

Influence of Peer Tutoring on Undergraduate Students' Anxiety in Integrated Science: A Case Study of University of Education, Winneba

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ABSTRACT

The study's goal was to determine how peer tutoring affected the anxiety of undergraduate students studying Integrated Science at the University of Education, Winneba (UEW) in Ghana's Central Region. The study used a cross-sectional survey research design. Out of 193 students majoring in Integrated Science in their last year at UEW, the researchers chose a sample size of 82 for the survey using a simple random selection procedure. Interviews and a questionnaire served as the study's research tools. After the students completed the surveys, the respondents were then questioned to discover their answers. Statistical Package for the Social Science (SPSS) version 26.0 was used to enter, purify, and analyze the gathered data. The data were arranged into frequency and percentages using the descriptive SPSS function. Due to academic pressure and a fear of failing, the study's findings indicated that the respondents experienced extremely high levels of anxiety in Integrated Science. In addition, it was discovered that one of the main contributors to Integrated Science anxiety was that most students paid attention to what their peers had to say about the program, and in particular, some courses, which had instilled fear in them even before they had taken the course. The study suggested that teachers do their best to aid students' comprehension and that teachers should encourage students to interact more with one another.

KEY WORDS: Anxiety, integrated science, peer tutoring, undergraduate students'

INTRODUCTION

While pursuing undergraduate courses at a university, a student must be fully committed to succeeding. According to the research, there are many factors that college students face stresses from. Both academic and extracurricular, these variables encompass societal, environmental, and psychological elements (Brand and Schoonheim-Klein, 2009). Having often to live away from the safety of home and family and take on adult duties are just some of the costs of doing this for many of the students in the Department of Integrated Science Education, University of Education (UEW), Winneba, Ghana. Even though research on the connection between stress and academic performance has attracted a lot of interest (Kumar et al., 2014; Bedewy and Gabriel, 2015), it is crucial to focus on how stress affects anxiety, depression, and panic attacks as well as how these elements relate to academic performance.

Anxiety as described by Lippman (2007) as "a condition of intense anxiety, uncertainty, and worry resulting from the prospect of a terrifying occurrence or scenario, generally to such a degree that normal physical and psychological functioning is impeded" (p. 38). The core causes of the various anxiety disorders are, according to the American Psychiatric Association (2013), fear and anxiety. The physical and

psychological effects of anxiety are often unfavorable. The symptoms manifest physically as shortness of breath, dizziness, tense muscles, palpitations, and a rapid heartbeat. On an emotional and cognitive level, anxiety leads to agitation, worry about imminent calamity, fear of shame, humiliation, and even fear of death. According to a news report from Brown et al. (2016), one in six college students has an anxiety diagnosis or is undergoing therapy for it, according to the American College Health Association (2018). Nearly 21% of those students surveyed said that anxiety had a detrimental effect on their academic performance, which showed up as a lower grade on a test or assignment, unfinished work, or dropping the course.

Peer tutoring is one technique to improve learning outcomes in this context. Recent initiatives and advancements in higher education greatly favor the development of peer tutoring systems (Pugatch and Wilson, 2018). According to the Education Endowment Foundation (2023), peer tutoring enhances learning and benefits tutors as well as their pupils. It is believed to be advantageous because smarter students serve as tutors who help their colleagues understand what they might not understand in the classroom as well as offering the less knowledgeable students the opportunities to ask questions which they might feel shy in asking the teacher. It also has the primary objective of raising students' academic achievement by

enticing them to behave in a way that would assist them reach the stated goal (Pugatch and Wilson, 2018). Since it encourages student empowerment, learning, and motivation, higher education uses it frequently (Colvin, 2007). While increasing student engagement, time on task, self-confidence, and self-efficacy, peer tutoring also promotes academic and social growth for both the tutor and tutee. It is necessary to enhance undergraduate instructors' comprehension of integrated science subject and to help them feel less concerned about science. This is due to the chance that instructors who previously struggled with anxiety as students would do so again when instructing and possibly pass it along to their pupils (Stoehr, 2017). In addition, the pupils' achievement in science is adversely correlated with the teacher's level of anxiety (Ramírez *et al.*, 2018).

According to Jacob and Zhao (2009), science fosters many of the talents that students will need in the 21st century to participate in our globalized society. These skills include problem-solving, critical thinking, reasoning, creativity, interpretation, and analysis. One of the four basic disciplines at Ghana's second cycle institutions is integrated science. In fact, the WAEC (2018) Chief Examiner's Report indicated that students' performance in integrated science has been poor due to their inability to provide descriptive answers to questions, their mispronunciation and incorrect spelling of scientific terminologies, as well as candidates' lack of subject-matter knowledge. Stakeholders and teachers alike have come out with ways of addressing this by organizing remedials for students, providing the suitable learning environment as well as using varying pedagogies to impact scientific knowledge but it has yielded less results as the fear of the subject still persist among the students. This study therefore examines the impact of peer tutoring on students' anxiety and its cumulative effect on their academic performance.

Given that there are not enough contact hours for integrated science in the Ghanaian educational system, the majority of basic and secondary school teachers frequently prefer to hand out notes and explain scientific ideas to students in order to finish the syllabi on time rather than evaluating the students' performance to determine their areas of weakness. As a result, teachers do not do much to close the achievement gap by focusing on a specific student or students, a specific set of skills, or a specific area of knowledge to help students perform better in science and develop science concepts. This includes making links between what students are learning and other subjects, incorporating reliable approaches, and carrying out interventions. Since they will assume the role of teachers in a few years, it is important to look into the anxiety of integrated science teacher candidates. If a teacher lacks confidence in the science topics being taught, it will damage both their attitude and the quality of their instruction (Owusu-Fordjour, 2021). A teacher's self-efficacy plays a key role in influencing the effectiveness of their lessons in the classroom (Owusu-Fordjour *et al.*, 2021), since a teacher with high self-efficacy is able to educate with confidence and without worrying about making mistakes.

An instructional strategy that encourages critical thinking, problem solving, and decision-making is peer tutoring (Rao and DiCarlo, 2000). According to research, chatting to peers helps students organize their thoughts and brings to mind ideas they might have forgotten on their own (Gok, 2012). The interactive method of peer tutoring was created to enhance the learning process (Rosenberg *et al.*, 2006). This approach has the benefit of keeping the student's attention and making the presentation more entertaining. In addition, it is crucial since it provides the lecturers with important feedback regarding the class's knowledge and where it is at. Compared to conventional lecture-based training, it is more efficient at enhancing students' conceptual understanding (Lasry *et al.*, 2008).

Peer tutoring in higher education is frequently researched as a way to assist students do better academically, very little study has looked at how peer tutoring affects undergraduate teachers' peers' apprehension about science. The goal of the present study is to comprehend the connection between Ghanaian undergraduate students' anxiety and peer tutoring in integrated science.

METHODOLOGY

The researchers used a mixed method approach to acquire a comprehensive understanding of the research problem. The investigation was therefore embedded within the mixed methods technique. The mixed method approach is a research methodology that combines qualitative (e.g., interviews, focus groups, and experiments) and quantitative (e.g., surveys, questionnaires, and experiments) data to investigate the research problem in order to gain a broad and in-depth understanding of it (Creswell and Clark, 2011). The convergent parallel mixed method technique in particular (Creswell and Clark, 2011) is most suited to this study. Separate qualitative and quantitative data are collected concurrently, analyzed, and combined using the convergent parallel mixed method methodology for this investigation (Creswell and Clark, 2011). The design's framework is shown in Figure 1.

To ascertain the impact of peer tutoring on undergraduate students' anxiety in integrated science without affecting the findings, the researchers used a cross-sectional survey approach for the study. Students majoring in integrated science in their final year at UEW made up the survey's sample. There were 193 students in the final year. The researchers also used a straightforward random sampling procedure to choose 82 students from the 193 students enrolled in integrated science as the sample size for this survey. In this study, interviews were used as the research instruments. The questionnaire was

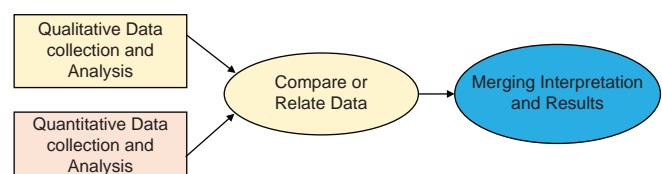


Figure 1: Study's convergent parallel mixed method design

administered to the 82 students sampled for the study. Issues of informed consent and confidentiality was adhered to ensure proper ethics of the study. Six (6) respondents were interviewed to ascertain their responses to the questionnaire after the students had completed the questionnaire. The Cronbach's alpha was reported to be 0.897 and the internal correlation to be 0.913, indicating reliability for the Zung anxiety self-rating questionnaire used.

RESULTS AND DISCUSSION

Demographic characteristics of participants include gender, age distribution, and students' residential status. It was observed from the data gathered that 38 (46.3%) were males while 44 (53.7%) were females. Again, a significant proportion of the respondents 41 (50%) were in the age category of 20–25 years. While 33 (40%) were in the age bracket of 26–30 and 8 (10%) were above the age of 30 years. None of the participant was a traditionalist or belonged to any other religion. Furthermore, 53 (65%) were residents in rented accommodation while 29 (35%) were in the hostels as presented in Table 1.

It was observed from the data gathered that undergraduate integrated science students at the University of Education show a greater level of anxiety as seen in Table 2.

From Table 2, it is evident from the data gathered that 43 (52%) participants responded that they always feel more nervous and anxious than usual in the semester toward the course of study. Five (6%) of the participants said that they sometimes feel the nerve, whereas 34 (42%) of the total sample said that they do not feel the nerve. Again, 61 (74) respondents reported that they always feel afraid for no reason at all within the semester. Three (4%) respondents said that they sometimes feel afraid, while 18 (22%) participants said that they do not or least feel afraid toward studies.

Furthermore, it was observed from the data gathered that 53 (64.6%) respondents agreed that they always felt upset easily or feel panicky. Ten (12.2%) participants reported that they sometimes feel upset or panicky while 19 (23.2%) respondents indicated that they do not feel panic at all. Furthermore, 53 (64%) respondents of the total sample attest

that they feel like falling apart and going into pieces within the semester toward the course of study, while none reported that they sometimes feel like that, 29 (36%) of the respondents indicated that they do not feel like they are falling apart and going into pieces.

Moreover, it was evident from the data gathered that 32 (40%) of the sample said that they felt that everything was all right and nothing bad would happen, 24 (29%) reported that they sometimes felt that way and 26 (33%) indicated that they did not feel good and always thought that something bad would happen. Finally, it was observed that 47 (57%) said that their arms and legs shook and trembled always while 13 (16%) indicated that they experienced that situation some of the times, and 22 (27%) of the respondents reported that they did not feel like that at all.

From the data from Table 2, it can be seen that all the statements provided showed a negative response from the students. From Statements 1 to 6, each of them was showing as much as 51% of the students responding with the highest interval possible. This gave an indication that students' anxiety level according to the Zung's scale was very high. For this reason, it can be concluded that the level of anxiety of the undergraduate students in the Integrated Science Education Department was very high due to the high pressure from studies as a result of limited time to study and take assessments.

In a focus group discussion, the researchers collected the responses with an interview guide. The responses were organized into themes as follows, with representative quotes:

- a. Integrated science courses are undoubtedly a difficult subject.
I wouldn't say integrated science is difficult, but it just needs more time as compared to the other subjects. And time is also what students don't have. (Student 4)
Integrated science is difficult; it is plenty, too many terms, a number of laws and theories. Integrated science is difficult. (Student 3)
- b. Anxiety towards the Integrated science course
I am not that good with integrated science and as such, I do not feel comfortable in most of the integrated science courses. I always want the time to move faster in other for me to leave to the class. (Student 2)
I do not feel so excited in lectures. I find it to be a normal class as the other class. (Student 5)

These results are consistent with research by Nerdrum et al. (2006), Ovuga et al. (2006), and Adewuya et al. (2006), who found that college students worldwide experience psychological morbidity, particularly depression and anxiety, as a result of worries about the future, academic pressure from handling difficult tasks and assignments, and a desire to improve their academic performance. According to Obioha (2011), who was explaining the situation in Nigeria, schools there have come a long way from having no science instruction to having nearly mandatory science programs at all levels, yet younger generations

Table 1: Demographic characteristics of respondents

Variable	Frequency (%)
Gender	
Female	38 (46.3)
Male	44 (53.7)
Age distribution (years)	
20–25	41 (50)
26–30	33 (40)
30 and above	8 (10)
Residential status	
Rented house	53 (65)
Hostel	29 (35)

Source: Field survey, 2022

Table 2: Student's anxiety level towards learning integrated science based on Zung's self rating

Statements	Frequency (%)				
	1	2	3	4	5
I feel more nervous and anxious than usual whenever school is about resuming	21 (26)	13 (16)	5 (6)	20 (24)	23 (28)
I feel afraid for no reason at all	10 (12)	8 (10)	3 (4)	29 (36)	32 (38)
I felt upset easily or feel panicky because of what our seniors told us	7 (8)	12 (15)	10 (12)	27 (33)	26 (32)
I feel like am falling apart and going into pieces whenever I am to take certain courses	15 (18)	14 (17)	3 (4)	29 (36)	21 (25)
I feel that everything is alright and nothing bad will happen	24 (31)	2 (2)	24 (29)	21 (26)	11 (14)
My arms and legs shake and tremble	12 (15)	10 (12)	13 (16)	24 (29)	23 (28)

Source: Field survey, 2022

still do not particularly desire to study science. This has an understandable cause. The social values prevalent in the nation today have drawn students' attention and interest away from studying science and toward other pleasures of life. According to Olasehinde and Olatoye (2014), the attitude that students have toward science has a large direct impact on how well they perform in the subject. Despite the recent prominence given to the integrated science topic, Adesokan (2021) and Agboola and Oloyede (2007) argued that it is clear that students still exhibit behavior toward science, which results in subpar performance.

Influence of Peer Tutoring on Undergraduate Students' Anxiety?

Here, students were interviewed on the state of their level of anxiety toward the integrated science course within the semester when their peers help them with tutoring them as the semester progress and some of their responses were as follows:

- a. How did peer tutoring help you?
It helped me a lot. In fact, this strategy should be used by the lecturers even when we go to the lecture hall. They should give us a task and allow us to interact to find answers to the task given to help boost our confidence and decrease our anxiety towards studying the courses. When a friend taught me the various courses we are undertaking, I understand them better than a lecturer will do, so I will suggest that they should make some of us teach us for us to do away with the fear of failure because of not understanding a topic taught.
- b. How do you see yourself now that your friend has taken you through the topic taught?
Very calm and easy. It all comes down to understanding the topic. I was feeling that from of uneasy because of not getting the concept taught and now that I have understood the topic, am fine and hope to continue the semester and write my final paper in peace for success.
- c. Was the peer tutoring strategy good for you?
Yes, this is because my friend takes time to explain concepts to my understanding rather than attending lecturer for the lecturer to attend to all of us.

From the responses above, there is an indication that peer tutoring had a significant influence for these students' anxiety because it was observed that what was causing students' anxiety was fear of failure because they seem not to have

understood the courses that they had been taught in the semester. However, when they were taught by their peers, they seemed to have a better understanding of the course and that got them more enthused for a better performance in the future.

This suggests that peer tutoring significantly reduced the student's anxiety, which was brought on by the strain of their studies and their fear of failing since they did not grasp the lecture material. However, when they are exposed to peer-to-peer tutoring and learning, they gained a lot more comprehension and their fear of failing declined significantly. According to studies by Hott and Walker (2012), José et al. (2020), and Alegre et al. (2020), peer tutoring is a tactic that supports academic growth across age groups, grade levels, and subject areas, and these findings add to the body of evidence supporting this claim.

CONCLUSION AND RECOMMENDATIONS

The anxiety level of undergraduate students in integrated science revealed that their anxiety level was very high due to academic pressure and fear of failure. The main factor responsible for student's anxiety was the teaching approach or teaching strategy, which was mostly lecture. Again, it can be concluded that students' negative behaviors and bad perception about the subject, which was identified through student's responses to question items on the questionnaire. Furthermore, it can be argued that students felt anxious because they thought that they may fail if they do not understand a concept in a course. Enhanced participation in science were noticeable when the students were grouped to undertake peer-teaching activities. This technique enabled the students to express themselves unreservedly, share ideas, develop the spirit of teamwork, and learned from one another. Students developed self-confidence and freely expressed their opinions during lessons.

According to the results, it is advised that peer tutoring in particular be employed as an efficient strategy in conjunction with microteaching to help students at the University of Education, Winneba, strengthen their teaching abilities. In addition, peer tutoring instructional methodologies should be incorporated into the secondary school economics curriculum, according to school authorities and educational administrators. Again, teachers should be the focus of seminars, conferences, and workshops. Their knowledge and expertise of the peer tutoring instructional technique would be improved as a result,

leading to effective implementation. Finally, to promote the development of students' general abilities, lecturers at the UEW should introduce students to the peer tutoring instructional technique when delivering instruction in the classroom.

ETHICAL STATEMENT

The researchers sought the consent and permission of respondents before obtaining information from them. This was done through self-introduction by the researcher, the purpose of the study, what it would be used for and how beneficial it is expected to be to the communities under study. They also assured that the information being sought from them would be strictly kept in confidentiality and that their identities was not be disclosed anywhere.

DECLARATIONS

Acknowledgment

The authors of the paper would like to thank my anonymous reviewers for their academic stimulation and constructive criticism throughout the development of the paper. We are again grateful to my colleague for the inputs they made to refine the paper.

CONFLICTS OF INTEREST

No conflicts of interest exist. We wish to confirm that there are no known conflicts of interest associated with this publication, and there has been no significant financial support for this work that could have influenced its outcome.

REFERENCES

Adesokan, F.G. (2021). *Effects of Multisensory Approach and Peer Tutoring on Academic Performance of Pupils with Attention Deficit Hyperactivity Disorder in Literacy*. (Doctoral Dissertation, Kwara State University, Nigeria).

Adewuya, A.O., Ola, B.A., Aloba, O., Mapayi, B.M., and Oginni, O. (2006). Depression amongst Nigerian university students. Prevalence and sociodemographic correlates. *Social Psychiatry Psychiatric Epidemiology*, 41(8), 674-678.

Agboola, O.S., and Oloyede, E.O. (2007). Effects of project, inquiry and lecture-demonstration teaching methods on senior secondary students' achievement in separation of mixtures practical test. *Educational Research and Reviews*, 2(6), 124-132.

Alegre, F., Moliner, L., Maroto, A., and Lorenzo-Valentin, G. (2020). Academic achievement and peer tutoring in mathematics: A comparison between primary and secondary education. *Sage Open*, 10(2), 2158244020929295.

American College Health Association. (2018). *American College Health Association, National College Health Assessment II: Reference Group Executive Summary*. United States: American College Health Association.

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. United States: American Psychiatric Publishing.

Bedewy, D., and Gabriel, A. (2015). Examining perceptions of academic stress and its sources among university students: The Perception of Academic Stress Scale. *Health Psychology Open*, 2(2), 2055102915596714.

Brand, H.S., and Schoonheim-Klein, M. (2009). Is the OSCE more stressful? Examination anxiety and its consequences in different assessment methods in dental education. *European Journal of Dental Education*,

13(3), 147-153.

Brown, C.L., Robitaille, A., Zelinski, E.M., Dixon, R.A., Hofer, S.M., and Piccinin, A.M. (2016). Cognitive activity mediates the association between social activity and cognitive performance: A longitudinal study. *Psychology and Aging*, 31(8), 831-846.

Colvin, J.W. (2007). Peer tutoring and social dynamics in higher education. *Mentoring and Tutoring*, 15(2), 165-181.

Creswell, J.W., and Clark, V.L. (2011). *Best Practices for Mixed Methods Research in the Health Sciences*. Vol. 2013. Bethesda, Maryland: National Institutes of Health, pp. 541-545.

Education Endowment Foundation. (2023). Working with Parents to Support Children's Learning. Available from: <https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/supporting-parents> [last accessed on 2023 Mar 23].

Gok, T. (2012). The effects of peer instruction on students' conceptual learning and motivation. *Asia-Pacific Forum on Science Learning and Teaching*, 13(1), 1-17.

Hott, B., and Walker, J. (2012). *Peer Tutoring*. Kansas: Council of Learning Disabilities.

Jacob, S., and Zhao, D. (2009). Teacher perceptions of equity in high school computer science classrooms. *ACM Transactions on Computing Education (TOCE)*, 20(3), 1-27.

José, L., Arco-Tirado, T., Francisco, D., Fernández-Martín, Y., and Miriam, H.T. (2020). Evidence-based peer-tutoring program to improve students' performance at the university. *Studies in Higher Education*, 45(11), 2190-2202.

Kumar, E., Rummel, N., and Koedinger, K.R. (2014). Adaptive intelligent support to improve peer tutoring in algebra. *International Journal of Artificial Intelligence in Education*, 24(1), 33-61.

Lasry, N., Mazur, E., and Watkins, J. (2008). Peer instruction: From Harvard to the two-year college. *American Journal of Physics*, 76(11), 1066-1069.

Lippman, L.H. (2007). Indicators and indices of child well-being: A brief American history. *Social Indicators Research*, 83(1), 39-53.

Nerdrum, P., Rustøen, T., and Rønnestad, M.H. (2006). Student psychological distress: A psychometric study of 1750 Norwegian 1st-year undergraduate students. *Scandinavian Journal of Educational Research*, 50(1), 95-109.

Obioha, E.E. (2011). Challenges and reforms in the Nigerian prisons system. *Journal of Social Sciences*, 27(2), 95-109.

Olaschinde, K.J., and Olatoye, R.A. (2014). Scientific attitude, attitude to science and science achievement of senior secondary school students in Katsina State, Nigeria. *Journal of Educational and Social Research*, 4(1), 445-445.

Ovuga, E., Boardman, J., and Wasserman, D. (2006). Undergraduate student mental health at Makerere University, Uganda. *World Psychiatry*, 5, 51-52.

Owusu-Fordjour, C. (2021). Attitude of teachers and its impact on their instructional practice. *European Journal of Education Studies*, 8(8), 163-176.

Owusu-Fordjour, C., Azure, A.J., and Koomson, C.K. (2021). Integrated science teachers' self-efficacy beliefs and its impact on their instructional practice. *European Journal of Open Education and E-learning Studies*, 6(2), 98-108.

Pugatch, T., and Wilson, N. (2018). Nudging study habits: A field experiment on peer tutoring in higher education. *Economics of Education Review*, 62, 151-161.

Ramírez, M., Duran, D., Flores, M., and Oller, M. (2018). Reading in Pairs, description and results of a peer tutoring program for English as a foreign language. *Innovation in Language Learning and Teaching*, 13(4), 303-317.

Rao, S., and DiCarlo, S. (2000). *Peer Instruction Improves Performance on Quizzes*. Michigan: Department of Physiology, Wayne State University, School of Medicine.

Rosenberg, J.L., Lorenzo, M., and Mazur, E. (2006). Peer instruction: Making science engaging. In: Mintzes, J.J., and Leonard, W.H. (Eds.), *Handbook of College Science Teaching*. United States: NSTA Press, pp. 77-85.

Stoehr, K.J. (2017). Mathematics anxiety: One size does not fit all. *Journal of Teacher Education*, 68(1), 69-84.

West African Examination Council (WAEC). (2018). *Chief Examiners' Reports on WASSCE*. Accra-Ghana. West African Examination Council.