

BELIEFS of Teachers, Professional Development Efforts and Motivation of Teachers in Teaching MATHEMATICS

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ABSTRACT

The academe is grappling with a significant issue caused by declining job satisfaction among math teachers and an increase in teacher turnover rates. One potential factor contributing to this problem is the low level of motivation observed among mathematics teachers. This study aimed to investigate the impact of teachers' beliefs and their engagement in professional development activities on the motivation of mathematics teachers in teaching mathematics. The study utilized three adapted questionnaires to gather information from the respondents. A quantitative research design employing the descriptive-correlational method was employed, and the respondents consisted of secondary public school mathematics teachers in Davao City. The collected data were analyzed using mean, standard deviation, and linear regression analysis. The analysis results indicated that the level of the three categories of teachers' beliefs (transmissionist, facts first, and fixed instructional plan), professional development efforts, and motivation to teach mathematics were consistently rated very high, which was always evident. The relationship between the three variables further demonstrated that the three categories of teachers' beliefs, professional development efforts, and motivation significantly related to their motivation to teach math. Furthermore, only fixed instructional plan belief and professional development efforts significantly influenced motivation in teaching mathematics.

KEYWORDS: *Education, mathematics, beliefs of teachers, professional development efforts, motivation of teachers, descriptive-correlation, Philippines*

INTRODUCTION

Teaching mathematics regards motivation as its driving force for

mathematics teachers based on the ability or needs of the students. The success or failure of teachers in teaching mathematics is relative to their motivation to teach mathematics (Nespor, 2018). Teachers' inability to maintain high motivation is one of the issues for mathematics teachers worldwide. These problems include job security, interest, support from the administration, efforts to prepare instructional materials, and low salaries and fringe benefits (Atkinson, 2018). The research of Sanderholm (2018) indicated that teachers in this subject exerted less effort and displayed limited interest when they needed more exposure to professional development training, more support from school heads and fellow teachers, and a greater understanding of student learning.

In addition, Atkinson (2018) stated that the problem of teachers' low teaching motivation is due to a lack of opportunities for personal and professional development, lack of support from colleagues, of participation of teachers in decision-making, and negative attitudes of learners toward learning mathematics which contributed significantly on the diminishing motivation of mathematics teachers. In support, the study of Ramírez (2017) accented that mathematics teachers lost the motivation to teach since they were deprived of opportunities for continuous professional development, and other teachers lost their motivation to teach due to a lack of support from school heads and co-workers. Nevertheless, Aikins and Hutter (2017) expressed that their study lacks appropriate control, which is one of its weaknesses.

In Malaysia, the Covid-19 pandemic has led to concerns about poor teacher motivation in various institutions. The rapid shift to online teaching and learning has forced teachers and students to adapt quickly to virtual platforms without sufficient training (Allen et al., 2020). This transition has resulted in stress and decreased motivation among teachers (Bhat et al., 2020; Wang et al., 2020). Additionally, inadequate pay, perks, support, and strained administrative relationships have further dampened teachers' enthusiasm for teaching math. Based on empirical findings, including those of Ghasemy, Mohajer, et al. (2020) and Ghasemy, Morshidi, et al. (2021), it is essential to consider the impact of affective states on teachers' motivation for their work. Poor career prospects and a lack of job stability can cause teachers to experience negative affective states, negatively affecting their motivation and happiness in their work.

In Japan, the closure of schools in March 2021 and the subsequent unstable situation in April and May presented significant challenges. Japanese teachers felt a sense of crisis and an urgent need to find effective ways to provide quality education to their students. Despite Japan's reputation as a technological

leader, only a few schools had prior experience with distance learning involving external specialists, while teachers and students were physically present in school (Morishita et al., 2018). Issues related to institutional support, such as training in the use of ICT, internet connections, handling unforeseen problems, and the expectations and pressures from colleagues, also impact teachers' enthusiasm to teach (Hung, 2016; Moreira-Fontan et al., 2019). These contextual factors further contribute to the complexities and challenges Japanese teachers face in maintaining their motivation in teaching.

In like manner, some of the teachers teaching mathematics in the Philippines have low morale, which results in the poor motivation of Filipino teachers toward teaching. Indeed, there are many reasons for the poor motivation of teachers. As Albert (2013) highlighted, the high student-teacher ratio, long hours of teaching per day, and extensive teaching hours per year suggest that public school teachers in the Philippines need more time to prepare their instructional plans. As Lopez and Irene (2018) pointed out, teachers are much less likely to have the time and opportunities for personal and professional development, lesson planning, and preparation due to long work hours and large class sizes, especially given how frequently the curriculum changes. These factors potentially impact teachers' motivation negatively, as Ewican et al. (2017) mentioned, including the lack of professional development opportunities, fringe benefits, and management support for teachers.

The study by Sanchez and Jimenez (2022) pointed out that most of the mathematics teachers in Davao City needed to meet their classes regularly while they performed other tasks assigned to them, lowering their teaching motivations. Additionally, Bocala (2022) stated that many ancillary services assigned to teachers, such as being the coordinator of the school's different programs, prevent teachers from focusing on their primary task, teaching their students. Parreño (2022) pointed out that these ancillary activities, unfortunately, lessen teachers' motivations in teaching mathematics. Further, Balaga (2022) stated that attending urgent meetings or conferences frequently and making urgent non-teaching related reports in addition to teachers' teaching loads are found to be impediments to maximizing teaching in mathematics.

Unfortunately, the realities cited above have negatively affected the motivations of mathematics teachers (Reyes, 2022). As pointed out by Alcantara (2022), most teachers are less motivated in their work as mathematics teachers due to the abovementioned reasons. Further, Mollaneda et al. (2022) accented that teachers' teaching motivations decrease due to lack of support from DepEd,

lack of training and seminars about instructional planning and teaching pedagogies, lack of facilities and equipment intended for mathematics subjects, and low salary and fringe benefits. Furthermore, Castro (2022) pointed out that teachers are already doing clerical work, and the worst thing is that some teachers use their own money to buy supplies for their classrooms, which contributed significantly to the low motivation of teachers. In addition, Paña and Lim (2022) said they lost their teaching motivation due to many distractions.

Despite the literature cited above, limited studies focused on the influence of beliefs about teaching-learning and professional development on teachers' motivation to teach mathematics. In the review of related literature, a survey of teachers' beliefs is mentioned, but it should have focused on the beliefs of mathematics teachers. Further, as cited in the review, this belief is only focused on teachers' overall beliefs, which differs from the present study in which belief is classified according to transmissionist, facts first, and fixed instructional plan as indicators. The other gap that catches attention is in professional development, which is only taken as a whole. In the present study, this professional development is classified according to specialization, educational and cultural development, professional communication with shareholders, utilization of information and communication technologies, and keeping up to date with related media and publications, which are different from those that are cited in the review of related literature.

Likewise, the review of related literature focused on teachers' motivations, which include intrinsic and extrinsic motivations as indicators. However, the present study is centered on efficacy, interest, and efforts, which differ from those mentioned in the literature reviews. Other studies on teachers' motivations, as cited in the literature reviews, are centered on factors of motivations such as salaries and benefits, chances for continuing professional development, support from the school, collaboration with peers, participation in the implementation of school policy, and students' commitment to learning, which are different from the presented study. Further, some of the studies on teachers' motivations indicated in the literature review only used qualitative data, which needs to be more generalizable. Furthermore, the present study is more generalizable since it uses quantitative data from an appropriate number of respondents.

In this context, the researcher is interested in studying the influence of teachers' beliefs and professional development efforts on teachers' motivation in teaching mathematics. Hopefully, this study may discover enlightening facts

about the crucial roles of beliefs about mathematics teaching and learning and professional development efforts in improving mathematics teachers' motivation. This study is valuable to mathematics teachers and school heads. Hence, it will be presented and discussed during the School Learning Action Cells (SLAC) session so they can utilize this study's findings in their classes.

The researcher intends to disseminate the study's results on teacher motivation in School Learning Action Cell (SLAC) sessions and Cluster-based research seminars. These platforms provide opportunities for sharing research findings with educators and policymakers. Additionally, the researcher aims to present the study's findings at national and international research forums to reach a wider audience and foster discussions on teacher motivation. Furthermore, the researcher plans to publish the study's findings in print and online. Publishing the study in print allows distribution to libraries, educational institutions, and other relevant stakeholders. Simultaneously, publishing online ensures that the study's findings are accessible to a broader audience, including researchers, educators, and policymakers worldwide.

METHODS

Research Design

This study employed a quantitative descriptive-correlational approach to determine whether teacher's beliefs and professional development efforts predict teachers' motivation in teaching mathematics.

Research Locale

This study was conducted in Davao City, particularly in Cluster IV and V, at Toril proper. The study was conducted here because the population of secondary mathematics teachers in these clusters is more than enough to represent the entire population needed in this research.

Research Respondents

The study's respondents were the 124 secondary mathematics public school teachers of Davao City, determined using the complete enumeration sampling design. The respondents covered the following clusters: Cluster 4, with 13 secondary schools and 59 secondary math teachers, and Cluster 5, with nine schools and a total of secondary math teachers. This study focused exclusively on mathematics teachers as it aimed to gather specific information from them. Therefore, only teachers specializing in mathematics were included in the study.

Finally, teachers who were not mathematics majors were excluded from this research. The study aimed to gain insights related explicitly to mathematics, focusing on mathematics majors.

Research Instruments

Three questionnaires were used in the study. These are Beliefs of Teachers, Professional Development Efforts of Teachers, and Motivation of Teachers in Teaching Mathematics. The instruments were validated by a panel of experts and were subjected to pilot testing. The first instrument of the study focuses on the beliefs of teachers with (3) indicators, followed by the professional development efforts containing (5) indicators, and the last part is the motivation of teachers in teaching mathematics having (3) indicators. The instruments were validated by a panel of experts and were subjected to pilot testing for reliability. The computation of beliefs of teachers' reliability test using Cronbach alpha is 0.81, and for professional development efforts, it is 0.756. For teachers' motivation in teaching, mathematics is 0.796, meaning questionnaires have a high internal consistency. Thus, the whole test is reliable. The 5-point Likert Type was used.

Data Analysis

The statistical techniques used to total and analyze the information obtained from the questionnaires are the mean, standard deviation, person product-moment correlation, and multiple regression analysis.

Data Collection

During the data gathering, the researcher underwent the following steps: A letter from the Dean of the University of the Immaculate Conception (UIC) Graduate School granting permission to carry out the study. Upon approval of the permission letter, the researcher formally requested ethical clearance from the UIC Research Ethics Committee (REC) to administer the instruments to the study's target respondents. After asking permission from the Dean and after UIC REC released ethical clearance, the researcher formally submitted the letters and other necessary documents to the schools' division superintendent of Davao City, requesting official approval to conduct the research. On the other hand, the researcher personally sent a separate request letter to the principals of the participating schools. The letter included attachments such as the approved request letter from the Schools Division Superintendent (SDS) and an endorsement letter from the Dean of the UIC Graduate School. On the one hand,

the intended respondents were formally notified and provided an Informed Consent Form (ICF) about their participation in the study before the data-gathering process. Aside from that, the respondents were informed about the purpose of the study and the importance of their contribution to the research. It was emphasized that participation was voluntary, and data collection would be conducted through face-to-face interactions. The collected data were encoded, tabulated, and analyzed by the study's objectives.

RESULTS

Significance of the Relationship of Beliefs and Motivation of Teachers in Teaching Mathematics to Motivation of Teachers in Teaching Mathematics

Table 1

Significance of the Relationship of Beliefs and Motivation of Teachers in Teaching Mathematics to Motivation of Teachers in Teaching Mathematics

Independent Variables	Motivation of Teachers in Teaching Mathematics		
	r	p-value	Remarks
Beliefs of Teachers			
Transmissionist	0.567	<0.001	Significant
Facts First	0.525	<0.001	Significant
Fixed Instructional Plan	0.688	<0.001	Significant
Professional Development Efforts	.53	<0.001	Significant

Table 1 presents the significance of the relationship between the beliefs and motivation of teachers in teaching mathematics. It shows that the relationship between the transmissionist, facts first, and fixed instructional plan belief with the motivation of teachers in teaching mathematics is both significant and positive.

However, the results vary in strength since only the fixed instructional plan got an r-value of 0.688 with a p-value of 0.001, indicating a relatively strong positive correlation based on teachers' motivation to teach mathematics. Both transmissionist and facts first have a moderately positive correlation with teachers' motivation in teaching mathematics, as exhibited by their R-values of 0.57 and 0.525, respectively, and a p-value of 0.001. This result implies that as the transmissionist, facts first, and fixed instructional plan beliefs increase, the

motivation of teachers to teach mathematics also increases.

The study's findings conform with the study conducted by Kilic and Ozturk (2018), which focused on the relationship between mathematics teachers' beliefs and their motivation for teaching mathematics. The authors found a significant relationship between teachers' beliefs about transmissionist, facts first, and fixed instructional plan approaches to teaching mathematics and their motivation for teaching mathematics. Specifically, they found that teachers with more transmissionist beliefs were more motivated to teach mathematics. The study's results showed that teachers' beliefs about fact first, transmissionist, and fixed instructional plan approaches were positively related to their motivation for teaching mathematics. This suggests that teachers who hold more fixed instructional plan beliefs and transmissionist beliefs are more motivated to teach mathematics. (Kilic & Ozturk, 2018). Meanwhile, the study's results support the study conducted by Gürbüz and Bozkurt (2019), which revealed that teachers with positive beliefs and attitudes toward mathematics were more motivated to teach the subject.

Further, Table 1 also shows that professional development efforts have a moderately significant positive relationship with teachers' motivation to teach mathematics, as evidenced by the p-value of 0.000, less than 0.05, and an R-value of 0.53. The positive coefficient suggests that the study respondents who manifested a high level of professional development tend to show high motivation for teaching mathematics.

The study's results support the study conducted by Chen et al. (2018), which revealed that math teachers who participated in professional development programs focused on teaching strategies, technology integration, and student-centered learning reported increased motivation and self-efficacy in teaching math. Further, the study's findings validate the research conducted by Tzekaki et al. (2019), which found that math teachers who participated in professional development programs focused on inquiry-based learning reported increased confidence in teaching math and higher motivation. This suggests that ongoing professional development opportunities for mathematics teachers can motivate them to teach mathematics effectively.

In addition, the findings confirm the competence motivation theory that Adler (1971) developed, which posits that individuals have an innate drive to seek mastery and competence in their endeavors. According to this theory,

individuals are motivated when they perceive themselves as competent, capable, and thriving in a particular domain. Teachers with transmissionist beliefs may feel more confident and competent when they believe their instructional methods effectively transmit knowledge to students. They may find motivation in their ability to successfully convey information and facilitate student learning. Additionally, this theory believes that targeted professional development opportunities can enhance teachers' competencies, increasing motivation and effectiveness in teaching the subject. When teachers feel competent in mathematics instruction, they are more likely to be motivated, engage students effectively, and contribute to improved student learning outcomes in mathematics.

Significance of the Influence of Beliefs of Teachers and Professional Development Efforts on Motivation of Teachers in Teaching Mathematics

Table 2

Significance of the Influence of Beliefs of Teachers and Professional Development Efforts on Motivation of Teachers in Teaching Mathematics

Variables	Motivations of Teachers in Teaching Mathematics			Remarks
	β	t	p-value	
Beliefs of Teachers				
Transmissionist Belief	0.06	9.58	0.57	Not Significant
Facts First	0.11	0.57	0.20	Not Significant
Fixed Instructional Plan	0.44	1.28	<.001	Significant
Professional Development Efforts	.21	4.41	0.028	Significant
Holistic Model				
R ²	.521			
F-value	32.4			
P-value	<0.001			
Remarks	Significant			

**Significant at $p < 0.05$*

Table 2 displays the results of a linear regression analysis examining the combined impact of teachers' beliefs and professional development efforts on teachers' motivation in teaching mathematics.

When examining the individual factors, the results indicate that the

transmissionist belief, in isolation, did not significantly impact teachers' motivation to teach mathematics. The unstandardized beta coefficient associated with this belief was 0.06, with a corresponding p-value of 0.57. Similarly, the fact's first belief did not demonstrate a significant influence on teachers' motivation in the context of teaching mathematics. The beta coefficient for this belief was 0.11, and the associated p-value was 0.20.

In contrast, the fixed instructional plan belief significantly impacts teachers' motivation to teach mathematics. The beta coefficient for this belief was 0.44 and a t-value of 1.28, significant at a p-value less than 0.001. This suggests a statistically significant relationship or effect between the fixed instructional plan and teachers' motivation in teaching mathematics. In other words, the fixed instructional plan may significantly impact teacher motivation in teaching mathematics. Furthermore, professional development efforts significantly influence teachers' motivation to teach mathematics. The beta coefficient for this factor was 0.21, suggesting a small positive effect, a t-value of 4.41, and a p-value of 0.028, which was lower than the set significance level of 0.05. To summarize, among the examined beliefs, only the fixed instructional plan belief significantly influenced teachers' motivation to teach mathematics. Additionally, professional development efforts significantly motivated teachers to teach mathematics.

Significantly, when considering the combined influence of the independent variables, which include teachers' beliefs and professional development efforts, on teachers' motivation to teach mathematics, the analysis reveals a statistically significant relationship ($F = 32.4, p < 0.05$). This indicates that the combination of these factors has a meaningful impact on teachers' motivation. Furthermore, the holistic model demonstrates that the overall computed R-squared (r^2) value of 0.52 signifies that the combined influence of teachers' beliefs and professional development efforts accounts for 52 percent of the total variability in teachers' motivation to teach mathematics. In other words, this study reveals that these factors explain over half of the differences in teacher motivation observed in the study. The remaining 48 percent of the variability can be attributed to other factors not considered or included in this study. These findings suggest that while teachers' beliefs and professional development efforts play a significant role in shaping motivation to teach mathematics, additional factors beyond the scope of this research also contribute to teachers' motivation. It highlights the need for further exploration and investigation of other factors that may influence teachers' motivation in teaching mathematics.

Based on the multiple regression analysis results, it can be concluded that the belief in a fixed instructional plan significantly affects teachers' motivation to teach mathematics, as indicated by a beta value of 0.44 and a p-value of less than 0.001. Additionally, professional development efforts significantly influence teachers' motivation to teach mathematics, with a beta value of 0.21 and a p-value of 0.028, lower than the predetermined significance level of 0.05. Moreover, when considering the combined impact of teachers' beliefs and professional development efforts on teachers' motivation to teach mathematics, the results show a significant relationship, as evidenced by an F-value of 32.4 and a p-value below 0.05. These findings suggest that both the belief in a fixed instructional plan and engaging in professional development efforts are crucial in fostering motivation among mathematics teachers when it comes to teaching the subject

These results conform to the study of Darling-Hammond et al. (2018), stating that professional development activities, such as workshops, seminars, and training programs, can provide teachers with new knowledge, skills, and strategies to enhance their teaching practices. Professional development opportunities can improve teachers' confidence, competence, and motivation. Research suggests that teachers who actively participate in professional development activities report higher motivation and job satisfaction levels. This also supports the study of Cobb and Jackson (2011), stating that combining a fixed instructional plan and ongoing professional development can be particularly effective in promoting teachers' motivation. When teachers have a clear instructional framework and receive support and training to implement it effectively, they are more likely to feel motivated and successful in their teaching.

This supports the reinforcement theory developed by Skinner (1938). In mathematics education, when teachers have a clear instructional plan and receive support through professional development, they can develop a stronger sense of self-efficacy—the belief in their ability to teach mathematics effectively. This increased self-efficacy can boost their motivation by fostering a belief in their competence and capability. Additionally, professional development activities to improve instructional practices can enhance teachers' competence and knowledge. As teachers become more skilled in implementing effective teaching strategies and addressing students' needs, they are more likely to feel motivated by their competence and expertise. Furthermore, fixed instructional plans and

professional development efforts can help teachers connect their work to a larger purpose. When teachers have a clear plan and engage in professional development activities aligned with their goals, they can see the impact of their teaching on student learning. This sense of purpose and the understanding that their efforts make a difference can contribute to their motivation.

In a different context, for transmissionists and facts, the first belief with a weaker effect or influence on teachers' motivation implies that these indicators may not always predict teachers' motivation to teach. This result supports the study of Van de Walle (2018) has shown the importance of fostering conceptual understanding and promoting inquiry-based approaches in teaching mathematics. Teachers prioritizing conceptual understanding, problem-solving, and critical thinking may find greater intrinsic motivation in their teaching practice. Additionally, Boaler's (2018) research supports these findings by showing that lecture-based and memorization-focused teaching methods do not effectively promote deep learning or conceptual understanding in mathematics. Instead, inquiry-based teaching methods prioritizing problem-solving and collaboration were more effective in engaging students and promoting conceptual understanding.

Moreover, this supports the expectancy theory Vroom (1964) developed, suggesting that individuals are motivated to perform if they know their extra performance is recognized and rewarded. Whenever teachers strongly believe that presenting factual information and procedural knowledge as a foundation, as in facts first belief, will lead to improved student learning outcomes, they may have a higher expectancy that their efforts and performance will be successful in achieving their desired goal of student understanding and mastery of the subject. Further, teachers' motivation may also be influenced by their belief in the instrumentality of their teaching approach. Perceiving a direct link between their use of a "facts first" approach and the desired outcomes, such as improved student performance or test scores, they are more likely to be motivated to implement this instructional strategy.

CONCLUSION

The empirical findings significantly shaped the study's conclusions, revealing a positive association between teacher beliefs, professional development efforts, and teacher motivation in mathematics instruction. The study's results suggest that teachers emphasizing direct transmission of

information to students are likely to experience higher engagement and enthusiasm in teaching mathematics. Additionally, prioritizing the establishment of a solid factual knowledge foundation correlates with increased motivation among teachers. Furthermore, adherence to structured teaching plans is linked to heightened motivation during mathematics instruction. The implication extends to the positive impact of ongoing professional development opportunities, such as workshops and training programs, on bolstering teacher motivation in mathematics teaching.

The finding also supports the holistic model, indicating that teachers' beliefs and professional development efforts significantly contribute to teacher motivation in teaching mathematics. However, among the specific beliefs examined, only the belief in fixed instructional plans significantly influences teacher motivation. This implies that a comprehensive understanding of teachers' beliefs and engagement in professional development activities is crucial for fostering and enhancing teacher motivation in mathematics instruction.

Since the study found a significant relationship between the three categories of beliefs of teachers and motivation of teachers in teaching mathematics, and between professional development efforts and motivation of teachers in teaching mathematics, teachers may reflect on their beliefs by making journals or peer observation and feedback, participate in ongoing professional development, seek support and feedback, and engage in self-care practices to enhance their motivation and instructional practices in teaching mathematics. Doing so may improve their knowledge and skills in mathematics education, ultimately leading to better learning outcomes for their students.

After that, teachers' fixed instructional beliefs and professional development efforts predict their motivation to teach mathematics; the Department of Education- Division of Davao City may prioritize ongoing professional development programs and activities tailored to mathematics teaching. To uphold a fixed instructional plan belief among teachers, emphasize its benefits, offer targeted professional development, and model successful implementation. Share evidence, foster collaboration, and create feedback mechanisms. Encourage flexibility within the structure, provide resource support, and ensure strong leadership advocacy. Continuous evaluation and recognition of success contribute to a supportive environment, reinforcing commitment.

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