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Elementary School Teachers' Math Teaching Efficacy Beliefs and Job Motivation: A Correlational Study

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ABSTRACT

Objective: This correlational study investigates the relationship between elementary school teachers' mathematics teaching efficacy beliefs and their job motivation in Mashhad, Iran.

Methods: The research explores how teachers' confidence in their ability to teach mathematics effectively relates to their motivation to engage in their teaching profession. The participants in this study are 250 elementary school teachers from Mashhad. Data were collected through validated self-report questionnaires that assessed both mathematics teaching efficacy beliefs and job motivation. Statistical analyses, including correlation and regression, were utilized to analyze the data.

Results: The results provide insights into the potential influence of teachers' self-perceived effectiveness in teaching mathematics on their overall job motivation.

Conclusions: This study contributes to the understanding of the interplay between teachers' beliefs in their teaching abilities and their intrinsic motivation to excel in their profession, particularly in the context of mathematics education.

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Introduction

Mathematical skills are essential in various aspects of life and work, providing vital support to fundamental abilities across different academic subjects (Wedege, 2010). The use of interdisciplinary approaches and techniques allows for the practical application and transfer of mathematical skills across a wide range of fields (English & Gainsburg, 2015). A cross-disciplinary philosophy challenges the conventional separation of subjects dictated by the curriculum, contending that this approach better aligns with the developmental traits of children. It does so by creating educational plans that integrate distinct disciplines, align learning objectives, themes, topics, and assessments across academic subjects (Arseven, 2015).

National standards and international assessments guide the teaching of mathematics, identifying mathematical concepts and procedures that offer transferable skills and play a crucial role in building knowledge that spans various disciplines. For instance, problem-solving is a critical skill required in diverse real-life and professional scenarios, necessitating proficiency in mathematics (Haylock & Thangata, 2007). Sellar and Lingard (2014) identifies a deficiency in mathematical problem-solving skills as a significant concern .In the context of elementary education, mathematics significantly contributes to a child's development of mathematical thinking and the emergence of mathematical literacy, with practical applications both in and outside of the school environment (Lehrl et al., 2016).

When it comes to factors influencing students' mathematical learning and outcomes, as well as the integration of technology for achieving higher-level learning results, teachers' pedagogical beliefs play a pivotal role. These beliefs impact instructional methods (Lehrl et al., 2016). Pedagogical beliefs encompass culturally-influenced values and attitudes which evolve over years of education, shaping one's understanding of instruction, learning, and self-perception. Beliefs have a stronger predictive power over human behavior than the consequences of actions (Bandura & Hall, 2018) and significantly influence teachers' professional values, which, in turn, steer their actions (Silverman, 2023). Beliefs encompass one's estimates regarding the likelihood of the accuracy of acquired knowledge or the occurrence of specific events or circumstances related to a subject (Restrepo et al., 2018). These beliefs are rooted in personal experiences and knowledge and

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interact with other cognitive aspects like attitudes, opinions, and judgments (Wyer & Albarracin, 2005).

Teacher efficacy is a topic of global interest among researchers, and a growing body of work explores the beliefs in the effectiveness of both preservice and in-service educators at all educational levels, ranging from early childhood to tertiary education (Wray et al., 2022). The increasing momentum behind this research is driven by the belief that efficacy beliefs play a pivotal role in guiding how teachers apply their professional knowledge in classroom settings, thereby significantly impacting the experiences and achievements of students.

Research has demonstrated that teachers with high levels of self-efficacy in mathematics instruction tend to employ more inclusive teaching methods characterized by adaptable objectives, versatile teaching approaches, and diverse assessment practices that enhance students' understanding of mathematical concepts (Swars et al., 2009). Gaining a deeper understanding of the factors associated with teachers' self-efficacy beliefs is of both theoretical and practical significance (Tschannen-Moran & Johnson, 2011).

According to Bandura, self-efficacy beliefs are most amenable to change during their initial development, and research suggests that teacher preparation programs have the potential to influence teachers' efficacy beliefs (Tschannen-Moran & Johnson, 2011). It is well established that teacher efficacy is specific to the subject matter, meaning that a teacher may have strong efficacy beliefs in one subject area while possessing weaker beliefs in others (Bandura et al., 2001). This has particular relevance for primary school teachers, who are typically expected to teach a broad curriculum to students of various age groups, ranging from 4 to 13 years old, often without specialized qualifications in specific subjects such as mathematics.

Additionally, research consistently shows that lower mathematics teaching efficacy beliefs are associated with more negative attitudes and anxieties among teachers when it comes to mathematics (Gresham, 2008). This negativity can have a detrimental effect on teaching practices, resulting in more time spent on repetitive, procedural tasks and less emphasis on problem-solving techniques and strategies (Briley, 2012). In contrast, Thomson et al. (2017) found that preservice teachers with higher mathematics teaching efficacy beliefs tend to incorporate more cognitively

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demanding tasks, encourage extended student explanations, foster student-to-student discourse, and establish explicit connections between different representations in their lessons.

Motivation in the workplace is widely recognized as a critical driver of organizational success, as it propels employees to perform effectively. The achievement of an organization's goals heavily relies on the performance of its workforce (Ganta, 2014). In contrast, even skillful employees may underperform if they lack adequate motivation (Deci & Ryan, 2014). Employers, therefore, seek not merely the presence of their employees at work but their complete dedication and enthusiasm. Work motivation remains a fundamental aspect of organizational psychology, shedding light on the reasons behind individual behavior within the workplace (Ronen & Mikulincer, 2014). Consequently, research into the factors that stimulate work motivation contributes to the theoretical foundation for understanding the origins of individual behavior and the practical social conditions that optimize performance and well-being .

For several decades, researchers have explored the intricacies of work-related behavior. At the heart of this inquiry lies the concept of motivation, which elucidates the underlying reasons for individuals' actions. Fundamental psychological needs play a crucial role in explaining variations in work motivation. These needs are akin to innate psychological nutrients and represent inner resources in individuals. They hold significant relevance for an individual's conduct and carry explicit implications for work performance. The satisfaction derived from addressing these diverse needs acts as a potent driver of individual functioning. Beyond individual-level factors, the social environment also influences work motivation. Social interactions and exchanges among individuals emphasize the importance of studying work motivation while considering contextual elements (Tokarz & Malinowska, 2019).

Tschannen-Moran and Hoy (2001) explored the concept of teacher self-efficacy and its relationship with teacher motivation and job satisfaction. While it doesn't directly address job motivation, it provides insights into the broader topic of teacher efficacy. In another study, Caprara et al. (2006) examined the relationship between teachers' self-efficacy, job satisfaction, and students' academic achievement. Job satisfaction is closely related to job motivation, and this study may shed light on the topic.

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Elementary school teachers play a pivotal role in shaping students' mathematical learning experiences. Their effectiveness in teaching mathematics is influenced by their self-efficacy beliefs in math instruction. Teacher efficacy is not only crucial for student outcomes but can also impact teacher job motivation and job satisfaction. However, there is a need to better understand the relationship between elementary school teachers' math teaching efficacy beliefs and their job motivation. This correlational study aims to explore the nature and strength of the correlation between these two factors to provide valuable insights into how teachers' beliefs in their math teaching abilities may affect their motivation within the context of elementary education.

Materials and Methods

The present study was a descriptive correlation study. The sample will consist of 250 elementary school teachers from Mashhad, Iran. Inclusion criteria may involve elementary school teachers actively teaching mathematics, with varying levels of experience and backgrounds. Two questionnaires were used to collect data:

Math Teaching Efficacy Beliefs Questionnaire: To assess the mathematics teaching efficacy beliefs of the teachers, we utilized the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) developed by Enochs et al. (2000). We chose the MTEBI as the instrument that most closely aligns with the objectives of our mathematics modules. The MTEBI comprises 13 items that gauge respondents' personal mathematics teaching efficacy (PMTE) (e.g., "I know how to teach mathematics concepts effectively") and eight items measuring mathematics teaching outcome expectancy (MTOE) (e.g., "The inadequacy of a learner's mathematics background can be overcome by good teaching"). Each item in the instrument offers five response categories, ranging from "Strongly Agree" to "Strongly Disagree." The MTEBI includes negatively worded questions, and we followed the MTEBI implementation guidelines by reversing the scores for these items. Consequently, for all items, a score of 5 indicates a strong level of PMTE/MTOE, while a score of 1 indicates a lower level of PMTE/MTOE. The final score derived from the MTEBI for each participant is the arithmetic mean of the relevant responses, falling within the range of 1 to 5. The MTEBI is a well-established instrument developed and validated by Enochs et al. (2000), and translated versions of the instrument have been employed in various international contexts (e.g., Chang, 2010). The reliability of this scale was satisfactory (Cronbach's $\alpha = 0.82$ for

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PMTE; Cronbach's $\alpha = 0.78$ for MTOE), with values exceeding 0.70, which is considered acceptable.

Job Motivation Questionnaire: Motivation at Work Scale (MAWS) is a 12-item measure of four key domains of motivation at work: external regulation, introjection, identification, and intrinsic motivation. This questionnaire measure teachers' job motivation, job satisfaction, and related factors. Items should encompass aspects such as intrinsic and extrinsic motivation, satisfaction with the teaching profession, and career aspirations. This scale is a well-established instrument in various studies. In the present work the reliability of it was calculated as 0.87

Using a random sampling technique, 250 elementary school teachers from Mashhad, Iran, were selected. Teachers were informed about the confidentiality of their responses and their right to withdraw from the study at any point.

The collected data was analyzed using statistical software (SPSS). Descriptive statistics was used to summarize demographic information and the mean scores of math teaching efficacy beliefs and job motivation. A correlational analysis, such as Pearson's correlation coefficient, was employed to examine the relationship between math teaching efficacy beliefs and job motivation.

Results

In table (1), the mean score for mathematics teaching efficacy beliefs and job motivation were provided and in the table 2, correlation coefficients matrix among research variables were presented.

Table 1. Descriptive findings of the research variables

Variables	Mean	SD
External regulation	12.54	2.31
Introjection	11.54	2.05
Identification	9.89	2.54
Intrinsic motivation	10.52	1.87
Job motivation	32.57	4.31
PMTE	41.25	5.11
MTOE	31.21	4.58
Mathematics teaching efficacy	65.81	5.84

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Table 2. Correlation coefficients matrix of research variables

Variable	1	2	3	4	5	6	7
1. External regulation	1						
2. Introjection	0.51**	1					
3. Identification	0.43**	0.58**	1				
4. Intrinsic motivation	0.54**	0.72**	0.67**	1			
5. Job motivation	0.66**	0.68**	0.53**	0.78**	1		
6. PMTE	0.48**	0.63**	0.54**	0.64**	0.62**	1	
7. MTOE	0.59**	0.59**	0.57**	0.55**	0.56**	0.57**	1
8. Mathematics teaching efficacy	0.53**	0.55**	0.57**	0.51**	0.56**	0.58**	0.60**

** $p < 0.01$

The results presented in Table (2) indicate the relationships between job motivation, its various components, mathematics teaching efficacy, and its different aspects. In this analysis, the focus is on correlation coefficients, which are numerical values that describe the strength and direction of the associations between these variables. All calculated correlation coefficients are significant and positive that means that as job motivation increases, mathematics teaching efficacy also tends to increase. In other words, there is a positive relationship between a teacher's motivation and their effectiveness in teaching mathematics. Overall, these results suggest that higher job motivation among teachers is associated with higher mathematics teaching efficacy, which implies that motivated teachers tend to be more effective in teaching mathematics. This information can be valuable for understanding the factors that influence teaching effectiveness and may have implications for educational policy and professional development in the field of mathematics education.

Discussion

The results of the current research, which aimed to explore the link between elementary school teachers' mathematics teaching efficacy beliefs and their job motivation in Mashhad, offer valuable insights into the dynamics of teaching effectiveness and the role of motivation in this context. The significant and positive relationships uncovered between job motivation and mathematics teaching efficacy beliefs are consistent with previous studies in the field of education. Motivated teachers are more likely to be engaged in their work, put in extra effort, and persist in the face of challenges (Ingersoll, 2001). This intrinsic motivation positively affects their teaching practices and student outcomes. In the context of mathematics teaching efficacy, a motivated teacher may be more

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inclined to adapt to innovative teaching methods, invest in professional development, and effectively address the diverse needs of their students (Tschannen-Moran & Hoy, 2001). This commitment and enthusiasm can translate into enhanced teaching effectiveness.

Moreover, when examining the components of job motivation and mathematics teaching efficacy, it is crucial to consider the multifaceted nature of these constructs. Job motivation can encompass factors such as intrinsic motivation, job satisfaction, and career development, while mathematics teaching efficacy beliefs consist of self-efficacy in teaching mathematics, outcome expectancy, and personal teaching efficacy (Skaalvik & Skaalvik, 2010; Wray et al., 2022).

The positive correlations found in this study suggest that increasing job motivation, whether through offering opportunities for professional growth, recognizing teachers' achievements, or fostering a supportive work environment, can potentially enhance teachers' mathematics teaching efficacy. Additionally, the link between motivation and self-efficacy is well-founded in self-determination theory (Deci & Ryan, 2012), which posits that individuals who feel autonomous and competent in their tasks tend to be more motivated and, consequently, more effective in their work.

In conclusion, the findings of this research underscore the importance of considering job motivation as a crucial determinant of mathematics teaching efficacy among elementary school teachers in Mashhad. Investing in strategies to boost teacher motivation, both intrinsically and extrinsically, may yield positive outcomes for mathematics education in this context. Policymakers and educational leaders can draw from these results to design interventions and policies that support and empower teachers, ultimately fostering a more effective and engaging learning environment for students.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of Islamic Azad University.

Author contributions

MH and SMM contributed to the study conception and design, material preparation, data collection and analysis. The author contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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