Students' self-belief about their mathematics capability and achievement in mathematics

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Abstract

Self-belief in someone's capability is an important component in learning. Someone who doubts his/her capability or ability may not succeed in accomplishing a given task. Mathematics has been regarded as a difficult subject by many students, and so they try by all means to avoid it. Many students doubt their ability or capability in learning and carrying out mathematics task because they believed that they could not succeed, and this has caused lots of problems and discouragement to the students in learning the subject. This study looked at the students' self-belief about their capability in learning mathematics, sources that enhance students' self-beliefs about their mathematics capability, students' self-belief in their mathematics ability and their achievement. The study uses a correlation. One hundred and forty students of the diploma year two students of a tertiary institution were selected as a sample through random sampling. Two research questions and two hypotheses were stated and used for the study. Instruments for data collection was the questionnaire which was analyzed using the SPSS. The study revealed that **i)** students' self-beliefs about their capability in mathematics influence their Ability ii) students' self-beliefs about their capability in mathematics influence students' achievement in mathematics.

Keywords: 1. Students, 2.Self-belief, 3.Mathematics, 4.Capability, 5.Achievement

Introduction

Mathematics as a course is needed by everyone for proper functioning in society. No individual that can do without mathematics, is part of our everyday life. We make use of it, knowing and unknowing. For the government to make it compulsory in schools, they knew the importance to the development of a nation. Many students face different problems in the study of mathematics. There are numerous factors which are responsible for these problems.

Most students doubt their ability in mathematics that they can never succeed in learning the subject and tend to avoid it due to various factors which are so many, but in this study, we are investigating students' mathematics self-belief about their capability, how it influences their ability and mathematics attainment.

Students' self-belief about their capability in mathematics learning

One important factor that we must bear in mind is the aspect of learning or solving mathematics problems is the students believe in their capability in completing mathematics assignment. The belief of students is fundamental to problem-solving in mathematics. For students to succeed in mathematics, there is a need for them to have a strong belief about themselves, that they have the ability to learn and solve mathematics problems. Students who believe in themselves usually judge themselves as capable of solving

problems in mathematics: for this specific reason, they make the necessary effort and look fora strategy that will enable them solve mathematics problems, which will eventually resultin success in problem -solving in mathematics (Murphy,2007, Lopez, Lent, Brown, & Gore, 1997; Pajares, 2005). Toproduce the needed desired effects through actions, students must believe that they are capable to do it, and this enables them to have little incentives to act (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996, Murphy,2007, Moran & Sarit, 2019).

Believing in one's capabilities assist or motivates to endure or persist in learningmathematics. Lack of this belief about their ability will only allow the students pursuemathematics learning since it is compulsory but not to know or master the subject. Students' belief about their mathematics capability is connected to mathematics attainment in many ways. These beliefs are formed, and it is influenced by students' previous attempts in achieving mathematics success, and the outcomes indicate that this self-belief contributes significantly to their past performance (Bandura & Locke, 2003, Murphy,2007). According to Murphy (2007) the belief formed by the students about their future capabilities or abilities to carry out the same function or mathematics task is dependent on their achievement. Level. Once this belief of students concerning their ability is negative, it has an adverse effect on them, and it is often difficult to overcome. Parents and teachers can enhance and encourage their children or students to develop a positive belief about their mathematical ability. When this is done, their belief concerning their ability in mathematics may likely be enhanced or high. But this does not mean that these same students achieve more in mathematics, rather it assists them in learning but not to be hindered due to negative belief about their capability.

Students' belief about their ability has a reciprocal relationship with their motivation. Generally, students tend to avoid activities that they feel are not comfortable with. This is right when we come to teaching/learning mathematics; students tend to choose a course based on their confidence and comfort. The mathematics compulsory nature as the basic requirements forces the students to complete or accomplish a certain level of coursework in mathematics. Since it is made compulsory for the students, they have no other option than to satisfy the general requirements as stipulated in their educational pursuit, and so they do it without motivation. It is vitalfor teachers to recognize and know the relationship that exists between students' beliefs about their capability and motivation. The belief of students about their ability significantly contribute senormously to performance and their motivational level (Bandura & Locke ,2003,Joel, Peter & Samuel ,2017, Son, Watanabe&Lo, 2017).

Apart from students' belief, the additional factor that may possibly contribute to students question on how to be successful in mathematics, which eventually results in poor achievement in secondary school mathematics, is their negative attitude toward mathematics. This negative attitude is common among students toward mathematics studying, and it has greatly affected them.

Sources that can enhance students' self-beliefs about their capability in mathematics

According to Bandura, studentsacquire self-beliefs that they can complete a task from some sources of information and that these sources of information influence their mathematics capability. He listed them as:

a) P**ast performance:** This source of self-belief about students' capability has a great impact and contribute immensely to students' confidence in studying mathematics. The good thing about this source is that a student who once successful in completing mathematics tasks or skills in the past may have the confidence that he/she will also succeed in performing such mathematics activity in the nearest future when given such tasks, and this will help in building student self-confidence. The way a student interprets his/her past experiences, failures or successes can have a great impact on his belief and ability. If a student is successful in the past, it helps him to develop his ability and may possibly more confident about future success in that mathematics task. On the

contrary, a student who experiences mathematics failure previously may doubt their ability and may likely lose confident about his capability, which may affect his achievement.

b) Vicarious Experiences: -This involves observing others performing a mathematics task, and which can serve as a strong influence on belief of the student about his ability**. A** student viewing or watching his classmates or models completing a mathematics assignment can be influenced to develop his ability in mathematics. Vicarious experiences, which mean students observing other students like themselves performing a certain task in mathematics, can assist students in making judgements concerning their own mathematics capabilities. The significance of this source is that if students observe their classmates solving mathematics problems being successful, this may motivate and make them have believed that they also can successfully solve mathematics problems.

The self-beliefs about student's ability here is unlike the one acquired through the source of past experience; observation experience is less stable. Once a student develops strong belief from their own successful completion or accomplishment of a task in mathematics, peradventure if failure occurs, it may not have much negative effect on the student, but in observing others once such classmate or models experience failure, the observer self-belief may continue to diminish due the failure. Self-model ling is a much powerful influence on students' self-belief in their mathematics ability. The situation where a student observes himself succeed is a powerful influence on self-capability.

c)**Verbal Persuasion-** This third source of self-belief does not contribute much when compared to student's personal experiences or observing others perform (vicarious experiences). Students' confidence in mathematics can be increased through motivation and persuasion by telling them, "You can work problems in mathematics successfully". Student can experience higher mathematics self-belief about their ability when the student has confidence in the person persuading is capable of solving mathematics problems and also trustworthy; otherwise, it will lower the self-belief of the student. Someone student knew fully well that cannot solve problems in mathematics cannot persuade him/her to perform well in mathematics, so in this situation, self-belief cannot be increased. When a student observed that the person persuading him/her could be successful or capable in mathematics, then self-belief can be increased.

Students' self-belief in their mathematics capability and their achievement

Several studies have shown that belief of students about their capabilityhas a good relationship with the students' engagement, motivation, effort expended and their academic achievement (Webb-Williams, 2018,Bandura, 1997,Zimmerman, 2000, Wigfield & Eccles, 2000,Kwon, Vela, Williams & Barroso,2019, Onoshakpokaiye, 2020). There are important correlations between ability self-belief and student's achievement. Studies revealed that students who possess high self-belief confidence in mathematics tend to besuccessful in relationsholding to academicactivity, checking their progress, and setting academic goals for themselves when compared to those students with low, average or below average confidence in mathematics (Zimmerman & Bandura, 1994, Kwon, Vela, Williams & Barroso,2019, Onoshakpokaiye, 2020).Students' self-assurance about their mathematical ability influences their mathematical understanding and mathematics learning (Kwon et al,2019).Students' sureness about their mathematics abilityrefers to student's belief about his/her own capability, how they see, assess the mselves of having the capabilityto solve problems in mathematics, perform, progress in tasks that are mathematics related (Betz & Hackett, 1983,Kwon et al,2019). Confidence of students as regards to their capability in learning mathematics has been linked to a different positive learning outcome of students, such as improvement of students'mathematics achievement and effective problem-solving skills (Betz & Hackett, 1983, Kwon et al, 2019).

How students think and interpret themselves tends to shapes their behaviour, especially when they are in difficult situations or facing some challenges (Bandura, 1977, OECD,2013). Studies have revealed that students with high belief in their mathematics ability are more efficient in mathematics problem solving; they persist longer when solving difficult problems in mathematics and tend to attempt difficult assignment in mathematics compared to those students with low, average and below-average mathematics capability (Hoffman & Schraw, 2009,Kwon et al,2019).

Students'self-beliefs about learning mathematics has an impact on students' achievementat different levelsbe it cognitive,affective, motivational and decision-making. This determines how the students endure when faced with difficult situation, how well they motivate themselves and influence their emotional life(Bandura, 1997, Wigfield and Eccles, 2000, OECD,2013). Thestudents'self-beliefs about their mathematics capability illustratesthe subjective convictions of students. Once a student builds his/her confidence that he can be successful in mathematics, this goes a long way inassisting or determining the progress of the student in mathematics, italso plays an independent role towards the growth, students' skills development and mathematics competencies(Bandura, 1997, Markus& Nurius, 1986, OECD,2013,Pajares & Graham, 1999).

Student's ability confidence in Mathematics refers to student's convictions that he/she is capable and can perform the given mathematics tasks successfully at specific levels (Schunk, 1991, OECD,2013). Better mathematics attainmentresults inadvanced levels of students' confidence, those with lowlevels of mathematics confidence performsbelow expectation despite their abilities (Bandura,1997, Schunk & Pajares, 2009,Tang, Pan, and Newmeyer,2008). It is very difficult for students who doubt their ability or does not believe in their ability to succeed or complete a given mathematics assignment. Since they did not believe in their capability, the needed effort might not be expended to accomplish that assignment successfully. Studieshaverevealed that studentswith low confidence or doubt their mathematics ability are less likely to motivate themselves and partake in the mathematics learning and regulate their achievement (Klassen & Usher, 2010, Schunk & Pajares, 2009).

Statement of the Problem

Mathematics, a compulsorysubject being offered by students at the lower educationallevel and also a requirement for entering a tertiary institution. It was observed that majority of students are no longer interested in learning the subject; they try as much as they could to avoid it due to the hatred, they have for it. Some of them assumed that this subject is meant for some set of students. Some others believed that they lack the capability to study mathematics, and so they lost confidence in themselves. For this reason, they see no need to do it. This lack of students' sureness in their mathematics capability has resulted io low poor achievement in most of the schools at the lower levels of education. Could it be that these problem semanated from the general notion about mathematics being difficult and that it is meant for the few, or there was no proper orientation by their mathematics teachers? Could it be that the mathematics teachers did not intimate the students about the correlation between confidence of students in their mathematics ability and mathematics achievement?

Purpose of the Study

The aim of this study is to examine how students' self-confidence in their mathematics ability or capability relate to their achievement in mathematics. To as certain whether there exists any relationship between students' Mathematics ability confidence and their mathematics achievement.

Research Questions

The following research questions were stated to guide the study

1. How does students' self-beliefs about their capability in mathematics influence students' Ability?

2. How does students' self-beliefs about their capability in mathematics influence achievement of studentsin mathematics?

Hypotheses

The following null hypotheses were stated and were tested at a 0.05 level of significance

1. There is no significant influence of students' self-beliefs about their mathematics capability and their Ability.
2. There is no significant influence on students' self-beliefs about their mathematics capability mathematics and students' achievement.

Methodology

The correlational research design was adopted for the study. This was used so as to establish the relationship that exists between students' self-beliefs about their capability in mathematics and their achievement. Diploma Year two students of Delta State University, Abraka, was used for the study. The total number of one hundred and forty students were selected randomly as a sample for the study. The main instrument that was used to gather data on students' self-beliefs about their capability in mathematics was the questionnaire. The questionnaire was made up of two parts. First part was to gather information on the students' confidence concerning their capability in mathematics. While the second part seeks to know the students' ability in mathematics, they were asked to enter the grades they obtained in mathematics from their secondary school certificate, which was used to assess their mathematics achievement. Two research questions were stated, while two hypotheses were also formulated to be tested at a 0.05 level of significance. The SPSS was applied for the analysis.

Research question one: How does students' self-beliefs about their capability in mathematics influence students' Ability?

Table 1: students mathematics self-belief and ability

	Mean	Std Deviation	N
Students' mathematics self-belief	23.5857	3.74355	140
Students' ability	1.76	0.426	140

The results presented in Table 1shows that the mean difference between Students' mathematics self-beliefand students' ability was 21.8257. The mean of Students mathematics self-belief is greater than the mean of the students' ability levels. This mean difference indicates that students' belief about their capability in mathematics influence their mathematics ability.

Research question two:

How does students' self-beliefs about their mathematics capability influence students' achievement in mathematics?

Table 2: Students self-belief about their mathematics capability and achievement

	Mean	Std Deviation	N
Achievement	6.6571	1.42824	140
Students' mathematics self-belief	23.5857	3.74355	140

The results in table 2 above shows that the mean difference between Students' mathematics self-beliefabout their mathematics capability and their achievement was 16.9286. From the above table 2, the mean value of

students' mathematics self-beliefis higher than the mean of their achievement, which indicates that it has an influence on students' mathematics achievement.

Hypothesis one: There is no significant influence onstudents' self-beliefs about their mathematics capability and their Ability.

Table 3: **Students' mathematics self-beliefabout their capability and Ability**

		Students'mathematics self-belief	Students' ability
Students' mathematics self-belief	Pearson correlation	1	0.056
	Sig(2-tailed)		0.014
	N	140	140
Students' ability	Pearson correlation	0.056	1
	Sig(2-tailed)	0.014	
	N	140	140

The correlation between Students' mathematics self-beliefabout their capability and students' ability shows 0.056, and this indicates a low positive correlation. The p-significant value associated with the correlation was seen to be 0.014 ($p < 0.05$). This implies that the correlation was statistically significant. Therefore, the null hypothesis was rejected.

Hypothesis two:
There is no significant influence onstudents' self-beliefs about their mathematics capability and students' achievement.

Table 4: Students' mathematics self-beliefabout their capability and students' achievement

		Achievement	Students' mathematics self-belief
Achievement	Pearson correlation	1	0.004
	Sig(2-tailed)		0.001
	N	140	140
Students' mathematics self-belief	Pearson correlation	0.004	1
	Sig(2-tailed)	0.001	
	N	140	140

The relationship between students' mathematics self-beliefabout their capability and students' achievement shows 0.004, and this shows a very low positive correlation. The p-significant value associated with the correlation was seen to be 0.001 ($p < 0.05$). This implies that the correlation was statistically significant. Therefore, the null hypothesis was rejected.

Discussion of the results

Hypothesis one, which stated thatthere is no significant influence of students' self-beliefs about their mathematics capability and their Ability was rejected, which revealed that students' self-beliefs about their mathematics capabilityinfluences students Ability in mathematics. With reference to table 1 and 3 above,

shows thatstudents' self-beliefs about their mathematicscapability have a significant influence on the students' ability in mathematics. For the students to improve in their ability there is the necessity for such students to have the belief and confidence that they can do well; this belief will eventually motivate such student in improving his/her ability in mathematics. This corroborates with the study of these researchers (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996,Murphy,2007); according to them, students can only produce the needed desired effects through their actions when they are certain that they have the capability and also able to do it and that this serves as motivation to act.

For students to carry out any given assignment in mathematics, such students must have the confidence that no matter want, they can succeed, and this confidence serves as a motivating factor, which eventually increases their mathematics ability. Also, in backing these findings, Kwon et al (2019) stated that students' self-confidence in their mathematical ability influences their understanding and mathematics learning. The studentwho doubts his/her ability or mathematics capability or has low confidence in mathematics are less likely to motivate himself/herself in partaking in the mathematics learning (Klassen & Usher, 2010, Schunk & Pajares, 2009).

Hypothesis two, which states thatthere is no significant influence of students' self-beliefs about their mathematics capability and students' achievement, was rejected, which shows that students' self-beliefs about their capability in mathematicsinfluences students' mathematicsachievement. Students' self-belief about their capability has a vital role to play as per students' mathematics achievement. A student who doubts his/her capability or ability in mathematics can never perform well because such a student may not put much effort since he/she is not motivated to study mathematics. Achievement can only come when a student is motivated, have a love for the subject then spend more time studying the subjects.Students' confidence in their mathematics capability or ability is linked to students positive learning outcome, such as their progress in mathematicsachievement and effective problem-solving skills (Betz & Hackett, 1983, Kwon et al, 2019). To support these findings, (Bandura,1997, Schunk & Pajares, 2009) asserted that better achievement in mathematics can only be attained when students' confidence levels in mathematics are high and thatthose with lowlevels of mathematics confidence perform low in mathematics, despite their abilities.

Conclusion

It cannot be argued that students' mathematics self-beliefabout their capability increases students' ability levels, influence students' ability and achievement. Mathematics is very vital to students' achievement. A student who believes that he is deficientin the ability to study mathematics cannot be motivated, most especially when he encountered difficult mathematics problems. Improving students' mathematics achievement calls for attention of everyone.

Teachers should ensure that students are motivated and encouraged through effective teaching. They should be devoted to their teaching by making the subject real, and it must not be imparted like a subjectthat is abstract

Parents should try their possible best to encourage their children at home, assisting them in their home assignment and also provide the necessary materials needed for the success of their children.

The government or management should make sure that students are motivated by providing the necessary materials needed by the mathematics teachers for proper handling of the subject. The students can also be encouraged by providing incentives to them, which can take the form of scholarship. In some developing countries, non-specialists are being employed to teach the subject, and they should ensure specialists are employed to teach this mathematics for effective delivering.

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