MATHEMATICAL WELLBEING OF MATHEMATICS TEACHERS IN THAILAND: AN INITIAL EXPLORATION

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110 mathematics teachers from across Thailand were surveyed for their perception of their own mathematical wellbeing (MWB), as well as the extent to which personally-held values were able to be fulfilled. Data analysis revealed that the mathematics teachers' MWB was generally positive, with no statistically significant difference amongst teachers from different school levels. The teachers' MWB relates to the embracing and fulfillment of nine ultimate values, all of which teachers nearly often got to fulfil, namely: accomplishment, autonomy, cognitions, compliance, engagement, meaning, perseverance, positive emotions, and relationships. While eight of these are known in the literature, compliance emerged as a value that is unique to teacher MWB.

INTRODUCTION

Mathematical wellbeing (MWB) refers to a person's wellbeing relating to the discipline of mathematics. It is a subject-specific component of general wellbeing. MWB was first conceptualised by Clarkson, Bishop and Seah (2010), and more recently investigated in greater detail by Julia Hill (e.g., Hill, Kern, et al, 2022).

While students' MWB has been the subject of research studies (e.g., Hill, Bowmar, et al, 2022; Hill & Seah, 2023), teachers' MWB is also important and should not be assumed. Our belief is that a mathematics teacher with a positive MWB would not only be teaching optimally, they will also be influencing their students affectively and conatively in constructive ways. Yet, to our knowledge no prior research has been conducted to assess or to understand the MWB of mathematics teachers.

In this context, we embarked on an exploratory study of the MWB of primary and secondary school mathematics teachers in Thailand, guided by the following research problem: What does teacher MWB look like for mathematics teachers in Thailand?

MATHEMATICAL WELLBEING

Adapting Huppert and So's (2013) definition of wellbeing, mathematical wellbeing refers to a person's subjective experiences of feeling good and functioning well with regards to the discipline of mathematics. Thus, a mathematics teacher's MWB reflects the extent to which they are feeling well and teaching mathematics well.

We subscribe to Tiberius' (2018) value fulfillment theory of wellbeing, which when applied to mathematics education posits that mathematical wellbeing is a function of the extent to which personally held values related to mathematics learning and teaching are fulfilled and actualised. In other words, a teacher with a positive MWB would be one who finds that they get to fulfil or actualise what they regard as important in mathematics teaching

or learning. If a teacher values *practice*, say, but if their school has a zero-homework policy, then *practice* will likely not be fulfilled, leading to disappointment, uncertainty or discontent. Accordingly, MWB is affected.

To this end, Hill, Kern, et al (2022) identified a set of seven ultimate values (UVs) the fulfillment of which is required for positive student MWB. These UVs are, namely, *accomplishment, cognitions, engagement, meaning, perseverance, positive emotions,* and *relationships*. Each of these seven UVs would be served by different instrumental values (IVs), which can differ from culture to culture. For example, the UV *accomplishment* might be attained through the IV of *performance* (in assessments), yet other teacher colleagues might actualise the same UV via different IVs, such as (student) *understanding*, or (students' in-class) *participation*. Indeed, we were curious if the same set of seven UVs apply to teacher MWB.

The nurturing and sustaining of MWB represents a strength-based approach to optimising students' affect and motivation. For example, a positive student MWB reduces the chance of these students experiencing mathematical anxiety and disengagement. In so doing, we are being proactive towards the prevention of mental issues affecting large numbers of mathematics students around the world. Similarly, nurturing mathematics teachers' MWB would also be a proactive approach against the potential for teacher burnout, negative attitude, or even mathematics anxiety.

MATHEMATICS TEACHING IN THAILAND

Nearly all (mathematics) teachers in Thailand received their accreditation through completing a four-year Bachelor of Education degree. Most of these programs are specialized, with a specific focus on disciplines such as Mathematics. However, it is also worth noting that certain programs may focus on producing teachers for primary school teaching only. Pre-service teachers are also relatively more exposed to mathematics courses compared to their peers in other countries (Tatto, Rodriguez, & Lu, 2015). Quality assurance and degree accreditation are overseen by the Ministry of Higher Education, Science, Research and Innovation, and the Teachers' Council of Thailand.

The relative low pay for teachers has contributed to a shortage of mathematics teachers, especially in rural schools. The authorities' response has been to allow mathematics graduates to become teachers without completing teacher training. Thailand was placed 57th out of 78 systems taking part in PISA 2018 Mathematical Literacy, with its performance considered to be statistically significantly below the OECD average.

Given these realities above, what is the state of teacher MWB in Thailand? Could it be harnessed by mathematics teachers to support their professional practice, or might it be affected by the issues confronting mathematics education?

In this context, we posed three research questions for the current exploratory study:
RQ1: How do the MWB of primary mathematics teachers in Thailand compare with the MWB of secondary mathematics teachers there?
RQ2: What are the values associated with mathematics teacher MWB in Thailand?
RQ3: To what extent are these teacher values fulfilled when there is positive MWB?

METHODOLOGY

Given the exploratory nature of this study, and the intention to map teacher values and teacher opinions of their sense of wellbeing in relation to mathematics teaching, the questionnaire method was deemed to be the most practical. An online questionnaire was constructed in Thai and distributed widely via a flyer posted on (mathematics) teacher discussion fora across several social media platforms in May – Jun 2023.

Once the questionnaire items were identified, the questionnaire was piloted with four teachers in Thailand. As the teachers responded to the questionnaire, they were encouraged to check that the vocabulary used could be understood by typical primary school students, that the questions and instructions were clear and explicit, and to record the time taken to complete the survey. This pilot testing stage led to several changes made to the questionnaire, thus increasing its construct validity. The questionnaire items are listed below, having been translated into English.

Item 1: Level of teaching (primary / secondary)

Item 2: When teaching maths, how often do you feel good AND function/teach well? (never / sometimes / half of the time / often / always)

Item 3: During those times when you were feeling good and functioning well in your maths teaching, what might be the reasons?

Items 4/6/8: What is the first/second/third important aspect of maths teaching to your professional practice?

Items 5/7/9: When teaching maths, how often do you get to express or show the first/second/third important aspect? (never / sometimes / half of the time / often / always)

We used a convenience sample technique to recruit participants, since the intention had been to explore the MWB of mathematics teachers in general across the kingdom.

As the questionnaire was conducted online using Google Form, data from within the submitted questionnaires were collated automatically by the software. Raw data were exported in the form of a spreadsheet.

The responses gathered from items 2, 5, 7, and 9 were transformed into numerical scores (Never = 1, Sometimes = 2, Half of the time = 3, Often = 4, and always = 5). The data collected from items 4, 6, and 8 were read by us individually to distil the UVs. This was guided by the seven MWB UVs evident in the literature (see above), while we were open to potential new UV categories. Inter-rater agreement was 97.8% (308 agreements out of 315 responses). The UV frequencies were then tallied. Frequency, mean, standard deviation, and Kruskal-Wallis test were used to interpret the data.

RESULTS

A total of 110 valid responses were received. The self-reported MWB of these Thai teacher participants, categorised according to their teaching levels (i.e., primary, primary and lower secondary, secondary), is shown in Table 1. The overall mean score of 3.94 indicates that amongst this group of mathematics teachers practising in different

parts of Thailand, on the whole, their teacher MWB is pretty much positive. They are nearly often feeling good and functioning well when teaching mathematics. In particular, primary mathematics teachers reported the most positive MWB, followed by their secondary counterparts. Those teachers who were teaching across primary and lower secondary school years reported the lowest MWB, even though it is still positive.

| Teaching levels | Tertiary major | | | | Total | Mathematical Wellbeing | |
| | Mathematics | | others | | | | |
	Teach only Maths	Teach other subjects	Teach only Maths	Teach other subjects		$\bar{x}$	S.D.
Primary	18	26	0	3	47	4.11	0.81
Primary and Lower secondary	12	5	1	1	19	3.68	0.89
Secondary	35	5	2	2	44	3.86	0.82
Total	65	36	3	6	110	3.94	0.83

Table 1: Mathematics teachers' MWB.

However, as shown in Table 2, there is no significant difference in the MWB mean scores among these three groups of teachers ($\chi 2 = 4.179$, p = .124, df = 2), with a mean rank of 61.56 for primary school teachers, 46.45 for primary/lower secondary school teachers, and 52.93 of secondary teachers. Thus, the difference in MWB between the primary and primary/lower secondary, and between primary/lower secondary and secondary are not statistically significant.

A total of 315 different values were encoded from the teachers' responses. Even though 330 responses were expected (i.e., 3 responses from each of the 110 respondents), 15 of these were either non-responses or meaningless terms (e.g., weather, location). As shown in Table 3, 304 of these values were categorised into the seven UVs that made up the

Teaching levels	N	Mean Rank
Primary	47	61.56
Primary / Lower secondary	19	46.45
Secondary	44	52.93
χ^2	4.176	
df	2	
p-value	.124	

Table 2: A comparison of MWB among three groups of teachers.

student MWB framework. Of the remaining 11, nine were categorised into the UV *autonomy*, which incidentally is also the additional UV identified for students' wellbeing in science education, in addition to the set of seven UVs associated with MWB (Hill et al, 2023). The last two values nominated by two teachers are similar, reflecting the importance for practice to be aligned with the mathematics curriculum in order for them to experience positive MWB. We propose to name this valuing *compliance*, the ninth UV underlying mathematics teacher MWB in Thailand.

UVs associated with teacher MWB (examples of contributing IVs)	Frequency
Accomplishment (Goal attainment, Leadership, Learning, Mastery, Outcomes, Success)	7
Autonomy (Agency, Autonomy)	9
Cognitions (Active learning, Analytical thinking, Analyzing problems, Assessment, CK, Cognition, Comprehension, Content, Differentiation, Explanation, Knowledge, Mathematical reasoning, PCK, Problem-solving, Recall, Remediation, Review, Skills, Teaching methods, Understanding)	139
Compliance (Alignment with curriculum)	2
Engagement (Activities, Attention, Engagement, Experimental learning, Hands-on, Interactions, Motivation, Readiness, Responsiveness, Teacher noticing)	44
Meaning (Application, Connections, Informal language, NoM, Prior knowledge)	27
Perseverance (Practice)	5
Positive emotions (Emotions, Enjoyment, Fun, Happiness, Interest, Learning atmosphere, Learning environment, Love for maths, Passion for teaching, Passion in maths, Positive atmosphere, Positive attitude, Praise, Safety, Self-esteem)	43
Relationships (Communication, Family support, Learning agreements, Relationships, Student cooperation, Students, Teachers, Teamwork)	39

Table 3: The values governing the teachers' MWB.

Amongst the nine UVs, *cognitions* are overwhelmingly the most often nominated. 139 of the 315 (or 44.1%) values the fulfillment of which contribute to teacher MWB are related to knowledge and skills, such as content knowledge and mathematical reasoning respectively. This is followed by a distant second most often nominated UV, *engagement*, and then, *positive emotions, relationships, meaning, autonomy, accomplishment, perseverance,* and *compliance*.

UV	Frequency	Fulfillment
cognitions	139	4.00
engagement	44	3.68
positive emotions	43	3.84
relationships	39	3.85
meaning	27	3.78
autonomy	9	3.89
accomplishment	7	4.46
perseverance	5	4.25
compliance	2	5.00

Table 4: Teacher fulfillment of MWB UVs.

How often do the mathematics teachers get to fulfil or express these UVs underlying their MWB? Table 4 provides the mean scores for the fulfillment of the UVs, with a maximum of 5 meaning 'always', 3 for 'half of the time', and 1 for 'never'. Thus, the two teachers who nominated *compliance* were able to experience fulfillment of this valuing all of the time, which would contribute towards their teacher MWB. Three other UVs – including the most popular, *cognitions*, as well as *accomplishment* and *perseverance* – get to be fulfilled often. The other five UVs are fulfilled nearly often enough, and well more than half of the time, with the lowest mean score being 3.68.

DISCUSSION

This exploratory study, probably the first of its kind researching teacher MWB, has found that with the perspective that MWB represents the extent to which personally-held values are fulfilled in a teacher's mathematics teaching, then these values can be categorised into nine groups of UVs. Seven of these are exactly the same as the ones which define student MWB, namely, *accomplishment, cognitions, engagement, meaning, perseverance, positive emotions,* and *relationships*. Then there is also the UV *autonomy* which has been the value that had been identified in the construct of students' science wellbeing (Hill et al, 2023). In addition, a new UV, *compliance*, has been identified. This is perhaps not surprising, since it is often expected of classroom teachers to 'follow the curriculum' when lessons are being designed, delivered, and students' learning assessed. So, for many teachers, being able to not only value *compliance* but actually getting to abide by the relevant policies and expectations, is a source of their teacher MWB. The uniformity of teacher education across the kingdom as discussed above might be a contributing reason. Not surprisingly perhaps, student MWB is not dependant on this valuing (of *compliance*).

Amongst the nine UVs underlying teacher MWB, *cognitions* have been the most nominated. After all, it is a teacher's job and responsibility to facilitate student learning of mathematical knowledge and skills, thereby developing and strengthening their cognitions.

At the same time, the teachers' valuing of *cognitions* might also refer to their own professional knowledge and skills, as illustrated by such IVs as *pedagogical content knowledge (PCK)* (see Table 3). Thus, being able to develop students' mathematical knowledge and skills through a teacher's lessons, and/or being able to utilise their own content or pedagogical content knowledge and skills in their practice, would contribute to a sense of positive MWB for the teacher.

Each of the nine UVs was fulfilled at least nearly often enough by the teachers, which supports the finding that teacher MWB is generally positive in Thailand. Given that the nine UVs were nominated a different number of times, ranging from 2 to 139, we are unable to draw conclusions from the different degrees of fulfillment. If the current model of student MWB also extends to Thai students, then our finding that the nine UVs associated with teacher MWB include the seven UVs of student MWB implies that student MWB possibly correlates with their teacher's. On the other hand, while *cognitions* might be the most emphasised for mathematics teachers (in Thailand) and students in Australia, *accomplishment* was most emphasised for students in China (Hill & Seah, 2023). What are the implications here for mathematics classrooms with migrant students (from China, say)? Would this constitute a form of values misalignment in the lessons? These are indeed implications for future research.

CONCLUSION

110 mathematics teachers from across Thailand responded to an online questionnaire surveying teacher perception of their own MWB, and the extent to which personally-held values were able to be fulfilled. In view of the Research Questions posed, data analysis revealed that the mathematics teachers' MWB was generally positive, with no statistically significant difference amongst primary school teachers, primary/lower secondary school teachers, and secondary school teachers. The teachers' MWB was found to relate to the embracing and fulfillment of nine ultimate values. That the teachers reported that they nearly often got to fulfil these ultimate values reinforced their overall positive teacher MWB. The nine ultimate values are: *accomplishment, autonomy, cognitions, compliance, engagement, meaning, perseverance, positive emotions,* and *relationships*. Seven of these values are already associated with student MWB and science wellbeing, and *autonomy* has been the eighth value for science wellbeing (Hill et al, 2023). *Compliance* is found to be unique to teacher MWB.

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