The Teacher as a Factor in the Formation of Students' View of Mathematics

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The sole author designed, analyzed, interpreted and prepared the manuscript.

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Abstract
This research study sheds light on students' views toward mathematics as a subject, and particularly the role of teachers in the formation of these views. Data were collected using questionnaire surveys as a quick means for gathering students' views. This method of data collection has also been found to be convenient for the study participants. Results gleaned throughout this study have significant implications for mathematics pedagogy and research.

Keywords: Mathematics; questionnaires; students; teacher; views.

1 Introduction
“"I hate math.""
""I am not good at math.""
""I have never enjoyed math classes.""

These, and other statements, are often used by students to describe their math anxiety. They also reflect that many students hold varied attitudes toward mathematics. Apparently, if students dislike math, they

1According to Cates and Rhymer (2003), math anxiety is "a condition in which students experience negative reactions to mathematical concepts and evaluation methods".
2Dislike of math in this study is defined as a negative attitude toward math causing a desire to avoid mathematics classes.

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would struggle in achieving good grades in math classes. Also, at the long term, students might even not pursue the subject any more unless they have to.

During her time at school, particularly at the high-school level, the researcher has class-mated various kinds of students, i.e. those who were enthusiastic to learn math and planned to pursue a math career; and those who disliked math and struggled hard to grasp basic math concepts. But what really influences students perceive mathematics differently? Is it the students themselves, the teacher’s approach, or the class activities? [1]. This study seeks to determine whether students' attitudes towards math are influenced by their math teachers.

2 Rationale for the Study

My primary motive for doing research on students' views toward mathematics developed throughout my academic journey as a student, undergraduate and postgraduate. From the outset of the journey, it was evident that my perception of mathematics and mathematical practice was different from that of some of my peers. Whilst I felt enthusiastic and peculiar during math classes, some other students seemed distant and disinterested in both the course and its teacher although the role of the teachers seemed to be as mediators who provided guidance when it was needed. After a long silence, I decided to break the ice and talk to my peers about their views and perceptions of mathematics and math classes, and carry on researching this classroom phenomenon.

3 Methodology

Two data collection tools have been utilised, namely questionnaires and interviews. The questionnaire included ten closed items, ranging between Likert-scale, ranking and filtering questions; and they all were concerned with students' view of mathematics and how this began and developed. Furthermore, the survey aimed at investigating students' perception of math teachers and classes, particularly those at the high school\(^3\). The average time spent to fill in the questionnaire was 12 minutes, and there were no ambiguous items\(^4\). Using a convenient tool for participants, surveymonkey.com\(^5\) was utilised in this study. The questionnaires were administered over a period of two weeks in March, 2013; and of the 100 students asked to fill it in, only 41 have responded. 13 of those participants were math students, 7 were pursuing math-related subjects\(^6\), and the other 21 were from various subject backgrounds.

As a supporting data source, interviews have been used in this study. According to Kvale [2], “interviews can provide depth of explanation within a particular context”. Interview can be either structured, semi-structured, or unstructured [3]. In this study, to allow eliciting in-depth details, semi-structured interviews\(^7\) were used. The interview involved the following questions:

1. Do you like math?
2. Why do you like or dislike math?
3. Was it the teacher who made you feel this way? Was it the class, or what exactly?

All selected randomly, five participants were individually interviewed by the researcher. All interviews were recorded, and each interview has approximately lasted for 10 minutes.

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\(^3\) This is because the high school study is the most recent experience students would have had before they joined university.

\(^4\) Given that, based on the advice of the module leader and other colleagues, the survey has been piloted and developed.

\(^5\) SurveyMonkey is a web survey development company that allows users to freely set up online questionnaires. The link for this service is: http://www.surveymonkey.com/

\(^6\) E.g. statistics and physics.

\(^7\) While a structured interview has a formalized, limited set of questions, a semi-structured interview is flexible, allowing new questions to be brought up during the interview as a result of what the interviewee says.
4 Findings

Regarding the questionnaire, students' answers were quite distinct. Asked, for instance, about their attitude towards math, 49% of the respondents expressed that they like mathematics, whereas 51% held varied opinions (26.83% disliked mathematics, and 24.39% said they would just study math if they had to) Fig. 1.

![Bar chart showing students' attitude towards Mathematics](image)

**Fig. 1. Students' attitude towards Mathematics**

Asked then what influenced their attitudes toward math, 90% of the respondents stated that the teacher has strongly affected their perceptions; whereas only 10% believed the opposite. Additionally, in contrast to the 55% who disagreed, 45% of the participants agreed that parents are also another factor in influencing their math perception. Also, around 71% of the respondents agreed that both the comprehensibility or difficulty of math have influenced their math perception, whereas approximately 29% disagreed to this (Fig. 2).

![Bar chart showing graphical representation of influence regarding attitudes](image)

**Fig. 2. Graphical representation of influence regarding attitudes**

Divided equally, 12 of the participants who liked math believed that their math teachers at high school did their best and succeeded in making them understand the subject, whereas another 12 respondents who disliked math admitted that though their teachers did their best, they were not good in explaining math concepts, Fig. 3.

Explicitly asked then whether they were taught by a teacher who made them like or dislike mathematics, students seemed who liked math all to agree on this. With 30% believing that their primary-school math
teacher influenced their likeliness of mathematics, 65% said that it is their secondary-school math teacher who made them like mathematics, Fig. 4.

Next, participants were asked about their perception of mathematics, around 61% agreed that mathematics is important in their daily life; whereas 34% disagreed, Fig. 5.

Lastly, students were asked whether their high-school math teachers encouraged them in class. 59% of the respondents reported being encouraged by their math teachers, whereas 49% reported the opposite, Fig. 6.

As to the interviews, 4 out of the 5 interviewees expressed their dislike of math and that this is largely due to teachers' approaches. For instance, S1\(^8\) says: “the teacher used just to give us the answer, but didn’t show us the steps”. S5, however, said “I like mathematics because the teacher was really good”.

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\(^8\)S1 = interviewee no. 1
Unsurprisingly, interviewees who disliked mathematics have agreed that their classes were ‘boring’ and had hardly included an activity or a ‘group work’. They also added they started disliking mathematics when they were all at the beginning of their secondary education (i.e. around Year 10). An exception to this, however, was S4 who said that she was “taught by a good teacher once, and she made me love math. Unfortunately she left, and I now hate math again”.

6 Discussion

The findings suggest a strong correlation between students’ view of mathematics and their math teachers. Also, students who reported enjoying math classes seemed to like mathematics more than those who reported math classes being boring and demotivating. Surprisingly, besides, around 24% of the participants didn’t believe in the importance of mathematics in their day-to-day life. This result rings an alarm for educators and math teachers whom I argue shall encourage the use of more class activities and group work, as this should positive students’ view of math.

It was also evident that students who reported disliking mathematics were unfortunately discouraged by their teacher right from an early study stage. Also, teachers’ way of explaining math concepts was seen by many students as unsatisfactory, and thus teachers should constantly evaluate their teaching.

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Footnote: This is similar to survey results.
7 Limitations of the Study

Limitations are unavoidable in every research as controlling all conditions and variables is extremely difficult and even inapplicable. Hence, the current study is no exception as it has some limitations. One of these limitations was the constraints of time, funding, and resources which led to limiting the data collection to a relatively small sample. Also, the study depended mainly on questionnaires and interviews as the study plan could not accommodate other types of data such as document analysis, material evaluation and/or classroom observation and field notes.

8 Conclusion and Recommendations

In sum, the study (although carried out at a small scale) has shed light on a very critical aspect of the formation of students' view towards math as a subject. Interestingly, participants were outspoken and have pointed to many critical issues not only in math classes, but also in the relationship between them and their math teachers. It is evident, however, that the teacher shall not be overlooked as a key player in forming students' likeliness or hatred of math. The study recommends continuous training to math teachers, and stresses on the importance of using varied activities, both curricular and non-curricular, in math classes. The study also recommends combined-strategies instruction to promote students' mathematical competence rather than teaching individual strategies. In addition, the study calls for incorporating kinetic activities such as role-playing which would add variety in follow-up activities for the students.

Consent and Ethical Considerations

To protect the participants' rights and to avoid causing them any harm, the researcher will obtain the necessary ethical consent forms and get them approved before carrying out the actual study. More precisely, different consent forms (i.e. for teachers and students) were distributed among the participants to sign. Furthermore, participants were informed that their participation in the study is entirely voluntary, and that the collected data would be strictly confidential and anonymous.

Competing Interests

Author has declared that no competing interests exist.

References

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[2] Kvale S. InterViews: An introduction to qualitative research interviewing. Thousand Oaks, CA: Sage; 1996.

[3] Blaxter L, Hughes C, Tight M. How to Research. (3rd Ed.) New York: McGraw-Hill Education; 2006.
Appendices

Appendix A: Screen shots of the electronic questionnaire
Appendix B: The questionnaire items

| Q.1 What are you studying currently?                                                                 |
|--------------------------------------------------------------------------------------------------|
| - Mathematics - Other math-related subjects - Other, please specify                               |

| Q.2 Do you like mathematics?                                                                      |
|--------------------------------------------------------------------------------------------------|
| - Yes, very much - Yes - I study just if I had to - I dislike it                                 |

| Q.3 If the math teacher made the class exiting and enjoyable I think this gives student more chances to like it? |
|--------------------------------------------------------------------------------------------------|
| - Agree strongly - Agree - Disagree - Disagree strongly                                       |

| Q.4 Has any of the following influenced your likeness of math either positively or negatively? |
|------------------------------------------------------------------------------------------------|
| - Teachers - Parents - Friends - I find it understandable - Its difficulty affect me negatively|

Other ...........................................

| Q.5 When did you choose mathematics as a major?                                                   |
|--------------------------------------------------------------------------------------------------|
| - Before high school - During my study in the high school - After high school                   |

| Q.6 I think my last math teacher at high school                                                |
|--------------------------------------------------------------------------------------------------|
| - did their best to make us understand and were good in this.                                 |
| - did their best, but were not able to make us understand fully                                |
| - did not care that much to make sure everyone understood the lesson.                          |

Other ...........................................

| Q.7 Have you ever been taught by a teacher that made you like or dislike mathematics? If yes please specify, did he make you like it or dislike it? |
|--------------------------------------------------------------------------------------------------|
| - Yes, at primary school - Yes, at intermediate school. - Yes, at the A-levels. - No.           |

| Q.8 How was your math class at high school (last math classes)?                                 |
|--------------------------------------------------------------------------------------------------|
| - Boring and didn't include any activities. - Interesting and included various activities.     |
| - Interesting, but it didn't include any activities. - Boring although it included various activities.|

| Q.9 Do you think mathematics is important in our daily life, and was your math teacher trying to explain how each topic is used in daily life (last math teacher you had)? |
|--------------------------------------------------------------------------------------------------|
| - Very important, but our teacher didn't explain how each topic is used in daily life.         |
| - Very important and our teacher has always explained how the topic is used in daily life.     |
| - Not important and our teacher didn't explain how each topic is used in daily life             |
| - Not important, although our teacher has always explained how the topic is used in daily life.|

| Q.10 Was your math teacher at high school encouraging you during math classes (last teacher you had)? If yes, how? |
|--------------------------------------------------------------------------------------------------|


Appendix C: Sample of correspondence used to recruit participants

Hello mark,

I should highly appreciate if you could also forward my survey to the student at IFPa & IFPb. and also to Peter Philipson (pete.philipson@northumbria.ac.uk) a Math Lecturer at the Mathematics Department, so he can ask his students at Year 1 and Year 2 to kindly fill it in.

http://www.surveymonkey.com/s/SFMPGYW

Thank you very much for your cooperation.

Tahani