

# Perceptions of Students on Introductory University Mathematics: Perspective Study on First Year Undergraduate Students

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## Abstract

This paper mainly sought to find out how students' perceptions influence students in their introductory university mathematics: The perspective of first-year undergraduate students of the University of Cape Coast. Specifically, the study sought to find out first-year students' perceptions about SHS mathematics and also to find out the perception students have about introductory university mathematics. The population size of the study was 600 students. The research design used was the descriptive survey and the stratified random sampling technique was used to select the sample. A questionnaire was designed and used to collect the data. From our findings, it was established that students have a positive perception about SHS mathematics and the introductory university mathematics course. Based on the findings of the study, it was recommended that teachers are encouraged to use learner centered approach of teaching mathematics with little regard to the teacher centered approach since the former ensures active participation of students in the teaching-learning process and facilitates understanding while the latter makes students mere passive listeners

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## 1.0 Introduction

The performance in mathematics among mathematics students has shown concern about the teaching of the discipline for some time (Ponte, Matos, Guimarães, Leal, & Canavarro, 1994). The fall in undergraduate students' enrolment led to a number of mathematical teaching initiatives designed to help students' enrolment and retention (Kennedy, Lyons, & Quinn, 2014). Enrolment of students into mathematics discipline has recently seen an upswing but finding out what students feel about mathematics, what makes them want to study mathematics, how useful and relevant they feel the subject could be in their future careers, that is the perceptions students have about senior high school mathematics and more importantly the perception they have about university introductory mathematics may be crucial information that could shape the direction, nature, curriculum and pedagogy of mathematics teaching. Despite these being pressing concerns, there is still relatively little literature that seeks to establish perceptions students have about introductory university mathematics.

In this paper, the term 'as a mental representation of mathematics, perceptions of mathematics' is conceptualized apparently constructed as a result of social experiences, mediated through interactions at school, or the influence of teachers (Mutodi, & Ngirande, 2014). It also refers to some kind of mental representation of something, originated from past experience as well as associated beliefs, attitudes and conceptions. Perceptions and beliefs about mathematics originate from past experiences; comprising both cognitive and affective dimensions (Aguilar, Rosas and Juan Zavaleta 2012). From a cognitive point of view, it relates to an individual's knowledge, beliefs, and other cognitive representations while from an affective domain it refers to an individual's attitudes, feelings and emotions about mathematics. Sam and Ernest (2000) claimed that many students are scared of mathematics and feel powerless in the presence of mathematical ideas. They regarded Mathematics as "difficult, cold, abstract, and in many cultures, largely masculine" Ernest, (1996).

A focus on first year undergraduate students is very interesting because the subject has generated an on-going debate among mathematics folks concerning the perception student have about mathematics. The perception held by mathematics students towards the subject influences, to a very large extent, their academic performance in the discipline as they move up the academic ladder, that is, graduating from the secondary to tertiary level. Nonetheless, not much empirical research has been advanced to find solutions to the possible challenges associated with it.

To the best of my knowledge, no study focuses on the perception students have about university introductory university mathematics in context of Ghana. The scantiness of published academic work and the limited range of empirical techniques employed can be confirmed by a quick check of the existing literature. This paper therefore presents a chronological, adaptive and reflective investigation into student perception about university introductory mathematics.

## 2.0 Statement of the Problem

Considering the background which details the importance of perceptions students have about university introductory mathematics. This paper therefore set out to investigate how perception held by mathematics students towards the subject influences, to a very large extent, their academic performance in the discipline as they move

up the academic ladder.

### 3.0 Research Questions

This paper sought to provide solutions to the following questions;

1. What is the perception of first year mathematics students about Senior High School mathematics?
2. What perception do students have about introductory University mathematics?

### 4.0 Significant of the study

By investigating the different themes, attitudes, belief and myths of mathematics that students hold, there is a potential for such themes, attitudes, beliefs to be challenged, promoted or discouraged. The information obtained from this paper would enhance better strategies and measures for promoting students understanding and participation in mathematics related fields. The results of this paper might inform the extent of the influences of parents and teachers in shaping students' perceptions of mathematics. The findings will reflect possible implication for mathematics education and mathematics teacher education. Knowing how students perceive mathematics learning experiences in school and how this could influence their beliefs in mathematics will help us to understand better how mathematics should be presented in the classroom. This knowledge may also help to enhance better curriculum planning and teacher development programs. Students' views of mathematics are important as they can shape the way in which they learn mathematics. Such views and perceptions may have more influence than knowledge in determining how individuals organise and define a given tasks.

### 5.0 Delimitations of the study

The study was confined to some first-year undergraduate students of the University of Cape Coast. These selected students read programs such as B.Sc. (Mathematics and Statistics), B. Ed (Mathematics), B.Sc. (Mathematics with Economics), and B.Sc. (Actuarial Science). This population was chosen to ensure the feasibility of the study given its timeline.

### 6.0 Limitation of the study

One of the limitations to this study was the close-ended nature of some questions in the questionnaire. This did not enable respondents add any remarks, explanations and qualifications to most sections of the questionnaire. This makes a lot of the items on the questionnaire non-exhaustive hence the possibility of bias result thereby affecting the generalizability of the findings.

## 7.0 Literature Review

### 7.1 The Concept of Perception

Perception is closely related to attitudes. Perception is the process by which organisms interpret and organize sensation to produce a meaningful experience of the world (Lindsay & Norman, 2013). In other words, a person is confronted with a situation or stimuli. The person interprets the stimuli into something meaningful to him or herself based on prior experiences. However, what an individual interprets or perceives may be substantially different from reality. The concept "perception" has been defined by several personalities. According to (Dobby, 1966), perception means, "an adaptive process". "It is the process by which an organism receives information and organizes it in order to make adjustments". He viewed perception from two dimensions, that is, perception of physical objects and perception of human accuracy through experience and practice. Dobby's perception of physical objects is reasonably stable and definite because physical objects do not exhibit motivation, that is, they are not motivated to mislead the observer.

Krach and Crutch (1988) state that, "man's perceptions are how he sees, hears, smells and feels the world about himself". They believe that what man perceives, feels, thinks about and imagines depends upon the physical and social environments in which he lives and upon his own biological nature, partly the way his brain and nervous system work. (Scott, 1975) views perception as both unique and complex and what we perceive around us is highly subjective and depends on our needs, our expectations and experiences. (Crawford, Gordon, Nicholas, & Prosser, 1994) found that the majority of students perceived mathematics as "numbers, rules and formulae". For some student's awareness of mathematics involves simply the recall of facts and the use of formal procedures. These views were associated with what he calls a "surface approach" to learning mathematics, that is, "the reproduction of knowledge and procedures".

### 7.2 Students beliefs about mathematics as a subject

Beliefs might be thought of as lenses through which one looks when interpreting the world (Holzberger, Philipp, & Kunter, 2013). Research shows that the beliefs and feelings adults experienced as learners carry forward to their adult lives, and these feelings are important factors in the ways they relate to the new generation of learners. There is a lack of interest in mathematics or a relatively higher tendency of mathematics avoidance among many of the

South African students. Most students hold the belief or myth that being good in mathematics is mainly due to ability than effort (McLeod, 1992). Many students admit this lack of achievement in mathematics as a permanent state over which they have little control. According to Tobias (2003), millions of adults are blocked from professional and personal opportunities because they fear or perform poorly in mathematics, for many these negative experiences remain throughout their lives.

Some studies have examined success in Senior High School and University mathematics ( Benbow and Arjmand, 1990 ),(Trusty and Niles, 2003) using range of variables such as gender and minority comparison. These studies suggest that minority students enrolled in four-year degree programs are academically less prepared than nonminority students. Although high school academic preparation may have a strong association with university mathematics performance and graduation from bachelor's degree programs (Trusty, 2002, Trusty& Niles, 2003), high school grades do not necessarily guarantee that a student is prepared for college level work (Choy,1993; Dillworth,1990).

According to (D'Souza & Wood, 2003) "tertiary students' experiences during their first year of study appear to be crucial to their personal adjustment and academic performance". They also claim that students adjusting to the problems at the beginning of undergraduate study can result in student dropout or deferring of courses. According to (Hannula, Maijala, & Pehkonen, 2004) there are on-going debates on the theoretical frameworks used in the conceptualisation of effect in mathematics education. Currently there is no precise, shared language for describing the affective domain, within a theoretical framework that permits its systematic study. Thus, this study is guided by different notions and discusses the relationship between their conceptions. The constructs, beliefs and attitudes, images, views, perspectives and opinions are not directly observable and have to be inferred, and because of their closeness it is problematic to have a common definition of these notions (Leder & Forgasz, 2002).

There is also a claim that mathematics is only for the clever ones, or only for those who have inherited mathematical ability(Kimball & Smith, 2013). Being mathematically knowledgeable is often treated as an indicator of general intelligence, as danced by the widespread use of mathematics in entrance tests. This view causes many people to perceive that learning mathematics is a question of ability rather than effort and that there is an inherent natural ability for mathematics. This perception leads students to accept their lack of accomplishment in mathematics as a permanent state over which they have little control.

However, studies have focused beliefs and attitudes and the endeavor to develop one coherent framework but researchers have not looked at the extent to which senior high school mathematics prepares students for university mathematics and also perceptions students held about university introductory mathematics. This paper therefore set out to investigate how perception held by mathematics students towards the subject influences, to a very large extent, their academic performance in the discipline as they move up the academic ladder.

## **8.0 Methodology**

In this paper, research design used was a descriptive survey. Gay (2002) iterated that a descriptive survey is useful for investigating varieties of educational problems including assessment of attitudes, opinions, demographic information, conditions and procedure. The design was selected because the study involved the gathering of data that was purely based on the perceptions of the respondents. According to Krejcie and Morgan (1970), a sample size of 234 is appropriate for a population of 600. That is 30% of the population 600. The study employed the purposive sampling technique. Questionnaire was the main developed for the purpose of the paper, research questions and hypothesis of the study. Adapted instrumentation was used for this paper.

## **9.0 Results and Discussion**

This section dealt with the results and discussion on the data collected from the field.

### **9.1 Research Question One: What is the perception of first year mathematics students about Senior High School mathematics?**

Research question one sought to find out the perception of first year mathematics students about Senior High School mathematics. The results are presented in Table 1.

**Table 1: Perception of First Year Mathematics Students about Senior High School Mathematics**

| Statement   | Mean | SD    |
|---|------|-------|
| I like solving mathematical problems                        | 3.00 | 0.83  |
| Studying mathematics at SHS is a waste of time.             | 1.65 | 0.74  |
| Mathematics has no use outside school                       | 1.62 | 0.74  |
| I use mathematics in my daily life                          | 3.23 | 0.64  |
| Mathematics is something I can learn                        | 3.02 | 0.93  |
| Most of SHS mathematics topics are difficult to understand  | 2.65 | 0.91  |
| Being good in Mathematics requires special skills           | 2.53 | 0.92  |
| Mathematics students in the SHS are highly respected        | 3.16 | 0.76  |
| Mathematics at SHS is about having a good memory            | 3.80 | 0.92  |
| There are many prospects in studying mathematics at the SHS | 3.70 | 0.59  |
| Mean of Means/Average Standard Deviation                    | 3.36 | 0.286 |

Table 1 shows the results on the perception of first year mathematics students about senior high school mathematics. It can be observed from the results that the first year Mathematics students have positive perception about Senior High School Mathematics (M=3.36; SD=0.28). For instance, the results indicated that most of the students agreed that they like solving mathematical problems and their responses did not differ from each other concerning the statement (M=3.00; SD=0.83). It was also revealed from the results that the students strongly disagreed that studying mathematics at SHS is a waste of time with no variations in their responses (M=1.65; SD=0.74). Following their responses on the fact that Mathematics has no use outside school, it was discovered that most of the student strongly disagreed with no differences in their responses (M=1.62; SD=0.74)

Paying attention to responses of the students on the use of mathematics in my daily lives, it was revealed that majority of the student agreed and there were no distinctions in their responses concerning the statement (M=3.23; SD=0.64). A closer look at the results showed that majority of the students agreed that Mathematics is something they can learn and their responses clustered around the same mean (M=3.02; SD=0.93). Most of SHS mathematics topics were not found difficult to be understood by the students. This can be observed from the results as most of the students disagreed with no differences in their responses (M=2.65; SD=0.91)

In addition, most of the student disagreed that being good in Mathematics requires special skills with no variations in their responses (M=2.53; SD=0.92). Moreover, on the responses of the respondents on Mathematics students in the SHS are highly respected, it was displayed that a greater percentage of the students agreed with no much differences in their responses (M=3.16; SD=0.76). Furthermore, majority of the students strongly agreed that Mathematics at SHS is about having a good memory with no distinctions in their responses (M=3.80; SD=0.92). Finally, the results portrayed that there are many prospects in studying mathematics at the SHS (M=3.70; SD=0.59).

From the above responses of the first year Mathematics students of University of Cape Coast, it can be concluded that the students have positive perception about Senior High School Mathematics. It is this positive perception that motivate them in pursuing Mathematics at the University level. The findings above resonate with the findings of researchers who have conducted researches on the subject under study. Notable among them is Gal and Ginsburg (1994) who found out that it is widely maintained in the literature that negative images and myths of mathematics are widespread among students. Many students view mathematics as a difficult, cold and abstract subject.

## 9.2 Research Question Two: What perception do students have about introductory University mathematics?

Research question two sought to find out the perception students have about introductory university mathematics. The results are presented in Table 2.

**Table 2: Perception of Students about Introductory University Mathematics**

| Statement  | Mean | SD    |
|--|------|-------|
| I always wanted to study mathematics at the university                                   | 3.68 | 0.94  |
| Mathematics at the university is full of mathematical theories                           | 2.98 | 0.86  |
| Introductory university mathematics requires too much memorisation                       | 2.47 | 0.96  |
| I wish I were reading any other program apart from mathematics                           | 2.53 | 0.94  |
| Introductory university mathematics is difficult   | 2.67 | 0.86  |
| The content of the introductory university mathematics course is too involving           | 3.81 | 0.69  |
| The content of the introductory university mathematics is different from what I expected | 3.98 | 0.86  |
| Mean of Means/Average Standard Deviation   | 3.16 | 0.403 |

Results from table 2 presents the perception of students about introductory university mathematics. It is indicated from the results that students have positive perception about introductory University Mathematics (M=3.16; SD=0.403). For the responses of the student on wanting to study mathematics at the university, it was found out that majority of the students agreed and their responses differ much from each other (M=3.68; SD=0.94).

Regarding their responses on mathematics at the university is full of mathematical theories, it was revealed that most of the students disagreed with no differences in their responses ( $M=2.98$ ;  $SD=0.86$ ).

Relating to their responses on whether or not introductory university mathematics requires too much memorisation, it was discovered that majority of the students disagreed with no differences in their responses ( $M=2.47$ ;  $SD=0.96$ ). On their responses on their wish to reading any other program apart from mathematics, it was brought to bear that majority of the students disagreed ( $M=2.53$ ;  $SD=0.94$ ). In the same vein, majority of the students disagreed with the statement that solicited their responses on the fact that introductory university mathematics is difficult ( $M=2.67$ ;  $SD=0.86$ ).

Furthermore, the results highlighted that the content of the introductory university mathematics course is too involving. This is obvious most of the students strongly agreed ( $M=3.81$ ;  $SD=0.69$ ). Finally, a greater percentage of the students strongly agreed that the content of the introductory university mathematics is different from what they expected ( $M=3.98$ ;  $SD=0.86$ ). Responses of the students revealed that they have optimistic perception about the introductory aspects of Mathematics taught in the University.

From the above responses it can be concluded that students have positive perceptions about introductory University mathematics. This is evident as majority of the respondents made it clear that the abstract nature of the concepts in the introductory mathematics course makes it imperative on them to adopt higher order cognitive processes to analyse. Nevertheless, the students agreed that the course helps them to better understand real world mathematical problems as it broadens their mind. This concurs with the findings of D'Souza and Wood, (2003)

## 10.0 Conclusions

From the findings of the paper, it can be concluded that first year mathematics students have positive perceptions about senior high school mathematics. It is worth mentioning here that students have positive perceptions about introductory University mathematics. Students have positive perceptions about introductory University mathematics. This is evident as majority of the respondents made it clear that the abstract nature of the concepts in the introductory mathematics course makes it imperative on them to adopt higher order cognitive processes to analyse. Nevertheless, the students agreed that the course helps them to better understand real world mathematical problems as it broadens their mind.

## 11.0 Recommendations

From the findings and conclusions above, the following recommendations can be made:

1. First year mathematics students have positive perceptions about senior high school mathematics. From the responses of the first year Mathematics students of University of Cape Coast after analysing the research question, "what is the perception of first year mathematics students about senior high school mathematics?" it was concluded that the students have positive perception about Senior High School Mathematics. It is this positive perception that motivate them in pursuing Mathematics at the University level.
2. Students have positive perceptions about introductory University mathematics. This is evident as majority of the respondents made it clear that the abstract nature of the concepts in the introductory mathematics course makes it imperative on them to adopt higher order cognitive processes to analyse. Nevertheless, the students agreed that the course helps them to better understand real world mathematical problems as it broadens their mind.

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