Student Teachers' Beliefs, Feelings and Attitudes toward Mathematics Learning and Teaching at the University of Trinidad and Tobago

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Abstract

The colonial fallacy that only a few persons are endowed with the capabilities to conceptualize mathematics, coupled with the belief that society equates mathematical ability with intellectual superiority, have contributed to low levels of mathematical self-concept and achievement among some students of mathematics. Some of these students are required to teach the subject as primary and secondary school teachers. This paper examines the influence of student teachers' beliefs, feelings and attitudes towards mathematics on their learning and teaching of mathematics. The sample (N=165) comprises third and fourth year, male and female, full and part time students, who were enrolled in the 4 year Bachelor of Education Programme at the Centre of Education Programmes, University of Trinidad and Tobago. Data collection employed the use of the Fennema - Sherman 1976 Mathematics Attitudes Scale which was adapted to formulate a 13 item survey instrument – Mathematics Attitude Survey (MAS). Regression analyses using MANITAB statistical package indicate that beliefs, feelings and attitudes towards mathematics are determined by students' feelings, expectations and perceived usefulness of mathematics. Gender did not emerge as a factor.

Keywords: *attitudes toward mathematics; feelings about mathematics; achievement in mathematics*

1. Introduction

There are worldwide concerns related to success in Mathematics at primary, secondary and tertiary levels of education. A study to improve the teaching of mathematics conducted in the Caribbean by the National Institute of Higher Education, Research, Science and Technology (NIHERST) in 2006, revealed that most students experienced great difficulty doing mathematics. This observation was supported in 2012 when the Caribbean Examination Council (CXC) subject awards committee expressed the need to address performance in Mathematics at the Caribbean Secondary Education Certificate (CSEC) examination. At the 2012 May/June examination, only 33 per cent of candidates secured passing grades I-III somewhat similar to 35 per cent in 2011(Table 1). The committee indicated that "on one question which tested perimeter and area, 36 per cent of the candidates scored no marks. Similarly, on a question which tested algebra, 33 per cent of the candidates also scored zero" (Jacobs, 2012, p.1).

The NIHERST (2006) survey advised teachers that "the teaching and understanding of mathematics are essential to the total development of the student and by extension, impact directly on the level of numeracy in the population" (pp.1). Since good mathematics instruction is essential for a progressive society (Persad, 2009), preparation of quality teachers of mathematics is mandatory in any society. However, mathematics teachers' classroom practices are influenced by their beliefs, interests, past experiences which influence their attitudes to their learning and teaching of mathematics (Singh, Granville & Dika, 2002).

1.1 Students' Beliefs

There is a perpetual fear associated with studying mathematics and this is coupled with the colonial belief that mathematics competence is an indicator of intelligence. There is also the perception that mathematics is irrelevant

and not very useful to everyday living, and not as valuable as language. Hence, beliefs related to math incompetence result in frustration, phobia, anxiety as well as reduced effort and persistence (Gilroy, 2002). Beliefs however, are correlated with values, feelings and attitudes (Maasz & Schloglmann, 2009).

Table 1. Caribbean Examination Council (CXC) Report on Performances by Caribbean Regional Candidates in the Caribbean Secondary Education Certificate (CSEC) Examination 2010-2015

Year	Approximate Candidates Entry	Percentage Grades 1-III	Total Marks	Mean Score
January 2015	9971	65%	180	Not Available
January 2014	11 690	47%	180	74
May/June 2014	90 100	50%	180	75
January 2013	12 900	40%	180	78
May/June 2013	92 400	35%	180	65
January 2012	14 200	40%	180	77.14
May/June 2012	95 000	33%	180	66.40
January 2011	13 760	37%	180	74.97
May/June 2011	90 000	35%	180	71.43
January 2010	No Examination			
May/June 2010	88 400	41%	180	76.59

https://www.cxc.org/?q=students-and-parents/exam-results-reports/exam-results-reports-csec

Paper 1 MC – 60 Marks Paper 2 – Structured Questions - 120 marks Total -180 marks

2. Conceptual Framework

Based on Ernest (1989) conceptual model, teachers' instructional practices are a function of their subject-matter knowledge, instructional beliefs, and mathematical attitudes. Teachers' attitudes related to mathematics, constitute both attitudes toward mathematics and attitudes toward teaching mathematics. In addition, teachers' previous school experiences and perceptions as students affect their beliefs and attitudes as teachers (Mapolelo & Akinsola, 2015). While the majority of students with the highest examination grades may not select teaching as their career, there is no guarantee that a perfect score in mathematics constitutes excellent conceptual knowledge of mathematical content require for teaching (Akinsola, & Ajiboye, 2009; Ball, Hill, & Bass, 2005; Bramald, Hardman, & Leat, 1995).

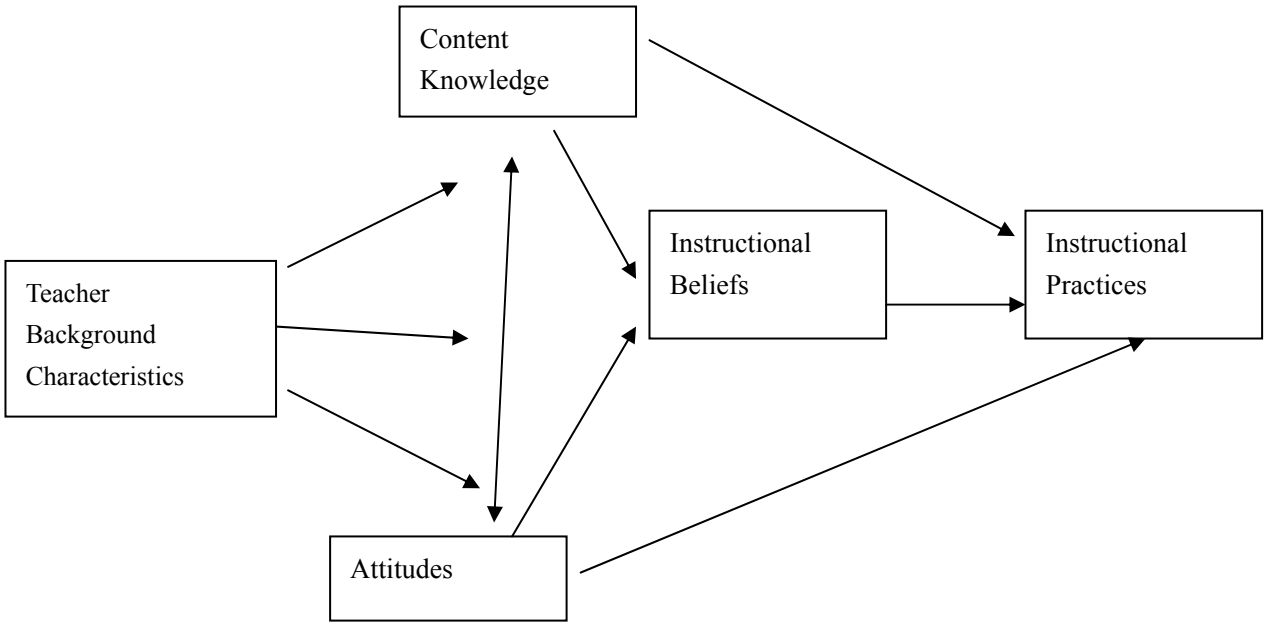

Figure 1. Theoretical Model Relating Teachers' Content Knowledge, Attitudes, Instructional Beliefs, and Instructional Practices (Earnest, 1989)

2.1 Performance in Mathematics

Educators and researchers have attributed many reasons for students' performance in mathematics: level of instruction and teacher competency (Khan, 2008), learners mathematical ability and genetics (Gilroy, 2002), problems such as math anxiety, math phobia, math avoidance, gender differences (Tocci & Engelhart, 1991), socio-economic status (Kainuwa & Yusuf, 2013) and math beliefs, emotions and attitude (Fennema & Sherman, 1976; Maasz and Schloglmann, 2009; Wilkins, 2008). However, teaching is often associated content knowledge and pedagogy (Shulman, 1986) but learners do best when they achieve conceptual understanding of mathematical concepts (Singh, Granville, & Dika, 2002).

Maasz and Schloglmann (2009) concluded that "prospective teachers undertaking university education bring with them beliefs and attitudes toward teaching acquired during their years as students at school and these beliefs can be barriers to developing new teacher competencies" (p.9). Definitions of attitudes related to mathematics abound. But there are common elements to all definitions. The social construct attitude is "influenced by many factors like gender social strata, age, stream of education and previous experience of the job" (Bhargava, 2014, p.27). Whether attitude is positive or negative, it is conclusively linked to emotions, beliefs, behavior and values (DeBellis, V. & Goldin, G.A.1999; Zan & Martino, 2008).

There has been evidence that teachers, including pre-teachers, beliefs and attitudes highly influence the way they teach (Furinghetti & Pehkonen, 2000; Philipp, 2007; Zevenbergen, 2005). Nevertheless, some pre-service teachers with low mathematics content knowledge display beliefs and attitudes consistent with their more capable colleagues. Hence, there are always concerns about quality mathematics teacher competence in the classroom (Lowrie & Jorgensen, 2015).

2.2 Math Attitudes

Within the last two decades, researchers have concluded that success in mathematics involves affective variables such as student ability, perceptions, parent and peer influences, socioeconomic factors and attitudes (Uysal & Yuksel, 2016). Ercilean, McCreith, & Lapointe (2005) stated that students' attitude to mathematics was one of the strongest predictors of mathematics achievement. However, the jury is still out on the verdict around the relationship between math attitude and math achievement. Some researchers have suggested that attitude influences achievement (Reynolds & Walberg, 1992) while others have argued that achievement influences attitude (Imai, 1993).

The significance of positive attitudes in general, and towards mathematics in particular is invaluable to teacher educators so that they can provide high levels of instruction to their students. Poor attitudes towards mathematics result in poor conceptual understanding of mathematical content as well as inability to provide quality pedagogy (Schuck & Grotenboer, 2004).

Research on attitudes in mathematics in teacher education (Aldridge & Bobis, 2001; Grootenboer, 2003b; Grootenboer & Lowrie, 2002; White, Perry, Way & Southwell, 2006) reported a significant number of negative attitudes among these teachers. However, there is a dearth of research on Caribbean student teachers' attitudes towards learning and teaching mathematics. Tertiary educators continue to face the dilemma created by the demonstration of many negative attitudes and beliefs towards mathematics by trainee teachers. Poor mathematics students would mean poor mathematics teachers and vice versa.

This paper examines student teachers' attitudes towards mathematics learning and teaching. Concerns were initiated when student teachers (in-service and pre-service), who were enrolled in a mathematics methods course at the national university in Trinidad and Tobago expressed concerns, fears, doubts and anxiety about their ability as students and teachers of mathematics. Applicants must be successful at the Caribbean Examination Council's (CXC) Caribbean Secondary Education Certificate (CSEC) Mathematics before being accepted in the Centre for Education Programmes.

2.3 Research Questions

This paper is guided by the following research questions:

1) Do the attitudes towards mathematics of student teachers, influence their teaching competence?
2) What factors contribute to positive student teachers' attitudes towards mathematics and teaching mathematics?

3. Methodology

3.1 Research Model

Based on the data collected, a model of four main factors was proposed. Presumably these factors influence the student's attitude towards Math learning and teaching. The proposed model was:

$$Y_{\text{Maths Attitude}} = \alpha + F_{\text{feelings}} + E_{\text{Expectations}} + U_{\text{Usefulness}} + G_{\text{Gender}} + \varepsilon$$

Each main factor (Model 1) was surveyed in further detailed into several sub-factors or variables that are listed under each analysis (Models 2 to 5).

3.2 Participants

The sample comprised 165 Years 3 and 4 fulltime and part-time student teachers who were pursuing a four year Bachelor of Education degree programme at the University of Trinidad and Tobago. The purposive sample was select from students who had pursued courses in Mathematics at the university and expressed concerns about their knowledge and teaching competence of the subject. The senior researcher teaches two Year 3 undergraduate mathematics courses. All trainee primary school teachers are required to teach mathematics at elementary school as part of their mandatory practicum course requirements in preparation for becoming teachers. All participants had completed at least two mandatory primary education mathematics content and methods courses at the university.

3.3 Data Collection Instrument

Participants completed the 20 minute Mathematics Attitude Survey which was adapted from the Fennema-Sherman (1986) mathematics attitude scale into a 13 item survey. The first six items requested general demographic information. Items 7-10 comprised items based on a 5 point Likert scale which required student teachers to respond Strongly Agree, Agree, Undecided, Disagree or Strongly Disagree (1 = Strongly Disagree to 5= Strongly Agree). These items requested information on feelings about mathematics as an academic subject, expectations about mathematics, usefulness of mathematics and perceived gender influences on mathematics. Questions 11 to 13 required qualitative responses about the student teachers' past and present mathematical experiences and feelings.

4. Data Collection and Analysis

The analysis was conducted using the MINTAB Statistical package. The data were initially analyzed to compute percentage respondents for each factor .These are presented in tables 3- 4.

Table 2: Equations for variables

$\mathbf{Y\ Math\ attitude = \alpha + F_{feelings} + E_{Expectations} + U_{Usefulness} + G_{Gender} + \varepsilon :}$	**Model 1**
$\mathbf{Y_{Feelings} = \alpha + Sb + Mx + Mc + Mc + Mu + Tg + Lm + Hm + Ti + Gc + Cm + Mg + PS + \varepsilon :}$	**Model 2**
$\mathbf{Y_{usefulness} = \alpha + Ca + NE + Ad + Ue + Vp + Du + Wt + Nu + Sm + \varepsilon :}$	**Model 3**
$\mathbf{Y_{Expectations} = \alpha + Cu + Gb + Gg + SL + Cx + Th + Nw1 + Op + Nw + \varepsilon :}$	**Model 4**
$\mathbf{Y_{Gender} = \alpha + Mb + Fg + Ws + Fp + Am + Wp + \varepsilon :}$	**Model 5**

The data were then analyzed using the generalized linear model (GLIM) and the best fit equations reported. Regression analysis was conducted with the independent variable as the "degree of Agree" and is represented in the equations as. The dependent variable [$\hat{}$Y] was the response for each factor from the survey, and is computed as a percentage. The Fennema-Sherman (1986) mathematics Attitude scale was adapted to formulate a 13 item survey in this study. The scale is divided into four subscales basically feelings, expectations, usefulness and gender. Table 3 shows the respondent feelings on Agree and Disagree response in percentage.

5. Findings

The analysis using GLIM revealed that the sub factors or variables presented in Model 2 to 5 were significant. When more than 60% of a variable were significant, as Strongly Agreed, then it was accepted. Similarly, when more than 60% of a variable were significant, as Strongly Disagree, then that value was accepted and considered significant to the proposed Model 1.

Table 3. Feelings about Mathematics

8	52.12	Disagree	Math is my best subject
2	53.94		Mathematics is hard for me
12	57.58		I never gained a conceptual understanding of math
9	63.03		Math is not for me
10	64.24		Math confuses me
11	84.24		Math is less important than language and art
5	51.52	Agree	I feel confident when I do math
14	58.18		I get good grades in mathematics
16	58.18		I learn math better when I work with another person or a group
1	59.39		I love mathematics
19	61.82		Math labs promote math understanding
17	63.64		I learn math best using manipulatives and technology
15	65.45		I am persistent in solving math problems. Math is a worthwhile, necessary subject
4	70.91		I get good grades in math
18	84.85		Mathematics has its own language

The Factors on *Feelings about Mathematics* "Best subject, Math not for me, Math confuses, and Math important "(Table 3, Figure 4) displayed a positive quadratic response.

The question "math is less important than language and art" received 84.24% disagree indicating the feelings of the respondents about the importance of math. The lowest response 52.12% went to the question, "Math is my best subject." This meant that more persons felt that math is not their favorite subject and that they have preferred subjects. On the other hand the statement "math has its own language" earned the Agree score of 84.85%, whereas "I feel confident when I do math" had the lowest Agree score of 51.52% indicating some measure of math phobia. This is a signal that respondents have less confidence in their capability of doing math. It can also reflect on their competence as math teachers.

Table 4. Feelings about Mathematics

Factor	Code	Regression	R^2	Equation
Best subject	Sb	$T_{Sb} = 29.2 + 13.9\ A - 3.50\ A^2$	83.1	1.1
Math not for me	Mx	$Y_{Mx} = 57.8 - 4.5\ A - 1.07\ A^2$	82.1	1.2
Math confuses	Mc	$Y_{Mc} = 52.8 - 0.3\ A - 1.71\ A^2$	69.5	21.3
Math important	Mp	$Y_{Mp} = 123 - 47.6\ A + 4.79\ A^2$	86.2	1.4
Math understanding	Mu	$Y_{Mu} = 40.6 + 6.3\ A - 2.50\ A^2$	77.8	1.5
Good teachers	Tg	$Y_{Tg} = - 21.8 + 40.8\ A - 6.21\ A^2$	68.2	1.6
Love maths	Lm	$Y_{Lm} = - 26.2 + 36.8\ A - 4.64\ A^2$	71.5	1.7
Maths hard	Hm	$Y_{Hm} = 1.4 + 35.4\ A - 6.79\ A^2$	49.3	1.8
Teacher interest	Ti	$Y_{TI} = - 34.2 + 49.2\ A - 7.36\ A^2$	90.8	1.9
Good grades	Gg	$Y_{Gg} = - 45.2 + 48.1\ A - 6.07\ A^2$	44.5	1.10
Confident in math	Cm	$Y_{Cm} = - 42.4 + 54.9\ A - 8.14\ A^2$	74.8	1.11
Good grades	Mg	$Y_{Mg} = 0.40 + 24.2\ A - 3.64\ A^2$	83	1.12
Persistent solving	Ps	$Y_{Ps} = - 34.4 + 39.8\ A - 4.79\ A^2$	59	1.13
Learn person	Lp	$Y_{Lp} = - 38.2 + 46.4\ A - 6.21\ A^2$	74	1.14
Learn technology	Lt	$Y_{Lt} = - 46.4 + 49.3\ A - 6.29\ A^2$	68	1.15
Maths lang	Mi	$Y_{Ml} = - 8.4 + 5.3\ A + 2.29\ A^2$	77.6	1.16
Labs understanding	Lv	$Y_{Lv} = - 62.8 + 61.7\ A - 8.14\ A^2$	69.6	1.17

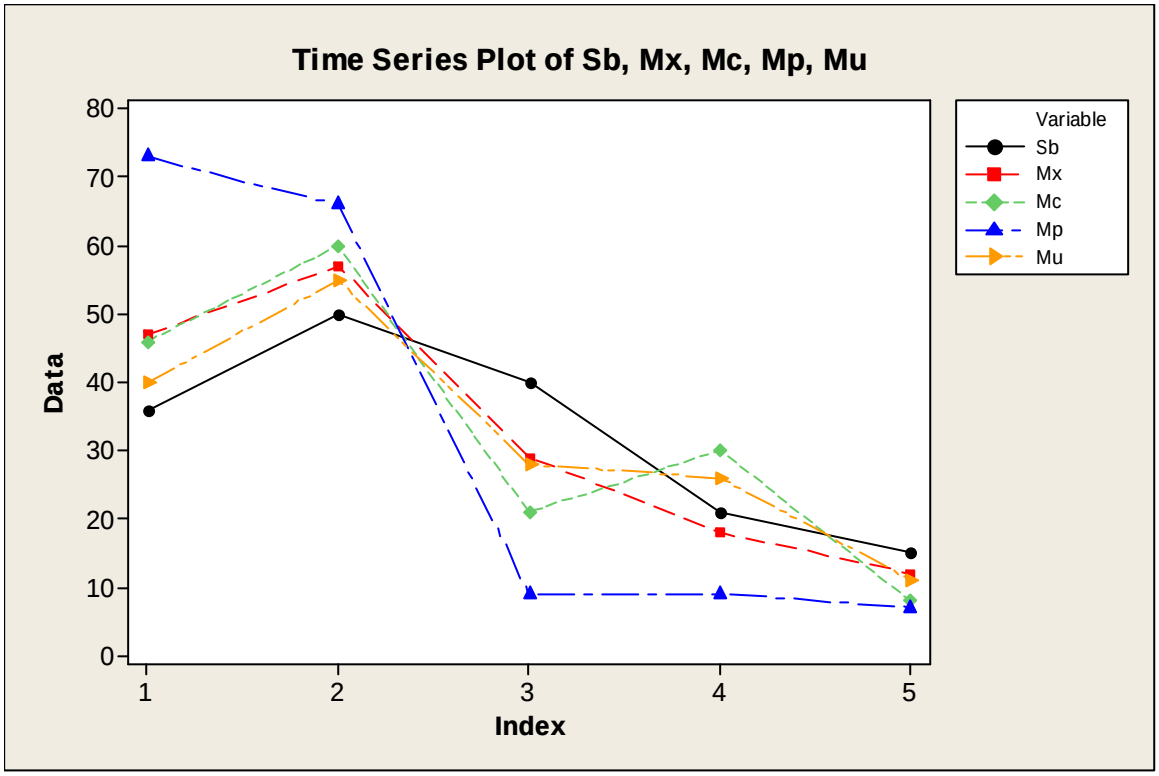

Figure 2a. Feelings about Mathematics

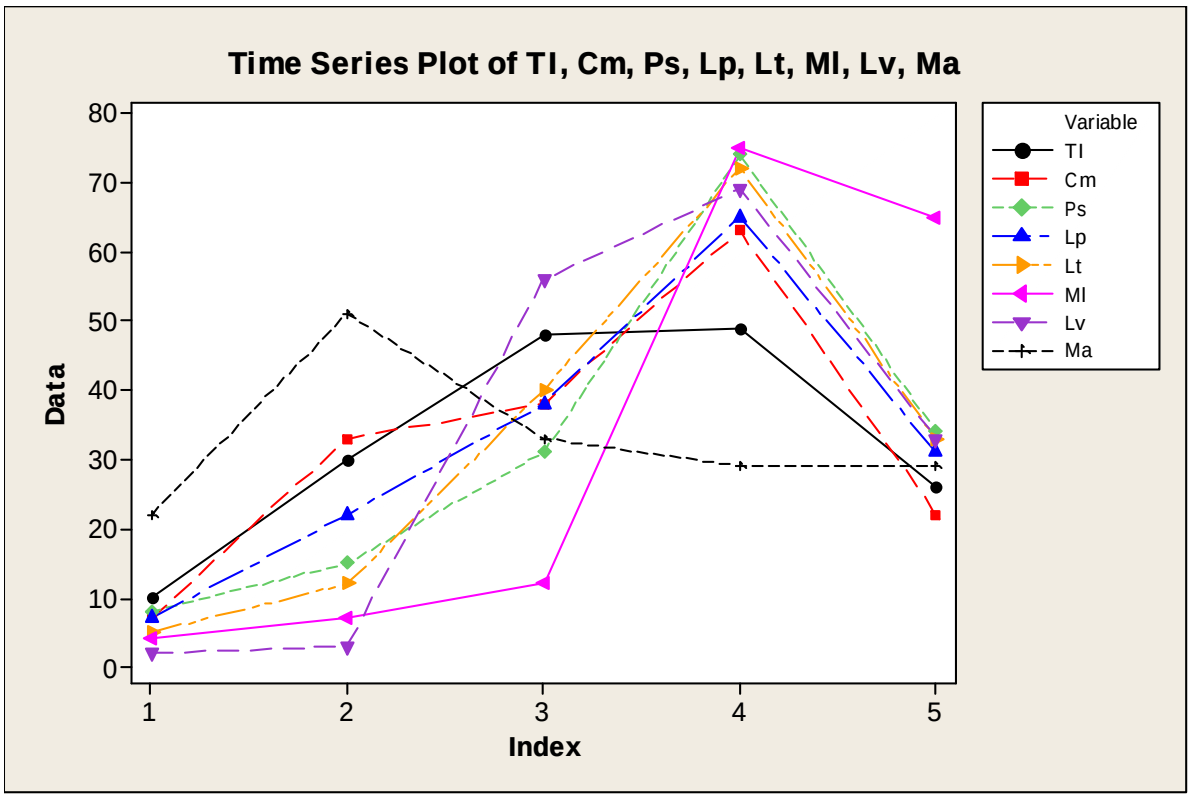

Figure 2b. Feelings about Mathematics

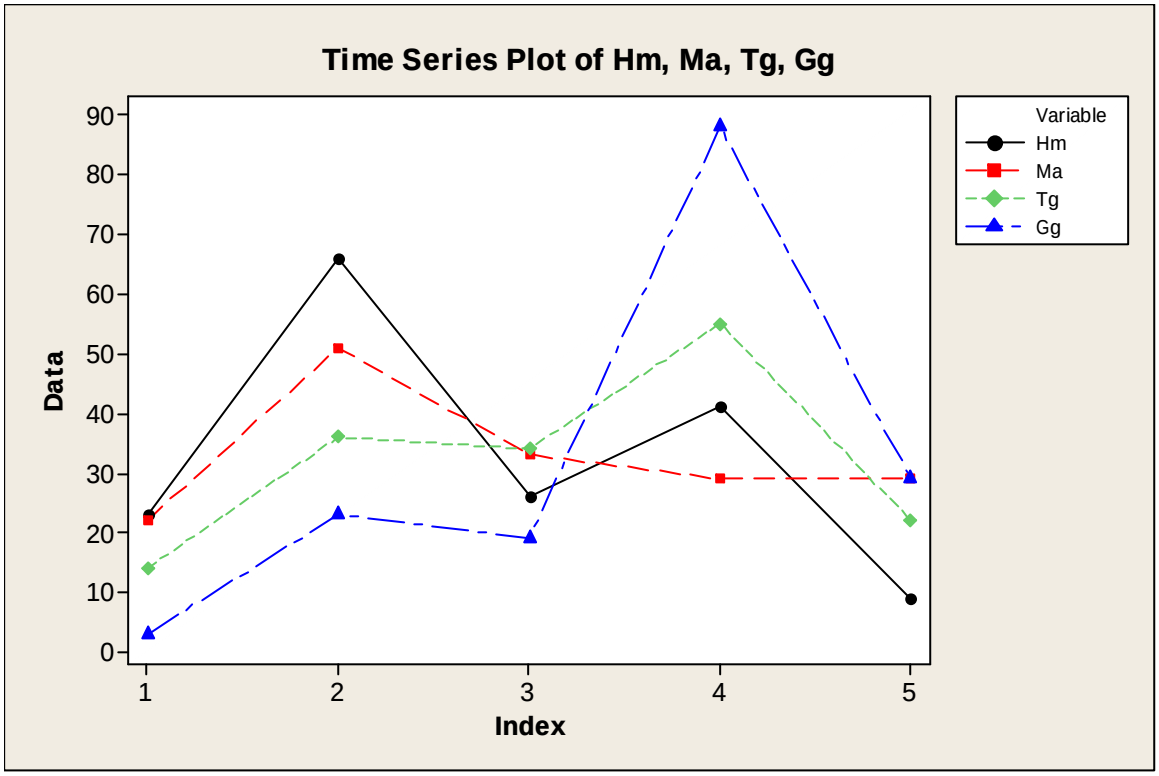

Figure 2c. Feelings about Mathematics

5.1 Usefulness of Mathematics

The survey on the usefulness of mathematics covered a wide range of which five (5) of the issues evoked positive quadratic responses (Table 2) as it was found to improve students' career and assisted them in the routine tasks. The subscale for the Usefulness of Math Table 5 gave a high Disagree score of the question "taking math is a waste of time 92.73%" which is a clear emphasis of the teachers' concept of the usefulness of math in people's lives. Positive attitudes towards math can be deduced from this subscale.

Table 5. Usefulness of Mathematics

6	57.58	Disagree	I can survive with minimum math knowledge
5	78.18		I would not use mathematics very often after school
3	92.73		Taking math is a waste of time
1	82.42	Agree	Mathematics will improve my career chances
7	90.91		Mathematics is used in almost everything
8	90.91		Mathematics is vital for progress
2	92.73		Mathematics is a worthwhile, necessary subject
9	93.94		Mathematics is used in daily tasks
4	95.15		Mathematics can be useful in adult life

The question "I can survive with a minimum math knowledge had 57.58%" is also supportive of the usage of math's. In the Agree category the highest score was recorded for the question "Math can be useful in adult life (95.15%) " affirming the usefulness of math by the great majority of adults. Four other questions of Math usefulness in daily tasks, being a necessary subject, vital for progress and used in everyday life received more than 90% agreement.

The results indicate that for most of the participants, there is a synergy with usefulness and necessity for math in their career development and it was essential for their progress. Less than 10% of the participants found that math was not useful and three (3) of the variables (Figure 3b) exhibited a negative quadratic response (Table 6, Equations 3.7 to 3.9), thus affirming the usefulness of math by adults.

Table 6. Usefulness of Mathematics

Factor	code	Regression	R^2	Equation
Career	Ca	$Y_{Ca} = - 11.1 + 10.9\ A + 0.41\ A^2$	80.9	3.1
Necessary	Ne	$Y_{Ne} = 1.1 - 3.2\ A + 3.13\ A^2$	83.6	3.2
Adult	Ad	$Y_{Ad} = 3.6 - 8.7\ A + 4.29\ A^2$	85.1	3.3
Used everything	Ue	$Y_{Ue} = - 3.3 + 0.2\ A + 2.56\ A^2$	89.4	3.4
Vital progress	VP	$Y_{Vp} = - 17.1 + 13.3\ A + 0.27\ A^2$	78.0	3.5
Daily use	Du	$Y_{Du} = - 5.8 + 2.1\ A + 2.29\ A^2$	78.5	3.6
Waste	Wt	$Y_{Wt} = 114 - 49.5\ A + 5.48\ A^2$	95.2	3.7
Not use	Nu	$Y_{Nu} = 76.8 - 22.1\ A + 1.46\ A^2$	96.7	3.8
Survive	Sm	$Y_{Sm} = 29.1 + 8.8\ A - 2.52\ A^2$	84.4	3.9

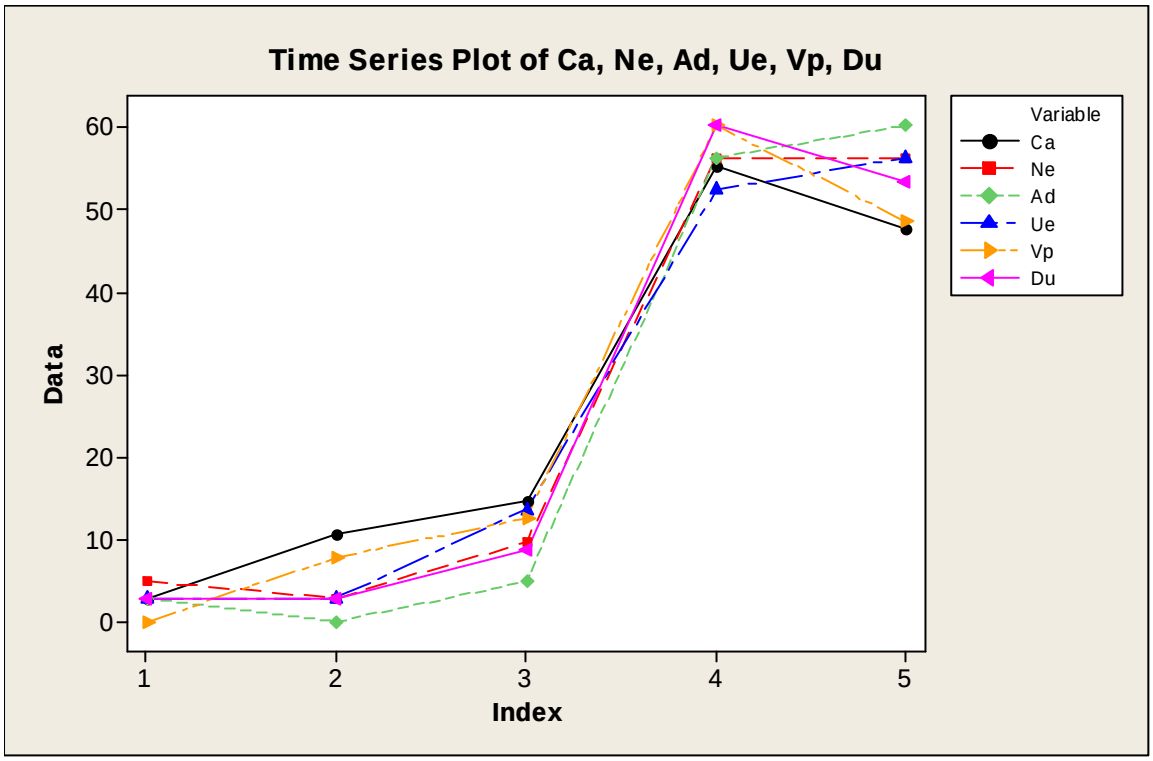

Figure 2d. Usefulness of Mathematics

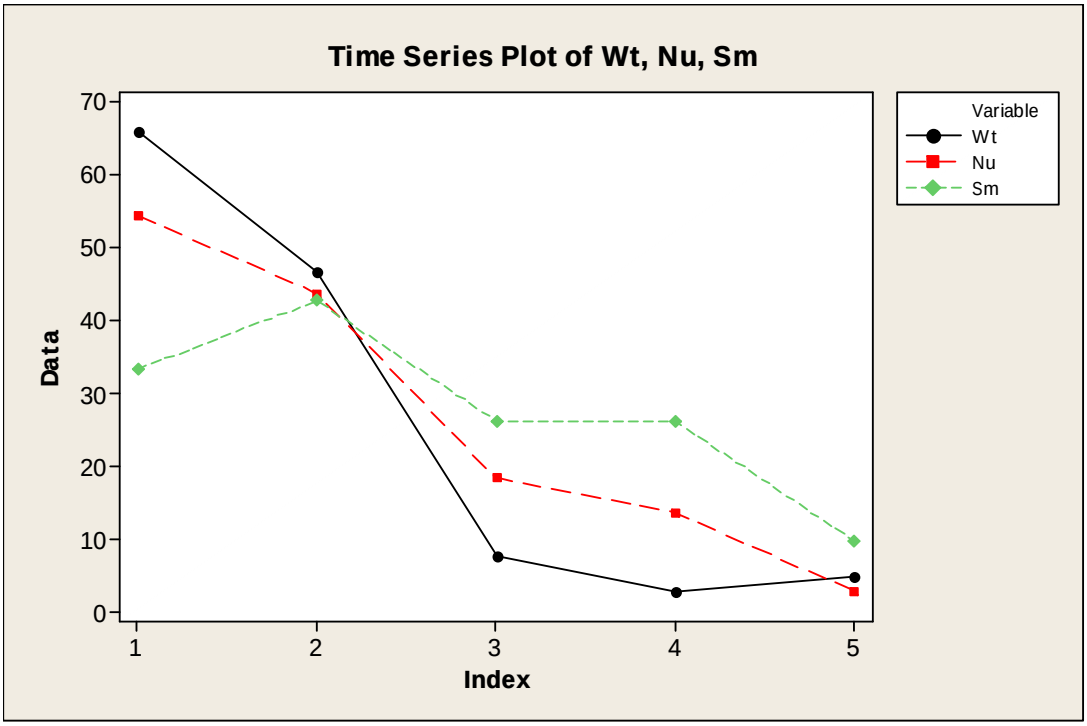

Figure 2e. Usefulness of Mathematics

5.2 Mathematics Expectations

The Expectations of students for mathematics (Table 7) showed a high Disagree score of (79.39%) for the question "I will never do math well" indicating that the majority of respondents expect themselves to perform well in mathematics. This had a negative quadratic response together with "hopeless". This question, "Ordinary students do not do math well" scored (62.42%) Disagree which means they are expected to do well in mathematics.

Table 7. Expectations of Students for Mathematics

8	62.42	Disagree	Ordinary students do not do math well
6	66.67		My teachers thought I was hopeless at math
3	76.36		I will never do math well
7	79.39		I will never do math well
9	55.76	Agree	I hope to study a lot more math
2	71.52		I am getting better at math
4	75.76		I expect good grades in math
5	76.97		I know I can excel in math
1	79.39		I need a conceptual understanding of math

The factors "Conceptual understanding, Getting better, Good grades, Study a lot, and Can Excel" exhibited a positive quadratic response (Table 8 and Figure 3a). The question "I need a conceptual understanding of math" (79.37%) gives a clear indication that the majority of the respondents have a problem of conceiving mathematical concepts. The lowest score 55.76%, in the Agree category was for the question "I hope to study a lot more math". This is another expectation that persons could change their attitude by studying more math. Two questions received high scores " I know I can excel in math 76.97%" and " I expect good grades in math 75.76%" a strong expectation that changes the attitude towards math.

Table 8. Mathematics Expectations

Factor	Code	regression	R^2	Equation
Conceptual understanding	Cu	$Y_{Cu} = 1.7 + 6.4\ A + 0.54\ A^2$	65.1	2.1
Getting better	Gb	$Y_{Gb} = -\ 33.8 + 36.5\ A - 4.44\ A^2$	73.5	2.2
Good grades	Gg	$Y_{Gg} = -\ 25.9 + 26.7\ A - 2.51\ A^2$	70.6	2.3
Study lot	SL	$Y_{Sl} = -\ 27.6 + 38.4\ A - 5.47\ A^2$	58.5	2.4
Can Excel	Cx	$Y_{Cx} = -\ 30.6 + 34.6\ A - 4.87\ A^2$	47.7	2.5
Though hopeless	Th	$Y_{Th} = 57.6 - 11.2\ A + 0.279\ A^2$	97	2.6
Never do math well	Nw1	$Y_{Nw1} = 77.9 - 22.3\ A + 1.38\ A^2$	97	2.7
Ordinary	Op	$Y_{Op} = 28.2 + 11.7\ A - 3.26\ A^2$	92.6	2.8
Never do math	Nw	$Y_{Nw} = 75.6 - 21.4\ A + 1.39\ A^2$	98	2.9

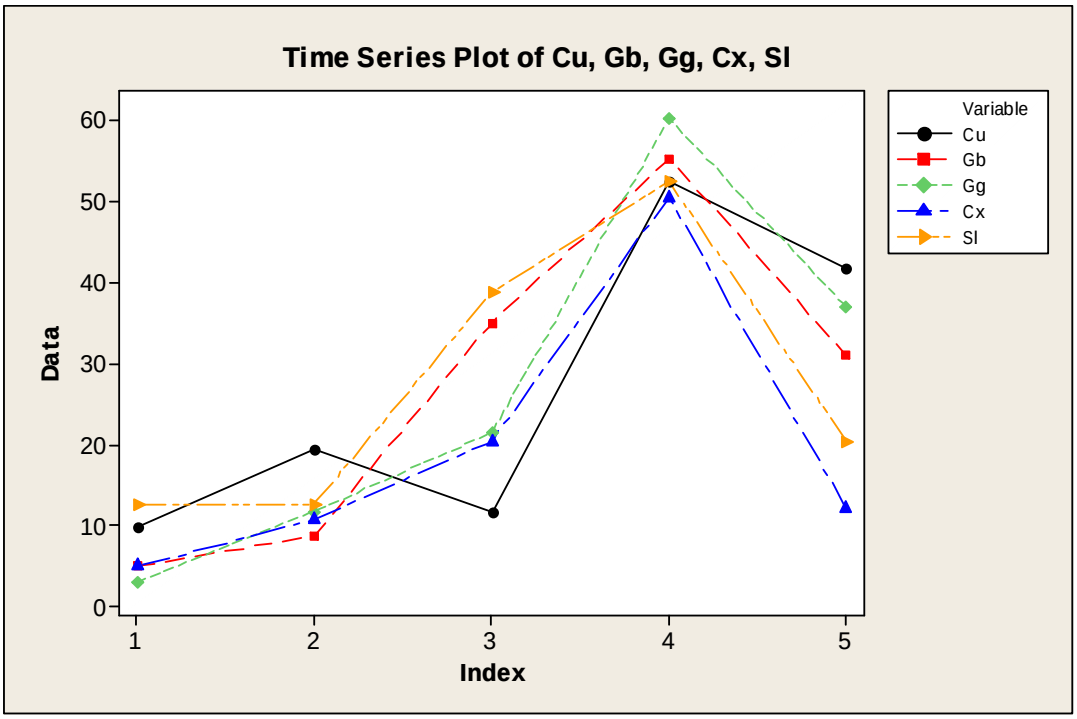

Figure 3a. Mathematics Expectations

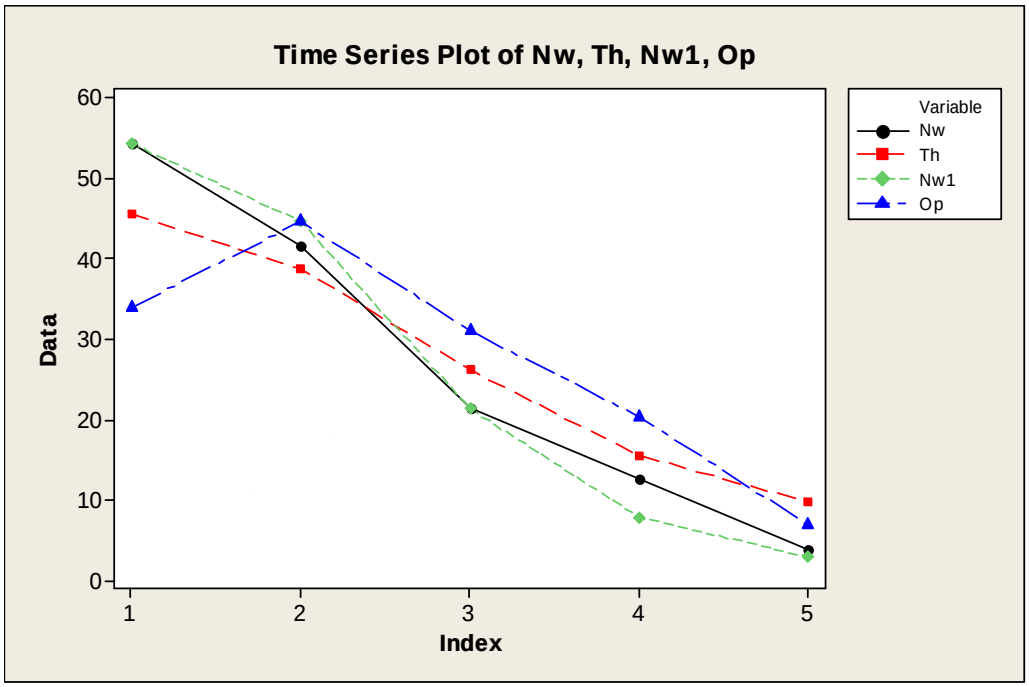

Figure 3b. Mathematics Expectations

5.3 Gender and Mathematics

The factors "Males better, Females not genius, Women strange, and Faith male" exhibited a similar negative quadratic response, suggesting more people believe it is true (Table 9, Figure 10). One question in the Agree category "Woman can do just as well as men in math" scored 85.45 % (Table 9) a strong statement that gender is not a determining factor for excelling in math (Mohamed & Waheed, 2011).

Table 9. Gender and Mathematics

1	54.55	Disagree	Males are better at math than females
6	58.79		I have more in a male math teacher
5	80.00		Women who like math are strange
2	86.06		A female cannot be a genius at math
3	85.45	Agree	Woman can do just as well as men in math

However, on the question "A female cannot be a genius at math" (86.6% Disagree) suggests that gender cannot be counted as a determining factor for being a genius in math.

Table 10. Gender and Mathematics

Factor	code	regression	R^2	Equation
Males better	Mb	$Y_{Mb} = 7.80 + 22.9\ A - 4.44\ A^2$	81.8	4.1
Females not genius	Fg	$Y_{Fg} = 112 - 50.0\ A + 5.84\ A^2$	92.3	4.2
Women strange	Ws	$Y_{Ws} = 73.6 - 21.2\ A + 1.52\ A^2$	86.6	4.3
Faith male	Fm	$Y_{Fm} = 37.1 + 1.5\ A - 1.25\ A^2$	63.4	4.4
Women math	Wm	$Y_{Wm} = 16.8 - 14.2\ A + 4.73\ A^2$	94.1	4.5
Females persistent	Fp	$Y_{Fp} = -40.8 + 52.3\ A - 8.11\ A^2$	62	4.6
Advance maths	Am	$Y_{Am} = -34.8 + 49.1\ A - 7.77\ A^2$	59.9	4.7
Women problem solvers	Wp	$Y_{Wp} = -21.4 + 37.6\ A - 5.81\ A^2$	60.4	4.8

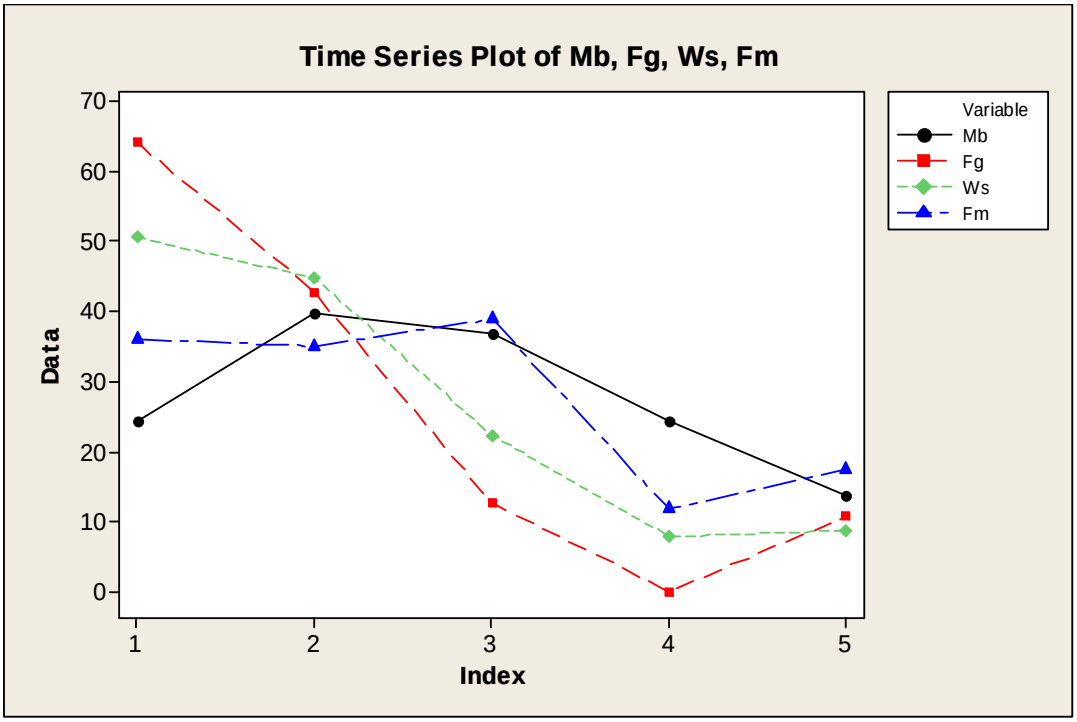

Figure 3c. Gender and Mathematics

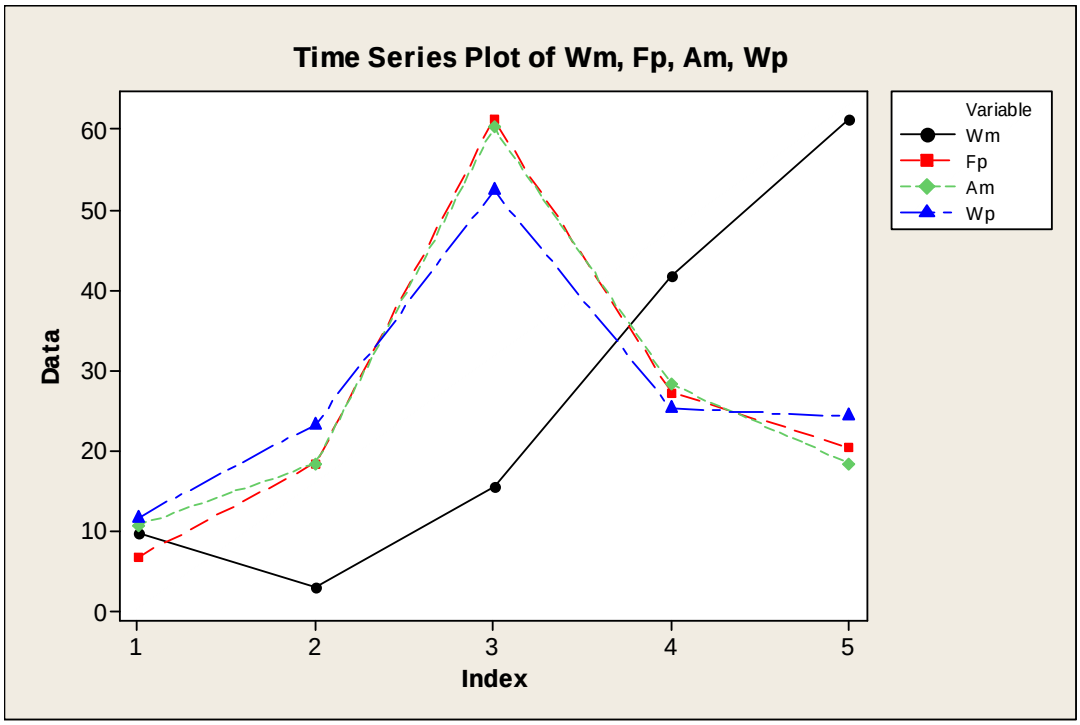

Figure 3c. Gender and Mathematics

6. Conclusion and Recommendations

It can be said that the proposed Model 1:

$Y_{\text{Maths Attitude}} = \alpha + F_{\text{feelings}} + E_{\text{Expectations}} + U_{\text{Usefulness}} + G_{\text{Gender}} + \varepsilon$: was positive in determining student attitudes toward math in three subscales. These are Feelings, Expectations and Usefulness. The subscale Gender proved to be a negative factor in determining students' attitude towards math. In their teaching competence students are governed or driven by these three factors. With strong feelings and high expectations student teachers are capable of performing to their optimum in teaching math. The usefulness of mathematics in their career and public life is another driving factor that could enhance their performance as math teachers irrespective of their gender.

Mathematics instruction at elementary and high schools should equip students with conceptual understanding of mathematical concepts and authentic applications to provide early positive feelings and attitudes towards mathematics. Teacher education programmes should provide pedagogical training to trainee teachers who have negative attitudes towards mathematics. Training should be mandatory to improve conceptual and pedagogical knowledge, provide enjoyment (Curtis, 2006), and hence beliefs and positive attitudes. How we learn is usually not how we should teach.

Dembo (2001) concluded that "Pre-service education should have two complementary goals. First, it should teach future teachers to become more effective learners themselves and secondly, it should teach them to be more effective teachers" (p.10). Students and student teachers need to be introduced to mathematics in meaningful ways so that they would acquire conceptual understanding, value the educational and authentic relevance of mathematics and hence develop more positive attitudes and beliefs towards mathematics.

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