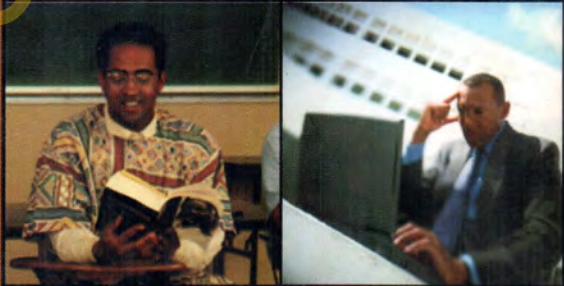


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# AN ASSESSMENT OF MATHEMATICS SELF - EFFICACY OF SECONDARY SCHOOL STUDENTS IN OSUN STATE, NIGERIA

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## **Abstract**

The study examined an assessment of mathematics self-efficacy of secondary school students in Osun State. It drawn on 500 students comprising 250 males and 250 females randomly selected from 5 secondary schools in Osogbo. Their ages range between 11-17 years with a mean age of 14 years and a standard deviation of 4. A self - efficacy instrument developed by (Morgan & Jinks 1995) was adapted with mathematics achievement test with  $r = 0.72$  developed by the researcher were used for data collection. Three hypotheses were tested at 0.05 level of significance using student-t test, Pearson Product Moment Correlation and Analysis of Variance (ANOVA) statistical tools. The results indicated that significant difference exists in the mathematics self-efficacy of the subjects based on gender and age groups, and that of mathematics achievement. Based on the findings, it was recommended that Secondary School teachers should always make mathematics class more interesting as this will go a long way to improve the student's self efficacy and achievements in the subjects.

## **Introduction**

Increasingly, educational leaders are recognizing that the process of learning is critically important and understanding the ways individuals learn is the key to educational improvement. Over the years, psychologist had become aware of the fact that a person's self-efficacy or his attitude to and perception of himself are intimately related to how he learns and behaves. It is this fact that caused Edstrom (1996) to postulate that many students have difficulty in school not as a result of low intelligence or physical impairment, but because they have perceived themselves as unable to do academic work. The author explained that success

in school, work or life appears to depend as much on how a person feels about the qualities and attributes he possesses or on those qualities themselves.

Learning outcomes have been regarded as a function of two characteristics, "skill" and "will" (McCombs & Marzano, 1990), these to the researchers must be considered because possessing the will alone may not insure success if the skills are lacking. Academic specific-domain assessments of self-efficacy are especially common in Educational research in particular. This is because the criteria outcomes tasks such as terminal grade, achievement test results that are often used do not lend themselves well to particularize self-efficacy assessment. Some researchers for example, have operationalized Mathematics self-efficacy as student's judgement of their capabilities to solve Mathematics-problems and perform Mathematics related course.

Obviously, many students failed Mathematics because they have low self-efficacy. One basic fact that people especially the secondary schools students failed to realize is that in Nigeria today almost all courses of study in our universities requires Mathematics at credit level. However, the increasing failure rate of students in this subject bothers the mind of the researcher. Hence, this study assesses Mathematics self-efficacy of secondary school students in Osun State, Nigeria.

### **Literature Review**

Self-efficacy refers to beliefs about one's capabilities to learn or perform behaviours at designated levels (Bandura, 1986, 1997). Self-efficacy concerns one's judgement of his capabilities based on mastery criteria. It's a sense of one's own competence within a specific framework. It focuses on one's own assessment of abilities in relation to goals and standard rather than in comparison with others capabilities (Bandura, 1997). He summarizes that "Students whose sense of efficacy was raised set higher aspirations for themselves, showed greater strategic flexibility in the search for solutions, achieved higher intellectual achievement, and were more accurate in evaluating the quality of their achievement than the students of equal cognitive ability who were led to believe they lacked such capabilities" (p. 215). Much research shows that self-efficacy influences academic motivation, learning and achievement (Pajares, 1996, Schunk, 1995).

Self-efficacy is grounded in larger theoretical framework known as social cognitive theory, which postulates that human achievement depends on interactions between one's behaviours, personal factors (thoughts, beliefs) and environmental conditions

(Bandura, 1986, 1997). Learners obtain information to appraise their self-efficacy from their actual achievements, their physiological reactions (Schunk Pajares, 1998). Self-efficacy belief influences task choice, effort, persistence, resilience and achievement (Bandura, 1997, Schunk, 1995). Additionally (Schunk & Pajares, 1998) asserts that students who doubt their learning capabilities, feel efficacious for learning or performing a task participate more readily, work harder, persist longer when they encounter difficulties, and achieve at a higher level. In academic settings, self-efficacy research has focused primarily on two major areas (Pajares, 1996). To him, one area has explored the link between efficacy beliefs and college major and career choices, particularly in the areas of science and mathematics (Brown, Lent & Larking, 1989; Farmer, Wardop, Anderson & Risinger, 1995, Lent, Brown & Larking, 1987). Researchers have reported that the mathematics self-efficacy of students is more predictive of their mathematics interest and choice of mathematics related courses and majors than either their prior mathematics achievement or mathematics outcome expectations and that male students report higher Mathematics self-efficacy than do female students (Hackett, 1985; Hackett & Betz 1989; Lent Lopez & Bieschke, 1991, 1993, Pajares & Miller 1994, 1995). According to Pajares (1996), students' confidence to solve Mathematics problems is a more powerful predictor of their ability to solve Mathematics problems than is their confidence to perform Mathematics-related tasks or their confidence to earn high mark in Mathematics related courses is more predictive of their choice of majors that required them to take many of the Mathematics-related courses on which they express that confidence.

Although literature on children's academic self-efficacy is rather scarce, (Jinks & Morgan, 1999) what does exist supports the link between Mathematics self-efficacy and academic achievement. Jinks and Morgan (1996) reported that significant relationships exist between students' perceptions of self-efficacy and self-reported grades and that this relationship held constant across urban, suburban and rural school environments. It seems clear that the agency whereby self-efficacy influence Mathematics learning is that; it encourages perseverance and provides the confidence to try different strategies. Those who doubt their ability give up a Mathematics learning process if early efforts do not result in perceived success (Brown and Inouye, 1978, Schunk, 1984). Frank and John in Odinko (1999) in their own opinion said that prior determinant such as ability and previous performance attainments helps to create self-efficacy perceptions and are also predictors of subsequent achievement.

Studies are available to show that self-efficacy is highly related to Mathematics achievement. Pajare (1996) examined the interplay between self-efficacy judgements and the Mathematics problem-solving of middle school students mainstreamed in algebra classes. Mathematics self-efficacy made an independent contribution to the problem-solving achievement of regular education students. Pajares also reported that girls expressed lower confidence when achievement scores did not warrant it and similar confidence when achievement scores warranted greater confidence. Bearmer and Lundberg in Tella, Tella and Adika (2008) adapted the MSES for use with secondary school students and used LISREL procedures to find that the composite effect of self-efficacy score mediated the effect of a generalized Mathematics attitude score on Mathematics problem solving. Consequently, although generalized mathematics attitudes had a strong direct effect on self-efficacy, they also had a strong direct effect on achievement.

Cooper and Robinson, in Pajares (1996) compared scores from the courses subscale of the MSES with scores on an achievement measure that consisted of solving-problems from the Missouri Mathematics Placement Test. He reported a low but significant correlation between mathematics self-efficacy and achievement. Researchers who investigated the relationship between Mathematics self-efficacy in various Mathematics outcomes reported significant correlation and direct strong effects (Hackett, 1955; Hackett and Betz, 1989; Pajares and Miller, 1994, 1995). Similarly (Tella et al., 2008; Oke, 2005) reported a strong correlation between self-efficacy and academic achievement, while Pajares and Kranzler (1995) constructed path models that included Mathematics self-efficacy, general mental ability, Mathematics self-concept, Mathematics anxiety, self-efficacy for self regulation, previous grades in Mathematics and gender. The key finding from this study was the direct effect of self-efficacy on achievement was as strong as the effect of general mental ability.

On the relationship between gender and self-efficacy, researcher reported that boys and men tend to be more confident than girls and women in academic areas related to Mathematics, Science and Technology (Meece, 1991, Pajares & Miller, 1994; Wigfield, Eccles & Pintrich, 1996). Despite the fact that achievement differs in these areas are diminishing or have disappeared (Eisenberg, Martin & Fabes, 1996). There is little evidence for differences in self-efficacy among elementary aged children. Differences begin to emerge following children's transition to Middle or Junior high School (Eccles & Midgley, 1989, Wigfield, Eccles, Maclver,

Reuman, & Midgley, 1991) with girls typically showing a decline in self-efficacy beliefs.

Schunk and Lilly (1984) had students in grades 6 and 8 judge's self-efficacy for learning a novel, Mathematical task, after which students received instruction, practice opportunities and performance feedback. Although girls initially judge self-efficacy for learning lower than did boys following the instructional program girls and boys did not differ in achievement or self-efficacy for solving problems.

### **Statement of Hypothesis**

Three null hypotheses were developed and tested for significant at 0.05 significant levels.

1. There is no significant difference in the Mathematics self-efficacy of male and female students.
2. There is no significant difference in the Mathematics self-efficacy of students based on their age group.
3. There is no significant relationship between students' self-efficacy and Mathematics achievement.

### **Methodology**

**Design:** This study adopts a descriptive survey design.

**Population:** The population of this study comprised all the secondary school students in Osogbo, the capital of Osun State.

**Sample:** Out of this population, a total of five hundred (500) students were randomly drawn from senior secondary classes. Their ages range between 11-17 years, with a mean age of 14 years, and a standard deviation of 4 years.

### **Instrument**

A standardized self-efficacy instrument developed by Jinks & Morgan (1999) with  $r = 0.64$  via a Cronbach reliability method was used for data collection for this study. This was restructured and revalidated. To establish its reliability co-efficient it was administered on 50 respondents out of the envisaged population. The correlation coefficient yielded an  $r = 0.68$  through a test-retest reliability method of two weeks interval. Academic achievement score was collected using a validated Mathematics Achievement Test with  $r = 0.72$ .

The Table below explains details about how the respondents were selected.

### Demographic Distribution of the Respondents

Schools	No. of Respondents	Percentage
St. Charles Grammar School	100	20
Fakunle Comprehensive School	100	20
Osogbo Grammar School	100	20
Muslim High School	100	20
Ife Oluwa Grammar School	100	20
Total	500	100
Sex: Male	250	50
Female	250	50
Total	500	100
Religion: Xtian	300	60
Muslim	200	40
Total	500	100
Age: 11-13	150	36
14-15	195	39
16-18	125	25
Total	500	100

### Procedure

Sampled students were administered self-efficacy scale and Mathematics Achievement Test. The exercise was carried out in each of the selected schools. The cooperation of the Mathematics teacher in each of the school made the exercise an itch free one. With proper supervision, there were no reports of loss items as 100% return rate was achieved.

### Data Analysis

The study adopts the student-t test, Analysis of Variance (ANOVA) and Pearson Product Moment Correlation for the analysis of data.

## Results

The results of the analysis are presented in the Tables below:

**Table 2: Difference in the Mathematics self-efficacy of male and female students**

Subject	No	$\bar{X}$	SD	Df	t.obs	t.crit	P	Rm
Male	250	35.7	6.6	498	3.67	1.96	0.05	5*
Female	250	38.6	5.1					

S\* Significant @ 0.05

Table 2 shows the difference in the Mathematics self-efficacy of male and female students. The result reveals that the t.obs 3.67 greater than t.crit = 1.96. This implies a significant difference exists in the Mathematics self-efficacy of male and female students. That is male students have higher Mathematics efficacy than do female students.

**Table 3: ANOVA of the difference in the Mathematics self-efficacy and Mathematics achievement**

Variables	No	$\bar{X}$	SD	r.obs	P.	Rm
Self-efficacy	500	70.9	14.9	0.84	0.01	S*
Mathematics Achievement	500	161.3	54.2			

S\*Significant @ 0.01

Table 3 shows the relationship between self-efficacy and Mathematics achievement. The result reveals r.obs 0.84 < P0.05. Hence a significant relationship exists between self-efficacy and Mathematics achievement. This means a high self-efficacy will usually lead to high achievement in Mathematics.

## Discussion

The first hypothesis on this study reveals that significant difference exist between Mathematics self-efficacy of male and female students. This corresponds with the findings of (Meece, 1999; Pajares and Miller, 1994; and Wigfield et al 1996) who reported that boys and men tend to be more confident than girls and women in academic area related to Mathematics. Similarly the reports by (Eccle & Midgle, 1989; Wigfield et al... 1991) that girls typically showed a decline in self-efficacy beliefs lend a good credence to the present finding of this study. In the same vein the second finding on this study reveals a mark significant difference in the Mathematics self-efficacy of the subjects based on their various ages. Eisenberg et al.. (1996) had earlier reported that

there is little evidence for the differences in the self-efficacy among elementary aged children. The further report by this researcher that differences begin to emerge following children transition to middle or junior high school support the finding of this second hypothesis.

Lastly, this study finds a significant relationship between Mathematics self-efficacy and Mathematics achievement. No wonder, many research findings have been reported in favour of this finding. Among these were (Cooper and Robinson 1991; Hackett 1985; Hackett and Betz, 1989, Pajares and Miller, 1994; 1995a, 1995b, Tella et. al, 2008; and Oke, 2005) also (Pajares and Kranzler, 1995) reported finding in agreement with this present finding by revealing the key finding of their study that direct effect of Mathematics self-efficacy was as strong as the effect on general mental ability.

Based on the various findings on this study, it is recommended that secondary school student should see Mathematics like other subjects and should consider it as simpler; even than other subjects. It is when they have the notion of this type at their subconscious that they can begin to do well in the subject. The mathematics teachers in our secondary schools are also called upon to always make Mathematics class an interesting one. By so doing, the self-efficacy and achievements of the students in Mathematics will no doubt improve.

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