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## STRESS-INDUCED FACTOR AS DETERMINANTS OF UNDERGRADUATES' NUMERICAL REASONING AND DECISION MAKING PROCESSES IN PSEUDO-MATHEMATICS COURSES

**Abstract:** This study investigated the influence of stress-induced factor as determinants of undergraduates' numerical reasoning and decision making processes (NRDMP) in pseudo-mathematics courses. The study employed descriptive research of the survey type. A sample of 400 undergraduates was selected using purposive sampling technique. A questionnaire used to collect data for this study was tagged "Stress Induces Factors among Pseudo-Mathematics Undergraduates Questionnaire (SIFPMUQ). The face and content validity of the instrument were ensured. The reliability of the instrument was established using test-retest method while Pearson's Product Moment Correlation analysis which yielded the reliability coefficient of 0.78 was obtained. The data collected was analysed using inferential statistics of t-test and Regression analysis. The findings of the study revealed that the regression model"  $y = 1.551 + 0.214x_1 + 0.069x_2 - 0.113x_3 - 0.170x_4$ " such that exposure to environment and academic workload contributed positively to NRDMP among pseudo mathematics undergraduates while financial issues and making new friends contributed negatively to NRDMP among pseudo-Mathematics undergraduates. Based on the findings, it was recommended that Students should be allowed to study in a conducive environment. Likewise, parents and guardians should endeavour to meet up with the responsibilities of their wards.

**Keywords:** Stress induced factors, Numerical Reasoning, Decision making, Pseudo-Mathematics, Undergraduates.

### Introduction

Numerical reasoning and decision making processes are the required essential tools in all Science based subjects especially in Mathematics, being a qualitative and quantitative knowledge driven subject that is applicable to virtually all human affairs. Therefore, numerical reasoning and decision making processes cannot be underestimated in solving day-to-day Mathematic problems. It is suffice to say without numerical reasoning and decision making processes, no human existence would be in emptiness. Numerical reasoning is the critical skill that enables a student to make use of all other scientific and technological skills. With the development of intuitive reasoning, students recognize that Mathematics makes sense and can be understood. Students learn how to evaluate, select problem-solving strategies, draw

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logical conclusions, develop and describe solutions, and recognize how those solutions can be applied. Knowledge of numerical reasoning enables the students to reflect on solutions to problems and determine whether or not they make sense. Mathematicians appreciate the pervasive use and power of reasoning as a part of Mathematics understanding.

Numeracy reasoning as defined by Estyn (2012) is the ability to apply simple Mathematics numerical facts, skills and reasoning to real-life problems. Similarly, the Welsh Government (2012) defines numeracy as identifying and applying numerical reasoning in order to solve a problem, and carrying out the numerical procedures which enable people to work out and show their solutions.

The ability to think critically and use numerical reasoning skills has become much more important in the workforce in recent years. Numerical reasoning ability is one of the most basic skill areas that exist in small children before they are taught Mathematics in school. Numerical reasoning helps in data interpretation or numerical critical reasoning tests, involve evaluating situations and drawing conclusions from the data provided to assess one or several of the following: critical thinking ability; basic or general arithmetic operations; ability to perform estimates; ability to analyze graphs and other data; level of speed in making analyses or assessments and level of concentration in solving problems. Therefore numerical reasoning is considered as one of the most basic skills needed in today's data-driven marketplace, and without strong numerical reasoning skills, it would be difficult for the students to meet up with the current dynamism experienced on global platform.

Numerical reasoning is fundamental to the knowing and doing of Mathematics. Ball and Bass (2003) equate numerical reasoning with a mathematical ability every student need in order to understand Mathematics. Student's access to Mathematics at the early stage is a powerful way of making numerical reasoning deepens the scientific and technological breakthrough of the students so as to become confident, self-reliant mathematical thinkers, students need to develop the capability to confront a mathematical problem, persevere in its solution, evaluate and justify their results.

Pseudo-Mathematics courses are the basics courses in Mathematics offered by early childhood education students with the aim of preparing their mind on the need for result oriented teaching that would produce great mathematicians and scientists in the future. Mathematics focuses on the ability to recall numerical facts and procedures, numerical reasoning focuses on the ability to apply those facts and procedures within a wide range of contexts. Stressing the role of numerical reasoning to solve real-world problems and decision making processes, Welsh Government (2012) suggested that through numerical reasoning, pupils are able to recognize how to use numbers to tackle a real-life situation, and planning a strategy to solve it. In a variety of situations, the ability to reason using numbers enables pupils in basic class to access and understand information such as sports, statistics, reading maps, building an object to scale, managing money and others. Without this skill, pupils will not be able to use their Mathematics ability in the real world.

Some stress induced factor such as exposure to new environment, academic workload, financial issues and making new friends seem to be contributing in no small measure to numerical reasoning and decision making processes among undergraduates who has developed phobia for Mathematics. According to Habibah, Wong, and Maria (2011), stress has always been an issue among undergraduates and past researches find stress to be

significantly correlated to academic achievement. For instance, being in a different environment can cause the beginners among undergraduates a great deal of stress. Pancer, Hunsberger, Pratt, & Alisat, in Habibah, Wong, and Maria (2011) asserted that individuals often move away from home for the first time, during this period they are cut off from family and friends, who have provided significant social support in their lives may likely experience an academic summersault in Mathematics if the initial stress factor comes up. Studies have shown that the period of greatest stress during their transition to University is in the first few weeks and months of their admission. The more life changes they go through, the more stress they will likely experience (Pancer, et al., 2000). Students are supposed to adjust to being away from home for the first time, maintain a high level of academic achievement in Mathematics, and adjust to a new social environment. However, if stress is not dealt with effectively, nervousness and loneliness, as well as sleepiness in early teaching of pseudo-Mathematics courses may aggravate an excessive worrying and may consequently resulted into poor numerical reasoning and decision making processes.

Another source of stress that undergraduates may encounter is by obtaining a lower grade more than their peers. Some students link their self-worth or future with their grades. Some undergraduates have become so preoccupied by grades that they allowed their health deteriorates. It has been found that moderate amounts of stress can help motivate students and sometimes increase academic performance. The fear of failing can also help to motivate students to prepare and perform well. Too much stress can interfere with how a student prepares, concentrates and performs (Habibah, et al., 2011).

Some undergraduates offering pseudo mathematics courses appear not to know how to properly prepare for a test and therefore perform poorly despite compulsory/ required to pass before graduation. The academic workload requires that students face a series of peak periods; there is a relatively constant underlying pressure to complete an upcoming assignment (Hudd, et al., 2000). After completing an examination there is a period of depression that students may experience which reflects on how they performed and their performance compared to other colleagues. Low self-confidence and a poor perception of performance in Mathematics related courses may be a reason why depression occurs after the test. Course overload can also cause students a great deal of stress. Also, having too many courses in a given semester, that are difficult to do well despite the courses are not advance Mathematics but basic yet they are perplexed. Many students will take extra courses so they can graduate early. This can cause students to suffer negative numerical reasoning and decision making processes later.

There are many undergraduates who have to work while they are attending higher institution. Some students have to work in order to pay their way through higher education which may pose a number of academic challenges for the students. There are many times when students have to work late at night and then do not have the time to study. This can then reflect on their academic work and on their grades. Worrying about their financial issues and their grades can be an immense stressor in their academic life. In effect, Trockel, Barnes, and Egget, (2000) suggested that more time spent at work can encroach on time otherwise available for studying. Hence, one stressor can cause another stressor to occur, having a negative impact on numerical reasoning as well as decision making ability.

In addition, making new friends can be another source of stress, which in turns leads to poor numerical reasoning and could also influence decision making among undergraduates.

According to Greenberg, (1996), giving up or changing new friendships and developing new ones is often a stressful activity associated with college life. It can be stressful for some students to try and find someone they can share things with for the support they used to have. The process of developing new friendships, while integrating themselves into a new social network, is an important step in the developmental process for students. The new network can be an important source of support and well-being and it may also turn the students upside down. New friends require a period of testing to see how much they can self-disclose to that person and feel comfortable at the same time. Going through these processes can be a stressful ordeal that can influence numerical reasoning and decision making process.

### **Purpose of the Study**

This study investigated the stress induced factor as determinants of numerical reasoning and decision making processes among pseudo-mathematics undergraduates in Ekiti State University. The study also examined the influence of environment, academic workload, financial predicaments and making new friends on the numerical reasoning of pseudo-Mathematics undergraduates. The study also established the most probable best and worst determinant of NRDMP of all the stress induced variables under consideration.

### **Research Hypotheses**

1. Exposure to environment has no significant influence on numerical reasoning and decision making among pseudo-Mathematics undergraduates.
2. Academic workload has no significant influence on numerical reasoning and decision making among pseudo-Mathematics undergraduates.
3. Financial issues has no significant influence on numerical reasoning and decision making among pseudo-Mathematics undergraduates
4. Making new friends has no significant influence on numerical reasoning and decision making among pseudo-Mathematics undergraduates.
5. Stress induce variables will not significantly contribute to numerical reasoning and decision making among pseudo-Mathematics undergraduates.

### **Methodology**

The study employed descriptive research design of the survey type. The population comprises of all undergraduates in Ekiti State University. A sample of 400 undergraduates offering pseudo-mathematics oriented courses was selected using purposive sampling technique. An instrument titled 'Stress Induces Factors among Pseudo-Mathematics Undergraduates Questionnaire (SIFPMUQ)' was used to collect data for this study. The instrument was divided into two sections. Section A contains items design to elicit information about the respondents such as sex, Parent social - economic Status, availability/non availability of library facilities, students' source of income and information. Section B contains 20 items on feedback from the students. The face and content validity of the instrument was ensured. The reliability of the instrument was established using test retest method. The instrument was administered on 20 students outside the sampled university at the interval of two weeks. Pearson's Product Moment Correlation analysis was used to analyse the result which yielded the reliability coefficient of 0.78. The data collected were analysed using inferential statistics of t-test and regression analysis tested at 0.05 level of significance.

## Results

**H<sub>01</sub>:** Exposure to environment has no significant influence on numerical reasoning and decision making among pseudo Mathematics undergraduates

**Table 1:** t-test summary on the exposure to environment for numerical reasoning and decision making among pseudo Mathematics undergraduates

Variable	N	Mean	SD	df	t-cal	p-value	Remark
Exposure to environment	200	3.869	0.074	199	1.96	0.004	Significant
NRDMP	200	2.008	0.260				

P<0.05

Table 1 shows the result of test between exposure to environment for numerical reasoning and decision making processes. The result indicates that the p-value (0.004) < 0.05 level of significance. The null hypothesis which stated that exposure to environment has no significant influence on numerical reasoning and decision making among pseudo Mathematics undergraduates was rejected. This implies that exposure to environment has a significant influence on numerical reasoning and decision making among pseudo Mathematics undergraduates.

**H<sub>02</sub>:** Academic workload has no significant influence on numerical reasoning and decision making among pseudo Mathematics undergraduates

**Table 2:** t-test summary on the academic workload for numerical reasoning and decision making among pseudo Mathematics undergraduates

Variable	N	Mean	SD	Df	t-cal	p-value	Remark
Academic workload	200	2.189	0.064	199	1.96	0.0280	Significant
NRDMP	200	2.008	0.260				

P<0.05

Table 2 shows the result of test between academic workload and numerical reasoning. The result indicates that the p-value (0.0280) < 0.05 level of significance. The null hypothesis which stated that academic workload has no significant influence on numerical reasoning and decision making among pseudo Mathematics undergraduates was rejected. This implies that academic workload has a significant influence on numerical reasoning and decision making among pseudo Mathematics undergraduates.

**H<sub>03</sub>:** Financial issues has no significant influence on numerical reasoning and decision making among pseudo Mathematics undergraduates

**Table 3:** t-test summary on the financial issues for numerical reasoning and decision making among pseudo Mathematics undergraduates

Variable	N	Mean	SD	df	t-cal	p-value	Remark
Financial issues	200	3.005	0.056	199	1.96	0.045	Significant
NRDMP	200	2.008	0.260				

P<0.05

Table 3 shows the result of test between financial issues and numerical reasoning. The result indicates that the p-value (0.045) < 0.05 level of significant. The null hypothesis which stated

that a financial issue has no significant influence on numerical reasoning and decision making among pseudo Mathematics undergraduates was rejected. This implies that financial issues have a significant influence on numerical reasoning and decision making among pseudo Mathematics undergraduates.

**H<sub>04</sub>:** Making new friends has no significant influence on numerical reasoning and decision making among pseudo mathematics undergraduates

**Table 4:** t-test summary on making new friends for numerical reasoning and decision making among pseudo mathematics undergraduates

Variable	N	Mean	SD	Df	t-cal	p-value	Remark
Making new friends	200	1.086	0.071	199	1.96	0.018	Significant
NRDMP	200	2.008	0.260				

P<0.05

Table 4 shows the result of test between making new friends and numerical reasoning. The result indicates that the p-value (0.018) < 0.05 level of significance. The null hypothesis which stated that making new friends has no significant influence on numerical reasoning and decision making among pseudo mathematics undergraduates was rejected. This implies that making new friends has a significant influence on numerical reasoning and decision making among pseudo mathematics undergraduates.

**H<sub>05</sub>:** Stress induced variables will not significantly contribute to numerical reasoning and decision making among pseudo Mathematics undergraduates

**Table 5:** Regression analysis on stress induce variables and numerical reasoning and decision making among pseudo Mathematics undergraduates

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
NRDMP	1.551	0.260		5.965	.000
Exposure to environment (x <sub>1</sub> )	0.214	0.074	0.216	2.905	0.004
Academic workload (x <sub>2</sub> )	0.069	0.064	0.079	1.083	0.028
Financial issues(x <sub>3</sub> )	-0.113	0.056	-0.141	-2.018	0.045
Making new friends (x <sub>4</sub> )	-0.170	0.071	-0.167	-2.389	0.018

a. Dependent Variable: Group discussion can aid the numerical reasoning of the students

P<0.05

Table 5 shows the result of test between the stress induced variables, numerical reasoning and decision making processes. The result indicates that all the stress induced variables significantly contribute to NRDMP among pseudo mathematics undergraduates. The analysis further revealed that exposure to environment and academic workload have a positive relationship/influence on NRDMP while financial issues and making new friends have a negative relationship/influence on NRDMP and decision making among pseudo mathematics undergraduates. Hence, the regression model is given as;  $y = 1.551 + 0.214x_1 + 0.069x_2 - 0.113x_3 - 0.170x_4$ . Thus,  $Y = a + bx$  is the regression model where y is the dependent variable (NRDMP) and  $x_1, x_2, x_3$  and  $x_4$  are the independent variables (stress induced variables);  $x_1$  is the

exposure to the environment,  $x_2$  is the academic workload,  $x_3$  is the financial issue and  $x_4$  is making new friends. This implies that;

a unit increase in exposure to environment leads to 0.214 increases in NRDMP.

a unit increase in academic workload leads to 0.069 increases in NRDMP.

a unit increase in financial issue leads to 0.113 decrease in NRDMP and

a unit increase in making new friends leads to 0.170 decrease in NRDMP.

a unit increase in other variables outside the stress induced factor under consideration leads to 1.551 increase in NRDMP. This implies that there are other variables that may also determine the NRDMP among undergraduates in pseudo mathematics courses.

### Discussion

The study revealed that there are lot of factors that influence numerical reasoning and decision making processes among pseudo Mathematics undergraduates. Some of the factors were tested in the above analysis revealed that exposure to environment and academic workload have a positive relationship/influence on numerical reasoning and decision making among pseudo Mathematics undergraduates. This was in line with Habibah, Wong, and Maria (2011), who asserted that environment has significantly correlates to academic achievement. They explained further that environment can interfere with how a student prepares, concentrates and performs in their academic. The result also negates the work of Pancer, Hunsberger, Pratt, & Alisat, (2000) that, the more life changes students go through, the more stress they will likely feel.

The study also revealed that financial issue and making new friends have a negative relationship/influence on numerical reasoning and decision making processes among pseudo-Mathematics undergraduates. This is in line with Trockel, Barnes and Egget (2000) who suggested that more time spent at work can encroach on the time available for studying.

The study further revealed that availability and usability of school library, group discussions, and availability of reading materials are other factors that influence numerical reasoning and decision making among pseudo Mathematics undergraduates. Such may be the nature of diet, variation in intelligence and body trajectory (Oginni, 2013), method of teaching, students interest and attitude towards mathematics among others.

### Conclusion and Recommendations

It could be concluded that some factors which are stress induce variables influence numerical reasoning and decision making among pseudo Mathematics undergraduates among which are environment, academic workload and financial issues. Also, some of the stress induce variables (exposure to environment and academic workload) have a positive influence on numerical reasoning while some other variable (financial issues) have a negative influence on numerical reasoning and decision making.

It is therefore recommended that:

1. Students should be allowed to study under a conducive environment where there are less noise
2. Library facilities should be provided and well equipped in the school environment
3. Students workload should be well monitored to a reasonable level in order to avert negative effect on them
4. Parent and guardian should endeavor to meet up on their responsibilities for their wards.

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### Biographical notes

**Dr Oginni 'Omoniyi Israel** is an erudite scholar of tested academic integrity. He obtained Ph.D degree in Mathematics Education. He is a science educator and curriculum expert per excellence. He has contributed immensely to knowledge in national and international journal. He is a lecturer of Mathematics and Education in the Department of Science Education of the Faculty of Education, Ekiti State University, Ado-Ekiti, Nigeria. Dr Oginni has been appointed at one time or the other as supervisor, reviewer and examiner for undergraduates and postgraduates' dissertations and theses. His passion to promote mathematics appreciation led to the study on "Stress Induced Factor as Determinants of Undergraduates' Numerical Reasoning and Decision Making Processes in Pseudo-Mathematics Courses" in order to deepen students understanding in some courses that are mathematical related.

**Mrs Ojo Oluwatoyin** is a researcher and teacher of Mathematics and Education. She is currently pursuing her Ph.D in Mathematics Education. She is a member of Mathematics Association of Nigeria. She has her journals in local and international journals. On the whole, she is a promising scholar. Her passion for mathematics led her to the study on "Stress Induced Factor as Determinants of Undergraduates' Numerical Reasoning and Decision Making Processes in Pseudo-Mathematics Courses".