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Home Environmental Factors and Science Anxiety Affecting Academic Performance of Pre-Service Science Teachers

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Abstract

This study aims to identify the significant relationship between the home environmental factors and science anxiety affecting the academic performance of all pre-service science education students at the University of Mindanao. The data for this study came from 124 respondents who participated in completing the survey and was collected using a descriptive correlation design. The researchers used a random sampling technique to select the respondents. Using mean and Pearson r analysis, a significant relationship between home environmental factors and science anxiety affecting the academic performance of pre-service science teachers was revealed. The study found that parents' socioeconomic status and students' attitude resulted in a high mean and reached a high descriptive level. In contrast, parental involvement reached a low descriptive level. Science Anxiety with an indicator of science content showed low anxiety levels. The result revealed no significant relationship between the variables affecting the academic performance of pre-service science teachers. This study advocates the various effects of dealing with anxiety concerning the factors from home environment and academic performance experienced by the learners. Giving guidance and support that will provide students with interest and motivation may be considered.

Keywords: science anxiety, home environmental factors, academic performance, Philippines.

Introduction

Anxiety is a feeling of unease a human can feel when stressed and nervous. It obstructs the normal thinking process of an individual and causes a threat to their self-esteem and well-being (Ahmad & Ajmal, 2019). The development and progression of an individual highly affect their level of academic performance as a student. Through the years, the concern about home environmental factors and science anxiety has been apparent in our society. In the context of science, anxiety might involve the student's emotion and behaviour, which affects their educational background, strategies, limitations, enthusiasm, and gender (Ali, 2015). For science major students at the University of Mindanao, this challenge becomes critical to understand anxiety concerning science.

The home environment is the most notable institution for the existence and continuation of human life and the development of numerous personality traits (Mimrot, 2016). Moreover, Evans (2020) asserts that in regard to child development in Bronfenbrenner's ecological systems theory, a simple home and school environment, complicated societal ideals, rules, and practices all play a role in the intricate system of interactions that make up a child's development. Dealing with anxiety is an emotional process that we need to survive in our daily life. Nowadays, the percentage of

students' anxiety is increasing in our new normal educational system. The anxiety brought by the subjects, particularly science, brings fear and disturbance among the students in schools, colleges, and universities. Although there are exceptionally excelling students in the mentioned subject, it cannot be repudiated that they are facing hardship in those subjects (Sanstad, 2018). Therefore, there is a need to conduct a study. The centre of this study is to measure the home environmental factors, anxiety among the students, and how to deal with them due to face-to-face classes while most students engage in online classes.

The independent variable (IV) indicates that home environmental factors affect academic performance. It represents the following three indicators: parental involvement, socioeconomic status, and attitudes of the students. First, parental involvement asserted by Naite (2021) affects the active involvement in their children's education. It may influence their growth, behaviour, and performance in academics from early to adulthood years of education. In addition, the socioeconomic status of a student's family or parents significantly affects academic success. The socioeconomic position of parents is a significant element that influences adolescents' academic achievement. Socioeconomic status specifies the combination of education, income, and profession. When a family exasperates poverty, the results may influence parenting and cause stress towards the children, affecting their emotional intelligence. The financial inadequacy of the parents makes the children feel inferior, which inhibits them from engaging with others and increases their daily stress (Chitra, 2020).

As Bhat et al., (2016) stated, parents' socioeconomic status influences academic performance and allows children from low socioeconomic backgrounds to compete with their high socioeconomic peers in the same academic environment. The parents' education levels can influence the value they have on education, which can influence a child's educational success, and further, be independent of income (Gobena, 2018). Afterward, the students' attitudes influence their decisions and achievements from various sources. The relevant criteria for evaluating academic success are their studying habits and attitudes. The negative and positive attitudes in physics significantly impact learning outcomes in physics and science, giving students a pessimistic approach towards learning, and making the learning process more complex now and in the future (Astalini et al., 2018).

On the other hand, the dependent variable (DV) indicates science anxiety, a debilitating cognition of science learning and negative emotion before and during science learning (Megreya et al., 2021). A similar study by Sanstad (2018) added that science anxiety is a specific field that drives emotions to constant dilemmas. Furthermore, Molin (2018) indicates anxiety in science is prevalent in exploration and science-related situations. Science content as an indicator represents a hostile field triggering students' in-depth emotional and psychological states and multiple perspectives on various concepts that reflect on balancing the factors of science and life (Brownell et al., 2018).

A study by Okoedion et al., (2019) implies that students' academic performance suffers due to the lack of family support. The lack of support and aid from friends and family members can affect the student's academic performance, emotional irregularities, short attention span, and a lack of self-esteem. The study by Muhammad et al., (2021) concludes that the home environment has a considerable impact on the emotion and thought competency or incompetency of parents and guardians, which has either confirming or antagonistic impacts on the student.

Parental involvement as described by Boonk et al., (2018) proves that the following variables show promise in terms of their correlations with academic achievements such as home reading, parents' expectations of the student's academic achievement,

discussion between parents and children about school, and support for their learning. The analysis of Otani (2019) stated that students' attitudes and goals mediate the relationships between parental participation and academic achievement. Socioeconomic status, typically defined as an individual or group's social class, was coined by Ovansa (2017). According to Das, Halder, and Mishra (2014), attitude is the belief that one has towards people and their surroundings. Their positive attitudes may influence students' academic achievement. Attitude shapes people's feelings, represented in their likes and dislikes. However, Verešová and Mala (2016) believe that students who do poorly in school have a negative attitude towards learning and that education and learning will not help them prosper.

Science continues to grow because of the advancement we have right now. Generally, anxiety is the common, broad, and vaguely mixed collection of different fears, making college students' education challenging (Sanstad, 2018). Enrolling in science courses is already a factor of students' anxiety since digesting science content can be challenging for students who have different abilities to analyse the problem. Brownell et al. (2018) added that the science field could picture a hostile environment, resulting in a higher level of anxiety in students that triggers their emotional and psychological state. In some cases, students feel anxious when they are not welcomed and are poorly treated (AlKandari, 2020).

According to a study by Bulic and Blazevic (2020), the setting affects students' duties, engaging the new norm of the educational system. Students perceive satisfaction in controlling the process. Students who lack motivation are those who quit upright, as opposed to those who develop motivation through the fulfilment of the process. Psychological factors affect the changing behaviours caused by COVID-19 such as physical activities, excessive phone usage, and isolation. College students who do online education are at a higher risk of developing mental health issues, social isolation, and less interaction with their social networks (Lischer et al., 2021). The researchers are determined to measure the relationship between home environmental factors and science anxiety indicators affecting students' academic performance. However, no academic studies have focused on addressing this issue, and previous studies measured different variables related to this study. Therefore, this is the research gap for which the researchers found the need to conduct the study.

Objectives of the Study

The primary purpose of our study is to measure the home environmental factors among the pre-service science teachers and their relationship in science anxiety affecting academic performance, specifically to answers the following questions:

1. What are the home environmental factors affecting the academic performance among pre-service science teachers? (s? (parental involvement, socioeconomic status of parents, and attitudes of the student)2. How does science anxiety influence the academic performance of pre-service science teachers based on science content?

3. Is there any significant relationship between home environmental factors and science anxiety affecting the academic performance of pre-service science teachers of the University of Mindanao?

Null Hypothesis

There is no significant relationship between the variables affecting academic performance, tested at a .05 level of significance.

Methodology

Participants

The respondents of this study are the students enrolled in the University of Mindanao, especially in the College of Teacher Education Department. The researchers chose Bachelor of Secondary Education Major in Science students as the

participants of this research. During the data collection process through a survey-designed questionnaire prepared by the researcher, 124 students responded, which took 43 days starting from February 12 to March 26, 2022. Some respondents could not respond due to their hectic academic priorities and poor connectivity. The sample size of 124 was significant and statistically measurable.Delice (2018) stated that a correlational study design should not be less than 30. It ratified Roscoe's idea of determining the sample size greater than 30 and less than 500 were fit to any behavioural studies (Memon et al., 2020) with a confidence level of 95% and a marginal error of 5.62%.

In addition, researchers use a random sampling technique to select the respondents since they are the ones who may provide the applicable information to appraise the hypothesis of this study. As face-to-face engagement may be limited, respondents can be selected online. The strengths of random sampling include its simplicity of utilisation and precise interpretation (Depersio, 2021). Inclusion criteria are the key features of the target population that the investigators will use to answer their research questions. Typical inclusion criteria include the level of exposure to home environmental factors, level of science anxiety, and the correlation between home environmental factors and science anxiety. Standard exclusion criteria include personal characteristics of eligible individuals such as the name, age, gender, status of a student, and year level.

Materials/Instruments

The study applies Ngussa and Gundula's (2019) "The Effect of Home Environmental Factors on Students' Academic Achievement: A Case of Community Secondary Schools in Monduli District, Tanzania" and; "Science anxiety levels in Emirati student teachers" adapted from Dickson et al., (2017) to create a 36-item survey questionnaire in measuring the relationship between home environmental factors and science anxiety affecting academic performance among the Pre-service Science Teachers.

Home environmental factors as independent variables fall into three sub-categories: parental involvement, socioeconomic status, and the attitude of students. The survey consisted of (17) questions to assess the participants with six items each for parental involvement and attitude of the students; five items for socioeconomic status. The instrument used the Likert Scale and its corresponding interpretations. The range of mean and descriptive levels anchors were: very high (4.20 – 5.00), indicating that home environmental factors are always manifested; high (3.40 – 4.19), indicating that the home environmental factors are frequently manifested; moderate (2.60 – 3.39) indicating that the home environmental factors are sometimes manifested; low (1.80 – 2.59) indicating that the home environmental factors are seldom manifested; and very low (1.00 – 1.79) indicating that the home environmental factors are never manifested.

Meanwhile, Science Anxiety as a dependent variable has one indicator of science content consisting of (19) questions to assess the participants. The instrument used the Likert Scale and its corresponding interpretations. The range of mean and descriptive levels anchors was: very high (4.20 – 5.00), indicating that the anxiety level toward science is always manifested; high (3.40 – 4.19), indicating that the anxiety level toward science frequently manifested; moderate (2.60 – 3.39) indicating that the anxiety level toward science is sometimes manifested; low (1.80 – 2.59) indicating that the anxiety level toward science is seldom manifested; and very low (1.00 – 1.79) indicating that the anxiety level toward science is never manifested. The researchers used Google Forms for the study to collect data.

After the data gathering, the researcher collected it for tallying scores and applying the following statistical tool used in the

investigation. The Cronbach Alpha reliability test of Home Environmental Factors shows .920, which indicates reliability between Science Anxiety with .974. The study found both variables to be reliable and accepted. According to Chetty and Datt (2015), Cronbach's alpha statistic is a standard tool that assesses the reliability of the questionnaires or instruments developed or appropriately adopted for research initiatives.

To correlate the relationship between the home environmental factors and science anxiety affecting academic performance, the following interpretations were used: very high positive (.90-1.00), high positive (.70-.90) correlation, moderately positive (.50-.70), low positive (.30-.50), and negligible (.00-.30) correlation. Those mentioned above distinguish the significant relationship between the variables.

Design and Procedure

This study used a quantitative method involves objective measurement and statistical and mathematical or numeral analysis. Data collection focused on surveys, questionnaires, statistics and measure variables, and pre-existing data (Pal, 2017). The advantage and strength of using a quantitative research method is the ability to collect statistical data to saves time and resources (Daniel, 2016).

This research is also designated as the correlational type, as Creswell (2012) stated that correlation analysis entails gathering data to describe and measure the degree of relationship between two or more variables. This research has two variables: Home Environmental Factors (IV) and Science Anxiety (DV) which affect academic performance.

The researchers gathered the data by following a step-by-step procedure. First, they made a request letter to validate the questionnaires for a proper survey. The researchers obtain the request letter once the validators have approved it. Second, after the questionnaires' validation and approval, they were submitted to the thesis adviser for revision and some modifications to the questions. Third, the researchers used time allocation to administer the questionnaires through Google Forms. Fourth, after the data was gathered, the researcher collected it for tallying scores and applying the statistical tool used in the investigation. In line with the study's aims, the responses to the questionnaire items were tailed and recorded accordingly. The statistical tools used in the interpretation of gathered data were Mean and Pearson's r. The mean determined the Home Environmental Factors and Science Anxiety of the respondents. Mean can be used to compare different data (Dudovskiy, 2015). Meanwhile, Pearson's r determined the significant relationship between home environmental factors (IV) and science anxiety (DV).

Result and Discussion

Level of Exposure to Home Environmental Factors

The mean score for the level of exposure to Home Environmental Factors is presented in Table 1, with an overall mean of 3.56. This mean score attributed to the highest rating given by the respondents, indicating that the students frequently displayed a level of exposure to Home Environmental Factors. The resulting mean score of indicators ranging from highest to lowest was calculated to derive the overall mean score.

Two indicators were classified as high, which signifies the parents' socioeconomic status. It had the highest mean of 4.08, indicating that the Home Environmental Factors are frequently manifested. It means that the socioeconomic status of parents affects their financial academic in terms of expenses. This study supports the idea of Chen et al., (2018) that there is a high and stable correlation between the parent's financial status and their children's academic achievement. Meanwhile, student attitude received also received a high mean of 3.64. It means that the student's attitude depends on how motivated the learner is. The results were in consonance with a previous study by

Mao et al., (2021) that enhancing students' positive attitude toward science could be conducive to learning in science. It impacts students to improve positive attitudes that may be beneficial to science learning.

On the other hand, Parental Involvement has a mean of 3.04, which indicates that environmental factors are seldom manifested. It means the involvement of the parents moderately affects the academic performance of the pre-service science teacher. This finding agrees with the study of Rasool et al., (2021) that parents' involvement in their children's education at home has a significant positive impact on their academic achievement by assisting them with homework, projects, and other school activities that affect their studies.

Level of Science Anxiety

Table 2 emphasizes the level of science anxiety that deals with the indicator science content. The result is a mean of 2.54 which falls under the low category, indicating that the anxiety level of pre-service science students toward science is seldom manifested. The pre-service science students are motivated to learn Science.

The learning in science content among pre-service science teachers shows low anxiety levels. In line with the findings of Avci (2017), as a result of research conducted on students' low level of science anxiety, they are influenced by their learning environment based on the country's educational system through integrating the education and changing world's advancement. Students' engagement in science is more actively motivated by learning than in another subject.

The level of science anxiety about the science content results in a mean of 2.54 with a descriptive level of "low." This result aligned with the study of Downing et al., (2020) which students experience mild anxiety due to active participation in science courses and opportunities to learn through self-learning and group learning. Based on the theory of Yerkes-Dodson Law, the relationship between the feeling of pressure to perform a task and viewing anxiety as either an achievement or failure emotion varies across the students and the intensity of stress they experience.

Table 1. *Level of Exposure to Home Environmental Factors.*

Indicators	Mean	SD	Descriptive Level
Parental Involvement	3.04	.97	Low
Socioeconomic Status of Parents	4.08	.85	High
Student Attitude	3.64	.81	High
Overall	**3.56**	**.64**	**High**

Table 2. *Level of Science Anxiety.*

Science Content	Mean	SD	Descriptive Level
1. I am afraid of science courses bringing down my overall GPA.	3.31	1.23	Moderate
2. I do not want to learn science if it is not mandatory.	2.30	1.10	Low
3. I am afraid of science exams more than any other exams.	3.06	1.24	Moderate

4. Thinking about learning new concepts, formulas, and definitions related to science makes me nervous.	2.87	1.26	Moderate
5. It is not necessary to learn science to be successful in my life (outside work).	2.05	1.16	Low
6. My mind goes blank in science exams, and I cannot think.	2.85	1.17	Moderate
7. I usually feel unhappy when learning science.	2.30	1.22	Low
8. It always makes me anxious that science is a compulsory course in the curriculum.	2.34	1.22	Low
9. Doing science activities in the classroom makes me uncomfortable.	2.42	1.23	Low
10. I feel like I am in a deep hole when solving science-related questions.	2.64	1.22	Moderate
11. I get stressed just when entering the classroom if the class is science.	2.38	1.17	Low
12. Learning science is not necessary to succeed in my career.	1.97	1.18	Low
13. I worry that the teacher will ask me questions in science class.	2.97	1.29	Moderate
14. I become nervous when I have to do science homework.	2.63	1.17	Moderate
15. I feel uncomfortable when I enter the science lab.	2.27	1.11	Low
16. I usually daydream in science class.	2.46	1.22	Low
17. I do not answer in science class even when I know the answer in case my friends make fun of me.	2.69	1.31	Moderate
18. I cannot learn science no matter how much I study.	2.35	1.20	Low
19. Everybody except me understands science.	2.41	1.24	Low
Overall	**2.54**	**0.96**	**Low**

Relationship between Home Environmental Factors and Science Anxiety

Table 3 displays study findings using the Pearson Product Moment Correlation Test. Parental involvement (r= .318, p<.05) and student's attitude (r= -.195, p<.05) are significantly related to science anxiety while socioeconomic status of parents and science anxiety is not significantly related (r= .025, p>.05). Home environmental factors are related to Science Anxiety (r=.110, p>.05), which means that there is no significant statistical difference. Therefore, the alternative hypothesis was not supported.

Among the three indicators, socioeconomic status relates to the highest result percentage based on the question specifying "I have access to basic needs at home (clothes, food & shelter)" that has a mean of 4.59, followed by "My parents support my academic needs" with a mean of 4.23. The findings revealed that the socioeconomic status of pre-service teachers at the University of Mindanao has low correlation to anxiety. It means that they are well supported financially in school, which leads to better academic performance; this was in line with the findings of Mishra (2021). Therefore, the revealed statistics goes in line with the null hypothesis. On the contrary, the student's attitudes toward science anxiety revealed a significant relationship in science anxiety. This finding has an overall mean of 3.64, rejecting the statistical decision affirmed by Besoyo and Tancinco (2016) that the attitude of the

student in learning science and their anxiety level does not correlate.

Moreover, in line with the ideas of Özbuğutu (2021), it can be figured that students' scores on science anxiety and attitude show a significant relationship wherein moderate and hostile toward the science lesson. Parental involvement was also rejected based on the statistical decision in dealing with student anxiety. It provides the overall mean of 3.04 and determines the relationship of this indicator− science anxiety. This paper cannot comprehensively review parental involvement due to practical constraints. As proved by Qasem (2018), the involvement of parents actively supports and motivates a learner's academic performance. Previous research findings in Barger et al., (2019) has discussed different support dimensions such as schooling, homework context, and academic adjustment for student development.

Thus, the findings of this study have shown no significant relationship between home environmental factors and science anxiety affecting academic performance.

In general, the statistics for home environmental factors indicates an "accepted" outcome, interpreting "no significance" between the science anxiety of the pre-service science teachers of the University of Mindanao and factors relating to home environment. The home environmental factors overall resulted in a mean of 3.56, indicating a high level of exposure to students affecting their academic performance. This finding grounded bio-ecological system theory, as stated by Madison (2016), that parents' influence plays a bidirectional role in shaping the whole child with the security, resources, and cognitive and behavioural aspects but does not contribute to the child's anxiety in learning science courses.

Table 3. *Correlation between Home Environmental Factors and Science Anxiety.*

Variables	Science Anxiety		
	r-value	p-value	Decision on H_o
Parental Involvement	.318*	.000	Reject
Socioeconomic Status of Parents	.025	.783	Accept
Students' Attitudes	-.195*	.030	Reject
Home Environmental Factors	**.110**	**.225**	**Accept**

*p < .05 is significant (two-tailed)

Conclusion

The study's findings conclude that the level of exposure to home environmental factors indicates a "high" overall and across all indicators: parental involvement, socioeconomic status of parents, and student attitude. The student's academic performance is highly influenced by parents' socioeconomic status and students' attitudes. In contrast, parental involvement is occasionally involved in their child's school progress and performance. The home environmental factors go in line with Bronfenbrenner's theory, the Five Systems, the development of a child grow as they expand their environment and interact with people, starting from their parents and the status they lived off of. The student's attitude reflects how the child is moulded through their environment, sculpting their own values and visions. Therefore, the level of science anxiety is low, particularly in science content. Science anxiety has low results,

which did not affect students' academic performance in school, but they were highly motivated to learn the science content. Moreover, pre-service science teachers in the University of Mindanao have no significant relationship between home environmental factors and science anxiety. It also contradicts from the findings of the study conducted by Ozbugutu (2021), where there was a significant relationship between science anxiety and environmental sub-dimension. It modifies that we cannot control the influences of each variable as a concluding result.

This study's result strengthens the students' progression in managing themselves in engaging home environmental factors and science anxiety. Since the study showed no significant relationship between home environmental factors and science anxiety, it magnifies that it influences the factors from home environmental in anxiety connecting the student's academic performance. In practice, the study also highlighted that during the pandemic, even though the educational system is online-blended learning, it deals with standard navigation from the learners, which are also the factors from the home environment and science anxiety showing limitations to a new environment of learning. How learners manage themselves for this new educational system is the general question of the stakeholders' role in the educational system, that is why researchers conducted this study to examine how this affects the pre-service science teachers.

Recommendation

This study advocates the learners' various effects of dealing with anxiety resulting from the factors of home environment and academic performance and if there would be a significant relationship between the variables or none. Perhaps, there are more possible factors that may affect the academic performance of pre-service science teachers. It needs to consider giving guidance and support that will provide interest and motivation to students. Continuing to provide psychological tests, counselling, daily monitoring from the parents and school administration, and peer counselling interaction between students. In addition, factors including teaching approaches, learning materials and instruments, performance and development, educational standards, peer pressure, and self-distraction variables should be considered to be tested.

This study is beneficial in providing awareness to students, faculties, and stakeholders of possible circumstances. In some cases, if a pandemic were to happen again, it may occur with limited interaction between students, teachers, and the process of learning. It contributes to the advantages of students, where they can cope with limitations as individuals and can motivate through the setting of learning. Mastering a specific field is the cornerstone in tackling specificities in line with the variables that are not yet covered and discussed in the following inquiry. The result of the research may serve as a basis for the subsequent study in identifying the home environmental factors and science anxiety that may be a result of incompetence of pre-service science teachers. Moreover, these two variables will be a great deal to learn how to teach and master science context and other fields.

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