Mathematics Pedagogy

Mathematics Anxiety and the Primary School Teacher

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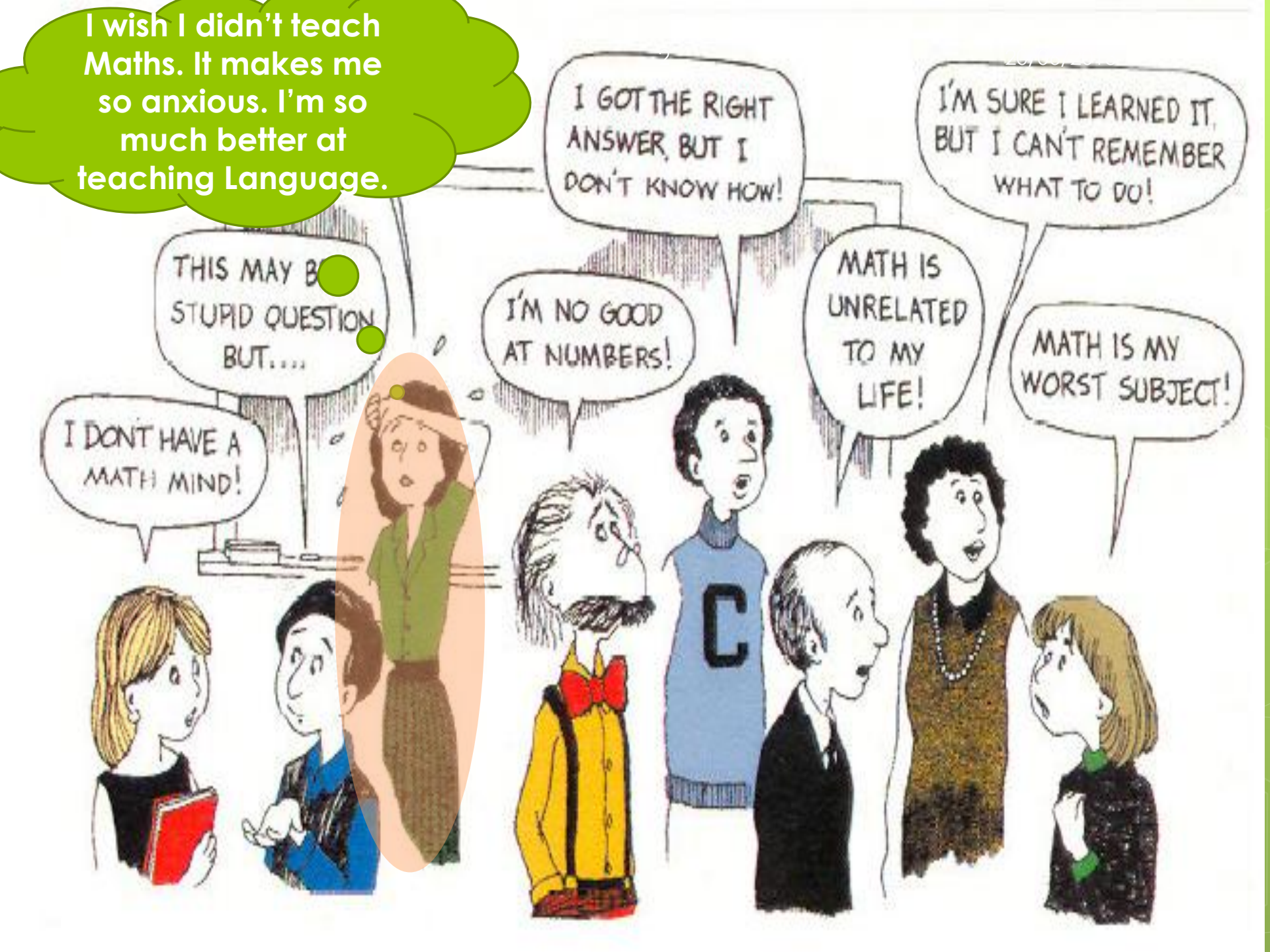
I wish I didn't teach Maths. It makes me so anxious. I'm so much better at teaching Language.
I GOT THE RIGHT ANSWER, BUT I DON'T KNOW HOW!
I'M SURE I LEARNED IT, BUT I CAN'T REMEMBER WHAT TO DO!
THIS MAY B STUPID QUESTION BUT....
I'M NO GOOD AT NUMBERS!
MATH IS UNRELATED TO MY LIFE!
MATH IS MY WORST SUBJECT!
I DONT HAVE A MATH MIND!
C

Some things primary teachers have said about Mathematics….

"Maths is only for bright people."

"Nobody in my family is good at maths."

"I usually call my co-teacher to teach maths, and I teach language arts."

"I probably don't spend as much time teaching maths as I spend teaching language arts. I just don't feel comfortable teaching it."

These statements peeked my curiosity.

Key Terms

Mathematics teaching anxiety: an intensely negative emotional reaction (Cemen, 1987) that teachers experience during preparation for and delivery of mathematics instruction (Peker, 2009).

Mathematics teacher efficacy: teacher's personal belief about his/her skills and ability to effectively teach mathematics (Gresham, 2008).

Mathematics avoidance: tendency to seek escape from dealing with mathematical situations.

Primary teachers report that…

- teaching involves whole-class instruction.
- no pre-service training is required for appointment.
- they teach all subjects in National Curriculum.
- they have general content knowledge in all subjects.
- professional training opportunities are limited.
- available professional training does not adequately meet pedagogical/content needs .

The Purpose of this study was…

to explore the relationship between mathematics teaching anxiety, and mathematics teacher efficacy and mathematics avoidance, among a small group of primary school teachers in Trinidad, by gender, age, and years of teaching experience.

My research questions were…

1. What is the relationship between primary teachers' mathematics anxiety, and their beliefs about efficacy for teaching mathematics, and their avoidance of mathematics?
2. What are the differences among (i) mathematics teaching anxiety, (ii) mathematics teacher efficacy and (iii) mathematics avoidance among primary teachers, by teacher variables of gender, age, and years of teaching experience?

"The Literature" says that…

highly math-anxious teachers

- perpetuate negative attitudes towards mathematics, (Uusimaki & Nanson, 2004),
- have low efficacy due to negative past experiences with mathematics (Swars et al., 2006),
- avoid mathematics-related studies and careers (Trice &Ogden, 1986),
- teach elementary mathematics because they believe it requires less mathematics (Tobias, 1978).

Methodology

- **Quantitative methods** - survey design
- **Independent variables**:
  - Teacher age
  - Years of teaching experience
  - Gender.
- **Dependent variables**:
  - Mathematics teaching Anxiety
  - Mathematics Teacher Efficacy
  - Mathematics avoidance.

Sample and Sample Selection

- **Population**: primary teachers at government and government-assisted primary schools in Trinidad.
- **Sample**: 68 participants selected using *criterion-based selection* (LeCompte & Preissle, 1993):
  - teaching at a government or government-assisted primary school in Trinidad and Tobago;
  - teaching the National Curriculum;
  - attained at least Ordinary level certification;
  - satisfied the recruitment procedure of the Teaching Service Commission of Trinidad and Tobago
  - agreed to participate in the study.

Data instrument

Mathematics Beliefs Questionnaire

Section A: demographic data (gender; age; highest level of educational attainment; number of years teaching at the primary level).

Section B: 4-point Likert scales adapted Revised Mathematics Anxiety Scale and the Math Avoidance Scale (Allen, 2001) and the Personal Mathematics Teaching Efficacy Beliefs Instrument (Enochs, Smith, & Huinker, 2000).

Data Management

- Qualitatively piloted with 10 primary teachers.
- Response rate: 72 of100
- Data screening
  - Cases with missing values deleted (4 cases).
  - Underlying assumptions satisfied:
    - independent
    - homogeneity of variances (Levene's Test)
    - normality (Kolmogorov-Smirnov and Shapiro-Wilk statistic (factorial ANOVA only)
- Analysis using SPSS 20

Hypotheses

H_{01}: There is no relationship between primary school teachers' mathematics anxiety, teacher efficacy, and mathematics avoidance?

H_{02}: There is no difference in primary school teachers' mathematics anxiety, teacher efficacy, and mathematics avoidance by gender .

H_{03}: There is no difference in primary school teachers' mathematics anxiety by teachers' age, educational attainment, and years of teaching experience.

H_{04}: There is no difference in primary school teachers' teacher efficacy by teachers' age, educational attainment, and years of teaching experience.

H_{05}: There is no difference in primary school teachers' mathematics avoidance by teacher' age, educational attainment, and years of teaching experience.

Data Analysis using SPSS 20

- Demographic data summarized.
- Descriptive statistics computed for DVs by IVs.
- Pearson product-moment correlation computed to identify linear relationship between DVs.
- Independent samples t-test computed to identify significant differences by gender for DVs.
- Three-way ANOVA computed by participants' educational achievement, years of teaching experience and age for DVs.

Findings – Demographic Data

Profile of survey respondents (n = 68) percentage of respondents

Profile	% of study sample
Age group	
30 – 39	64.7
40 – 49	30.9
50 – 59	4.4
Gender	
Female	64.7
Male	35.3
Highest level of education	
Secondary school	2.9
Teachers Diploma	63.2
Bachelor in Education	22.1
Masters/Doctorate	11.8
Years of teaching experience	
6 – 15	50
16 – 25	38.8
Over 25	11.2

Findings – Descriptive Statistics

	Mean	Standard deviation
Mathematics Anxiety	2.30	.27
Teacher Efficacy	2.26	.24
Mathematics Avoidance	2.05	.27

Mean score	Interpretation
≤ 2.50	Low
> 2.50	High

Findings – Descriptive Statistics

		Mathematics Anxiety	Teacher Efficacy	Mathematics Avoidance
Gender	Male	2.32 (.21)	2.23 (.23)	2.17 (.22)
	Female	2.28 (.30)	2.25 (.24)	1.99 (.28
Years teaching experience	6 – 15	2.29 (.23)	2.28 (.23)	2.02 (.29)
	16 – 25	2.24 (.22)	2.19 (.23)	2.08 (.26)
	Over 25	2.51 (.48)	2.34 (.24)	2.10 (.25)
Age	30 – 39	2.30 (.21)	2.24 (.25)	2.04 (.30)
	40 – 49	2.22 (.35)	2.28 (.21)	2.05 (.21)
	50 – 59	2.63 (.32)	2.38 (.15)	2.13 (.29)
Educational attainment	Sec. school	2.35 (.35)	2.05 (.38)	2.25 (.39)
	Teach.Dip.	2.30 (.30)	2.24 (.22)	2.06 (.26)
	B. Ed.	2.26 (.23)	2.35 (.26)	2.07 (.21)
	Masters/PhD	2.33 (.17)	2.20 (.24)	1.95 (.39)

Findings – Hypothesis 1

H_{01}: There is no relationship between teachers' mathematics anxiety, teacher efficacy, and mathematics avoidance?

	r	r^2
Mathematics Anxiety – Teacher Efficacy	.270*	.073
Mathematics Anxiety – Mathematics Avoidance	.071	.504
Teacher Efficacy – Mathematics Avoidance	.038	.001

Pearson's revealed a significant, but weak positive relationship between mathematics anxiety and teacher efficacy **ONLY**.

Findings – Hypothesis 2

H_{02}: There is no difference in primary school teachers' mathematics anxiety, teacher efficacy, and mathematics avoidance by gender .

	t	df	Sig.
Mathematics Anxiety	.565	66	.574
Teacher Efficacy	.101	66	.920
Mathematics Avoidance	2.692	66	.009

Independent-samples t-test revealed significant gender-related difference in mathematics avoidance **ONLY**. Males reported higher levels of mathematics avoidance than females.

Findings – Hypotheses 3, 4, 5

H_{03}: There is no difference in primary school teachers' mathematics anxiety by teachers' age, educational attainment, and years of teaching experience.

H_{04}: There is no difference in primary school teachers' teacher efficacy by teachers' age, educational attainment, and years of teaching experience.

H_{05}: There is no difference in primary school teachers' mathematics avoidance by teachers' age, educational attainment, and years of teaching experience.

3 x 4 x 3 factorial ANOVA s (design) computed for DVs:

- Mathematics Anxiety
- Teacher Efficacy
- Mathematics Avoidance

Findings – Hypothesis 3

Mathematics Anxiety – Test of between-subjects Effects

	F	Sig.
Overall	1.078	.399
Age	.482	.697
Years of teaching experience	1.783	.178
Educational attainment	.482	.697
Age*Yeas of teaching experience	.000	.995
Age*Educational attainment	.114	.952
Educational attainment*Years of teaching	.816	.521
Age*Educational attainment*Years of teaching	1.282	.263

Findings – Hypothesis 4

Teacher Efficacy – Test of between-subjects Effects

	F	Sig.
Overall	1.391	.184
Age	.893	.416
Years of teaching experience	1.614	.209
Educational attainment	.632	.598
Age*Yeas of teaching experience	.370	.546
Age*Educational attainment	.828	.485
Educational attainment*Years of teaching	1.194	.325
Age*Educational attainment*Years of teaching	.211	.648

Findings – Hypothesis 5

Mathematics Avoidance – Test of between-subjects Effects

	F	Sig.
Overall	.659	.819
Age	.078	.925
Years of teaching experience	.003	.997
Educational attainment	1.046	.380
Age*Yeas of teaching experience	.004	.951
Age*Educational attainment	.439	.726
Educational attainment*Years of teaching	1.337	.269
Age*Educational attainment*Years of teaching	.088	.768

Findings – Hypotheses 3,4,5

- No significant main effects.
- No significant interaction effects.

There was no significant difference by teachers' age, educational attainment, and years of teaching experience in mathematics anxiety, teacher efficacy, and mathematics avoidance.

Where to now?

Conclusions

- Mathematics anxiety not evident among participants.
- Higher anxiety associated with lower efficacy and higher avoidance.
- Teacher variables did not significantly influence anxiety, avoidance and efficacy.
- Older and more experienced teachers reported marginally higher anxiety and avoidance, but lower efficacy than younger and less experienced ones.
- Female teachers reported marginally lower anxiety and avoidance, but higher efficacy than males.

The way forward…

- Revisit analysis using different teacher variables.
- Larger scale – sample size; educational districts.
- More refined sampling technique – stratified, random sampling.
- More construct-related items on questionnaire.
- Mixed-method design for deeper understanding of phenomenon.

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Thank You!

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