary base knowledge.

Interdisciplinary base knowledge though not a common phrase, operationally in this study, refers to the undergraduates' science education student's basic knowledge of science across Biology, Chemistry, Physics, Geography, and Mathematics. Exposing students to different knowledge disciplines is a step toward interdisciplinary learning. This perhaps might have underpinned the introduction of electives and other compulsory cores other than the subject core into our various undergraduate science education programs. In Sule Lamido University specifically, undergraduate science Education students are directed to register for core courses and electives in addition to their major. An undergraduate biology student for instance is directed to register for courses like thermal physic, Thermodynamics, and differential calculus (Undergraduate student handbook, 2018) thus promoting an interdisciplinary mindset. This can also be seen from the newly launched Core Curriculum Minimum Academic Standard (CCMAS) launched by the Nigeria University Commission whose features clearly support undergraduate science education students' acquisition of knowledge from different scientific disciplines. Contributing to the same argument,

Handtke and Bögeholz, (2022) lamented that, subject-specific training does not support Interdisciplinary teaching and by implication interdisciplinary base knowledge. Therefore, it is the researcher's opinion that science teachers and by implication undergraduate science education students, willing to take up teaching have a role to play in promoting the interdisciplinary knowledge base of the students. They should in both content and process help students to know and understand the interconnectedness of science. It is obvious that taking courses away from the major undoubtedly will prepare students and teachers to teach science better- however, many students go through the formality without seeing the universality of concepts across the different disciplines. In this study, the researcher tried to explore the interdisciplinary base knowledge of undergraduate science education students. Specifically, the study test the students' knowledge of basic science concept across Biology, chemistry, physics, mathematics and geography.

This study is anchored on Bartlett's Schema Theory (1932). The theory suggests that past reactions, experiences, and knowledge are actively organized in form of schemas. The theory also assumed that all new information interacts with the old information represented in the schema. Piaget (1952) claimed that knowledge cannot simply emerge from sensory experience; some initial cognitive backup structure is necessary to make sense of the world. Thus, the development of the cognitive frame of students' teachers is necessary for the effective teaching of science, decision-making and problem-solving. Ultimately what ones knows will determine his response to questions or problems. The researcher is of the view that a robust cognitive frame developed by exposing students to diverse experiences of science can promote scientific literacy and problem-solving. In other words, science education students should be able to see the interconnectedness and the universality of science. Therefore, this study explored the Interdisciplinary base knowledge of undergraduate science education students.

Empirically, Kanmaz (2022) examined the views of teachers about the interdisciplinary approach and their level of use of this approach in primary and secondary education curricula. An explanatory mixed design was employed in the study. The sample of the research is composed of 413 classroom and branch teachers working in official primary and secondary schools in the central districts of Denizli. The finding revealed that teachers have positive views on the interdisciplinary approach. Further, the teachers found the interdisciplinary approach relatively useful. The study also reports that teachers' views on the interdisciplinary approach differed by the variables of professional seniority and teaching level, whereas the gender variable was not found to be a significant predictor.

Handtke and Bögeholz (2023) in a survey asked these questions concerning German teachers. Do (prospective) teachers believe they are capable of interdisciplinary science teaching (i.e., self-efficacy beliefs)? How do their beliefs develop during teacher education? Which advantages and challenges do they perceive regarding interdisciplinary science teaching? Do their perceptions change over time? The authors surveyed 271 (prospective) biology, chemistry, and physics teachers in 2019, 2020, and 2021. Finding revealed no significant changes in the mean of self-efficacy beliefs. The prospective teachers agreed in the majority (>50%) with nine out of seventeen advantages and seven out of seventeen challenges of interdisciplinary science teaching. Three advantages reached over 70% approval: Crosslinking content, addressing key problems, and Promoting interest in sciences our challenges reached over 70% approval: Lack of teacher education, Out-of-field teaching, Lack of depth in content, and Low motivation of teachers due to low affinity to and education in the subject. Neither do the perceptions change s between the time points (absolute and relative stability) nor are they very stable. Brassler (2018) in a pre-test – post-test study was conducted on a sample of 86 students participating in an interdisciplinary global service-learning course with a cohort of 140 students participating in traditional monodisciplinary courses at the same level in different departments (including Psychology, Economics, Education, and Geography students. Findings revealed students' development of interdisciplinary competence, self-awareness, and global civic activism was higher in interdisciplinary global service learning.

Objectives of the Study

The study specifically had the following objectives:

1. To find out if there is any difference in the mean performance score of male and female undergraduate students in the Interdisciplinary Base Test.
2. To find out if there is any relationship between the students' scores in the Interdisciplinary Base Test and their CGPA

Research Questions

1. What is the difference in mean performance scores between male and female undergraduate students?
2. What is the relationship between the students' Interdisciplinary scores and their CGPA?

Research Hypotheses

1. There is no significant difference between the mean scores of male and female undergraduate students.
2. There is no significant relationship between the student's CGPA and the student's score.

Methodology of the Study

The study employed a mixed design of ex post facto and correlational design. The target population is all the 300-level undergraduate biology students that registered at Sule Lamido University, Jigawa state. The choice of this particular level is supported by the fact that, the students at this level are more stabilized – having spent two years in the university. Randomly a sample of seventy (70) students were chosen for this study. A test instrument titled; the Undergraduate Students Interdisciplinary base Knowledge Test (USESIBK) was used to gather the data. The instrument has a reliability coefficient of .078 using a test-retest. The test items cut across Geography, Biology, Chemistry, Physics, and Mathematics. The items comprise ten (10) short answers, questions, fill-in blanks, and objectives (see appendix i). A mean score of less than 5 is considered poor, while a mean score of 5 and above is adjudged good. The student's CGPA was retrieved from the 300-level adviser. Data analysis was done using SPSS version 23. All analysis was done at a 0.05 level of significance.

Results of the Study

The study investigated the Interdisciplinary Base Knowledge of undergraduate science education students. The students' CGPA and their test scores as measured by the Interdisciplinary Base Knowledge Test constitute the data. Data analysis was done and the result is presented in the tables below.

Research Question 1: What is the mean difference in mean performance scores between male and female undergraduate students?

Table 1: Mean and Standard Deviation of Students Test scores

Gender	Mean	N	Std. Deviation
Female	4.1000	30	1.42272
Male	3.3500	40	1.56156

From the above, female undergraduate science education students had higher mean scores (M= 4.1000, SD = 1.42272) than male students (M= 3.3500, SD =1.56156). The mean difference is 0.75 in favor of the female

Ho1: There is no significant difference between the mean interdisciplinary knowledge base scores of male and female undergraduate students. Independent t-test analysis was computed and the result is presented in the table below

Table: T-test Analysis of Male and female scores

Group	N	Df	t-value	Significant
Female	30	68	2.065	.043
Male	40			

*P<0.05

The table above revealed t (68) = 2.065, p=.043. The p-value is below the set level of 0.05 which indicates that there is a significant difference between the scores of male and female students. Therefore, the null hypothesis is not accepted.

Ho2: There is no significant relationship between the student's CGPA and scores. Linear correlation was computed and the result is presented below.

Table 3: Linear Correlation Analysis of the Students' CGPA and Scores

Variables	N	R	P
CGPA SCORES	70	.246	.040

*P<0.05

The table above shows the result of a linear correlation between the students's CGPA and their test scores. There is a positive correlation between the two variables, r (2) = .246, p = .040. From the table, the p-value is less than the set value of 0.05, this indicates that there is a significant relationship between the students's CGPA and their scores. Therefore, the earlier-stated hypothesis is not accepted

Discussion

The findings revealed a significant variation in the performance mean scores of male and female students' undergraduate students in the Interdisciplinary base knowledge test. The result is not contrary to expectations. Many studies have turnout mixed results concerning the impact of gender on performance scores. Babalola and Fayombo (2009), and Abiam & Odok (2006) found that gender alone does not affect academic achievement. Other studies have reported in favour of males (Aina, 2013, Abuh, 2021 Akpotor & Egbule, 2020). However, within the context of this study, the finding equally showed that the mean scores of both male and female students in the test, in relation to the benchmark mean are relatively poor. This might be attributed to the straight jacket approach to teaching mindset borne by many teachers across various levels of learning. It is the thought of the researcher, that a science teacher at any level should have the content as well as the posture to teach and show the interconnectedness of science. In this fame, Klein (1990) posited that teachers need to be intentional about promoting the connectedness of several disciplines. It could also be attributed to students' attitude to these courses. Reflecting on the word of Blumberg (2000) many undergraduate students could not connect as to why they are directed to register courses outside their major discipline particularly in the first two years. Students are unable to see the connections of other courses with their major (Blumberg et al, 2000).

The finding did show a weak positive correlation as opined by Schober et al. (2018), between the students' CGPA and their scores in the interdisciplinary test. This is not contrary to the researcher's expectations. However, the finding supports the idea that students' cognitive abilities alone cannot account for this problem. The finding is incongruent with Ornguga, et al. (2018) who reported a relationship between JAMB scores and the final CGPA for graduates. Students with high CGPA must have mastered the content and passed their examination. However, they might have fallen short of grasping the universality and the interconnectedness of science. It is my thought that undergraduate science education students should have a strong schematic knowledge representation of the different aspects of science. They should be able to see the connection between science and appreciate the fact that scientific knowledge is universal across all branches of science. This also will help them experience firsthand the relevance of each discipline as an integrated whole. The more you know, the more you ask an intelligent question, and the more you guess (hypothesize) intelligently. Exposing students to knowledge from a wide range of disciplines equips her/he not only to know but to participate in both decision-making and problem-solving. In the word of Mayer and Wittrock (2006), problem-solving has a connection with the knowledge in the problem solver's cognitive frame.

Conclusion

In summary, the study managed to explore and report the interdisciplinary base knowledge of a sample of undergraduate science education students. There is a significant difference in the mean score of the male and the female. The linear relationship between the student CGPA and their score was positive but weak. Generally, the mean scores of the participant were relatively poor irrespective of gender or students' CGPA. Although it is premature to draw any insightful claims, yet inability of this sample group of students to respond correctly to the test items should be further studied.

Recommendations

Based on the findings of this study, the following recommendations were made:

- Faculty should gear classroom instruction and evaluation toward improving the Interdisciplinary knowledge base of undergraduate students.
- University management should encourage Interdisciplinary conference attendance so as to refresh and enhance interdisciplinary collaboration.
- Professional bodies like Science Teachers Association (STAN) should develop guidebooks to help science teachers implement interdisciplinary teaching practices.

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