Journal on Mathematics Education
Volume 14, No. 1, 2023, pp. 1-18

An empirical study of factors influencing primary school teachers' long-term commitment to Realistic Mathematics Education

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Received: 14 November 2022 | Revised: 20 January 2023 | Accepted: 22 January 2023 | Published Online: 25 January 2023

Abstract

Realistic Mathematics Education (RME) is a re-emerging teaching and learning pedagogy approach that has gained a lot of momentum since 2016. Prior publications concentrated mostly on curriculum design and student achievement, while little attention was devoted to understanding teachers' perceptions toward RME. Thus, the purpose of this study was to investigate the effects of factors that influence teachers' perceptions to adopt RME in the long term. Ten hypotheses were proposed and tested employing the Generalized Structured Component Analysis (GSCA) technique. 226 primary school teachers from various regions were recruited to answer the questionnaires via Google Form. The experimental results validated six out of ten expected relationships between the factors in the extended self-determination theory model. That is, perceived competence affected confirmation, confirmation influenced both intrinsic motivation and satisfaction, intrinsic motivation influenced satisfaction, and satisfaction and parental involvement both were considered reliable predictors of realistic math education continuance intention. The remaining hypotheses were not validated, that is, autonomy, relatedness and competence were not found significant on intrinsic motivation, and intrinsic motivation did not influence RME continuance intention. Overall, the model explains 57.9% the amount of variance in the data. Administrators and policymakers are recommended to intervene on validated relationships to increase teachers' retention and long-term commitment to RME, whereas unsupported assumptions must be reexamined in the future.

Keywords: Confirmation, Parental Involvement, Realistic Mathematics Education, Satisfaction, Self-Determination Theory

How to Cite: Nguyen, G. T. C., & Pham, C. T. H. (2023). An empirical study of factors influencing primary school teachers' long-term commitment to Realistic Mathematics Education. *Journal on Mathematics Education, 14*(1), 1-18. http://doi.org/10.22342/jme.v14i1.pp1-18

Realistic Mathematics Education (RME) is an emerging teaching and learning pedagogy approach that has gained a lot of momentum lately, especially since 2016 (Phan et al., 2022). Given the growing significance of mathematics and its applicability to modern life and the economy, several nations revamped their approaches to mathematics education (Kilpatrick, 2012; Robitaille & Travers, 2003; Van den Heuvel-Panhuizen, 2010), and RME was the outcome of the "New Math" reform. In contrast to traditional mathematics teaching and learning, which focused on theories and textbooks—a pedagogy approach that caused anxiety in students and isolated the learning experience from reality (Treffers, 1993), the goal of RME is to transform mathematics learning into an enjoyable and relevant experience for learners by presenting problems in real-world settings (Van den Heuvel-Panhuizen & Drijvers, 2020). The teacher then acts as a facilitator, guiding students toward potential answers to issues they have identified in their respective situations (Wubbels et al., 1997) rather than instructing procedures step by

step (Van den Heuvel-Panhuizen & Drijvers, 2020). Through activities in RME, students strengthen their problem-solving, critical thinking, and analytic skills – which are vital competencies to thrive in the 21st century.

With the growing interest in the new pedagogy approach, researchers have started adopting RME in various math topics, including geometry (Alim et al., 2020; Apsari et al., 2020), algebra (Duyen & Loc, 2022; Kusumaningsih & Herman, 2018), number and operations (Rianasari et al., 2012; Shanty, 2016) or curriculum development (Chairil Hikayat et al., 2020; Van Zanten & Van den Heuvel-Panhuizen, 2021). A recent literature review conducted by Prahmana et al. (2020) reported that most of the prior publications focused on adopting RME in teaching number and operations and that design research (or curriculum development) was the primary research method employed in the great majority of previous studies. On the other hand, causal-comparative research was only utilized in a few research (0.9%). One potential reason for these results is that RME was predominantly used in primary schools, where numbers and operations were emphasized until grade 5 (Van de Walle et al., 2016). This implies that little research was conducted to determine the causal relationships between the variables leading to the success of RME. We verified the findings of Prahmana et al. (2020) again by visualizing the topics around RME.

Figure 1 highlights keywords extracted from 132 peer-reviewed publications from Scopus database with the searching keyword “realistic math* education”. It can be seen that from 2010 to 2014, most research was focused on research design. On the other hand, studies from 2018 to 2022 were attributed to a learning model to foster “thinking” ability.

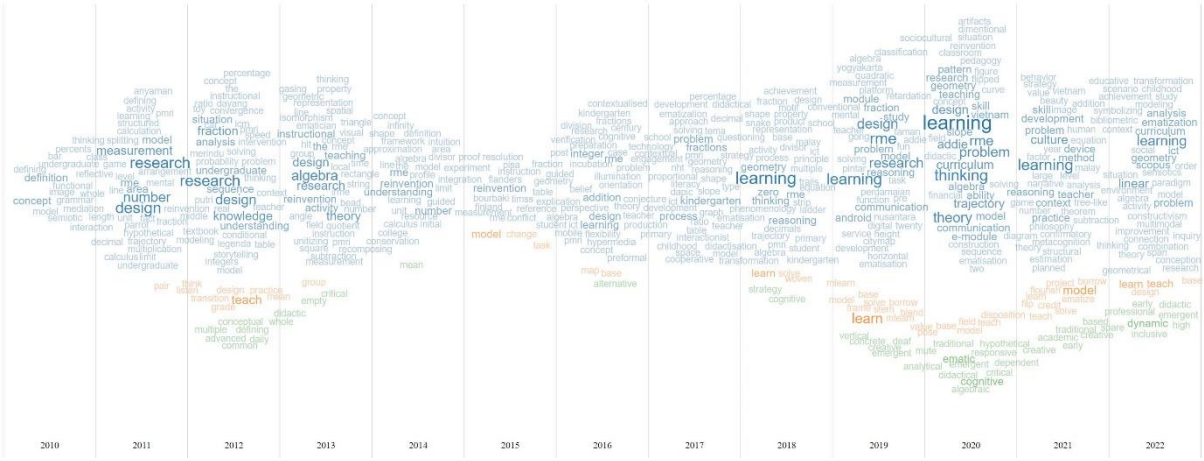

Figure 1. Evolution of topics around realistic math education since 2010

Since the success of teaching and learning mathematics depends not only on the pedagogical approach, curriculum design but also on the willingness of teachers to transform their pedagogical approach in motivating students in the long run (Fredriksen, 2021; Khairunnisak et al., 2022), scholars have begun assessing teachers’ perceptions from multiple perspectives (e.g., attitude, knowledge, belief, experience, gender, competence) in an effort to bring math experience to students (Adulyasas, 2017; Khairunnisak et al., 2022; Mariana et al., 2021; Rifandi et al., 2021; Van der Sandt, 2007). Therefore, it is plausible to assume that teachers' reluctance to continue utilizing the RME strategy after the first acceptance stage may contribute to students' lack of motivation and, consequently, to unsatisfactory mathematics achievement. Nonetheless, this research approach was exceedingly uncommon in RME Do et al. (2021). To the best of our knowledge, only one effort conducted by Prahmana et al. (2020) has

been made on this particular topic so far. This scarcity of resources could be partially explained in the report of Prahmana et al. (2020) where most prior publications were design research, descriptive research, and pre-and post-experiments.

Given the paucity of cause-and-effect relationship investigation on RME from teachers' perspective (Prahmana et al., 2020), the purpose of this study was to better understand the factors that influenced teachers' intention to continue adopting RME in their teaching style. In another word, this research attempted to evaluate a conceptual framework that integrated external factors and self-determination theory variables that affect the utilization of RME. The findings of this study were expected to provide educational policymakers with indications on how to enhance the mathematics learning experience for students through the lens of teachers.

METHODS

Conceptual Model and Hypothesis Development

There are several theoretical models that seek to explain human behavior in responding to a phenomenon. For example, Theory of Reasoned Action (Fishbein & Ajzen, 1977)- seeks to clarify the interaction of actions and attitudes in human behavior; Theory of Planned Behavior (Ajzen, 1991) - was developed in response to the Theory of Reasoned Action's constraint that human action is totally controlled by reason; Stimulus Response Theory (Mehrabian & Russell, 1974) - tries to explain that people's behaviors were affected by their knowledge; Self-Determination Theory (Ryan & Deci, 2000)- seeks to explain human tendency through the satisfying of fundamental psychological demands for autonomy, competence, and relatedness. Self-Determination Theory (Adams et al., 2017; Ryan & Deci, 2000) posits that human beings have three fundamental psychological needs including *autonomy* – the desire to control one's experience and behavior, *competence* – the ability to complete tasks and gain experience, and *relatedness* – the sense of belonging with the surrounding environment. It is hypothesized that if these requirements are met, the individual will be more motivated by internal factors and have higher expectations for positive outcomes, both of which will influence whether the behavior is maintained and whether it can be internalized into the person's psychological state of self-discipline. In addition, it is anticipated that teachers' levels of competence will also have an effect on their level of confirmation (Sørebø et al., 2009). This is owing to the belief that RME competence will make teachers more efficient in their implementation of RME techniques, which will, in turn, lead to an increase in their level of confirmation (Sørebø et al., 2009). Grounded in this theory, many researchers have adopted SDT in their studies to foster teaching and learning (Kalenda & Kočvarová, 2022; Razali et al., 2020; Wang et al., 2022). Based on the SDT and literature review, the following hypotheses were proposed in this study:

Hypothesis 1 (H1). Perceived Autonomy had a positive effect on Teachers' Intrinsic Motivation on utilizing RME approach in primary schools.
Hypothesis 2 (H2). Perceived Competence positively affected Teachers' Confirmation on utilizing RME approach in primary schools
Hypothesis 3 (H3). Perceived Competence had a positive effect on Teachers' Intrinsic Motivation on utilizing RME approach in primary schools
Hypothesis 4 (H4). Perceived Relatedness positively influenced Teachers' Intrinsic Motivation on utilizing RME approach in primary schools

Sørebø et al. (2009) asserted that Teachers' Confirmation influenced their level of motivation, and their experimental results validated this hypothesis. The underlying assertion behind this assumption was attributed to the belief of cognitive dissonance theory which explained why verified (perhaps disproven) initial assumptions may impact users' motivation. In the context of this research, it was expected that when teachers were confirmed to adopt RME, they would be motivated to do RME related tasks. As such, the following hypothesis was proposed.

Hypothesis 5 (H5). Teachers' Confirmation positively affected their Intrinsic Motivation on utilizing RME approach in primary schools.

Bhattacherjee (2001) asserted that confirmation had a positive effect on satisfaction, since confirmation would suggest the achievement of anticipated outcomes. Meanwhile, disconfirmation (underwhelming performance as compared to expectations) indicates unfulfilled expectations (Bhattacherjee, 2001). The effect of confirmation on satisfaction has been validated in several school-related continuance studies (Sørebø et al., 2009; Suriazdin et al., 2022; Zhang et al., 2020). Thus, the following assumption was proposed.

Hypothesis 6 (H6). Teachers' Confirmation positively affected their Satisfaction on utilizing RME approach in primary schools

Gagné and Deci (2005) characterized intrinsic motivation as the performance of entertaining an activity without any reason of doing it. From this perspective, this study posited that when teachers enjoyed utilizing RME approach, they were more likely to be more satisfied with the method they used. The positive effect of intrinsic motivation on satisfaction has been confirmed in several prior studies (Ryan & Deci, 2000; Sørebø et al., 2009; Tang et al., 2020). In addition, the present study assumed that RME would be widely adopted in the long term by teachers who have a genuine interest in the approach, who like the process of using this strategy to enhance their students' math learning experience. The role of intrinsic motivation on continuance has been verified in many comparable research (Oliveira et al., 2021; Sørebø et al., 2009). Accordingly, the following hypotheses were proposed.

Hypothesis 7 (H7). Teachers' Intrinsic Motivation had a positive effect on their Satisfaction in primary schools

Hypothesis 8 (H8). Teachers' Intrinsic Motivation positively affected their Intention to continued adopt RME approach in primary schools

Bhattacherjee (2001) hypothesized that continuance intention was influenced by satisfaction and this assumption has been validated in much prior research (Daneji et al., 2019; Lu et al., 2019). In the context of this study, when teachers were satisfied with RME approach, they would continue to adopt this methodology in the future. Thus, the following hypothesis was proposed.

Hypothesis 9 (H9). Teachers' Satisfaction positively influenced their Intention to continued adopt RME approach in primary schools

Literature work has shown a strong relationship between parental involvement and teachers'

readiness (Nguyen et al., 2022; Sumanasekera et al., 2021). This is owning to the fact that when children are being at home, their parents will take the role of teachers. As such, the communication between parents and school teachers should be opened for updating teaching methods and learning materials (Carmichael & MacDonald, 2016). Accordingly, the following hypothesis was proposed.

Hypothesis 10 (H10). Parental Involvement positively affected Teachers continued adopt RME approach in primary schools.

Figure 2 depicts the proposed conceptual model based on the hypotheses. Each factor is represented by an ellipse, and the prediction is denoted by an arrow.

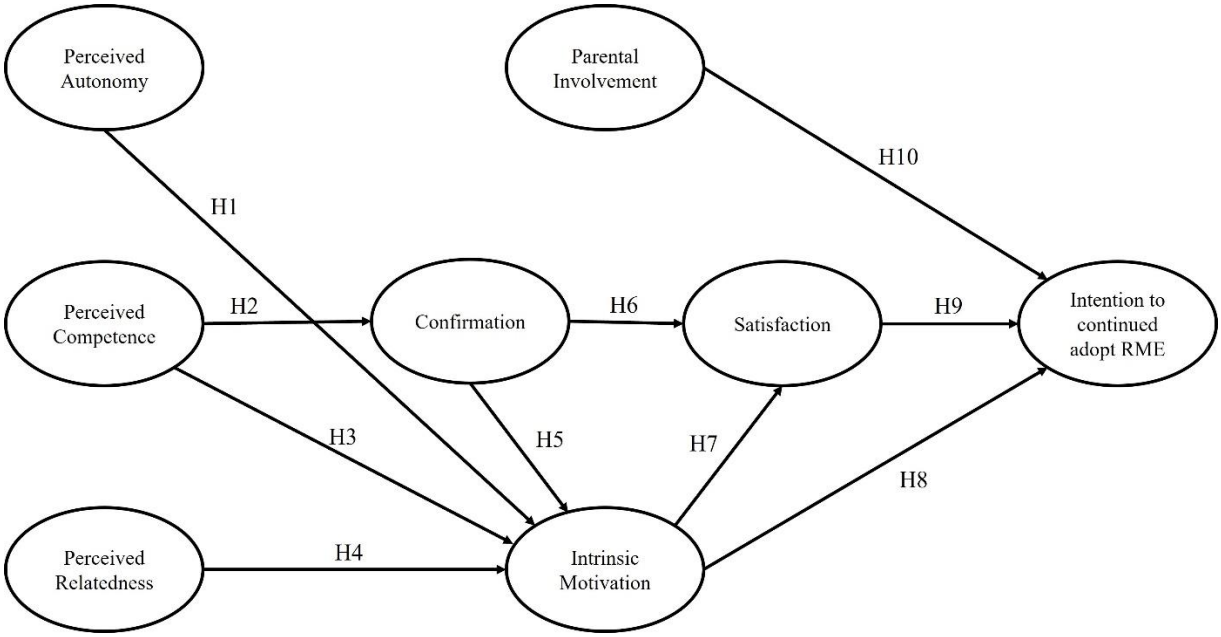

Figure 2. The proposed conceptual model: extended Self-Determination Theory with external factors

Participants and Data Gathering Tools

The study's target population consists of elementary school math teachers. This research used the approach of purposive, non-random sampling to recruit participants from the accessible population. In this respect, an online survey (namely, a Google Form) was used to administer and gather data. Before the actual survey was administered, participants were told of the goal of the study, the sort of data that would be gathered, how the data would be kept and disseminated, and their opportunity to opt out at any time. The study was conducted in one month, between October and November of 2022. The questionnaire consists of two sections: the first segment comprises five demographic profiles of the respondents, and the second section consists of 24 Likert-scale questions regarding the respondents' assessments of their degree of motivation-related variables with respect to RME. Using listwise deletion, if a single question was not answered, the entire instance was omitted. Before administering the questionnaires to respondents, two RME advisors examined the questions for reliability and face validity.

There was no disclosure of identifiable personal information in this research, hence, no ethical approval was needed.

Measures

In this research, participants' levels of agreement with each statement were measured using a five-point Likert scale. In this case, a score of 1 indicates that individuals strongly disagree with the statement, while a score of 5 indicates that respondents strongly agree (1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, and 5: Strongly Agree). The instruments were employed from previous studies (Nguyen et al., 2022; Sørebø et al., 2009) and justified to fit with the current study context.

Data Analysis Plan

Figure 2 revealed that there are intricate interactions among components, including direct and indirect effects. Conventional multivariate data analysis techniques had limitations because they could not simultaneously solve the equations (Kline, 2015). In this respect, Structural Equation Modeling (SEM) is the preferred approach adopted in this research, since it overcomes the conventional techniques (Kline, 2015). Covariance-Based SEM (CB-SEM) and Partial Least Squares SEM (PLS-SEM) are the two most common SEM methodologies used by researchers. While the former is frequently used to validate theories, which necessitates a large sample size and a normal distribution, the latter is frequently used to develop theories and make predictions in model estimations, which relaxes the assumption of a normal distribution. Since the present study adopted non-probability and purposive sampling approach, the normal distribution is not warranted. Thus, the PLS-SEM methodology was chosen for the study's design. Generalized Structured Component Analysis (GSCA) was selected from the many techniques available for PLS-SEM (Hair et al., 2019) due to its adaptability to work with even small samples. GSCA (Hwang & Takane, 2014) has been implemented in numerous domains (Jung et al., 2020; Nguyen et al., 2022; Purwanto et al., 2021). GSCA Pro 1.1 (Hwang et al., 2022) was used to perform the experiment.

RESULTS AND DISCUSSION

Descriptive Analysis

Overall, 448 responses were obtained from the survey. Through the data cleaning process, 22 items were removed due to incomplete responses, 8 items were excluded due to duplications, 192 items were removed due to inappropriate response behaviors (no variance in the answers). In the end, only 226 items were eligible for analysis (see Table 1). This number meets the minimum sample size for data analysis (that is 200 observations recommended by Soper (2022)) with respect to the conceptual model. Males account for 21.24% of the sample, while females account for 78.76%. More than half of respondents are between the ages of 26 and 45 (52.22%), a significant proportion of samples (41.58%) are above the age of 45, and the remaining respondents are between the ages of 18 and 25 (6.2%). In terms of level of education, most respondents (51.77%) graduated from vocational schools, followed by the undergraduate level (33.18%), a small portion of participants graduated from high school and obtained a teaching certificate (12.40%), and only a small percentage of teachers (2.28%) held a master's degree. In terms of living area, more than half of teachers reside in urban or rural regions (56.2%), followed by district (23.89%) and province/city (19.91%).

Table 1. Participants' profiles included in the data analysis

Variable	Item	Frequency	Percentage
Gender	Male	48	21.24
	Female	178	78.76
Age	18-25	14	6.20
	26-35	35	15.48
	36-45	83	36.74
	Over 45	94	41.58
Education Level	Vocational schools	117	51.77
	Undergraduate	75	33.18
	Certifications	28	12.40
	Master's degree	6	2.28
Demographic	Rural area	127	56.20
	District	54	23.89
	Province/City	45	19.91
Total		**226**	**100**

Quantitative Analysis

Table 2 displays descriptive data, including mean and standard deviation, for the variables. All means here are above the median (2.5) on the 5-point Likert scale, while standard deviations ranged from 0.628 to 1.075.

Table 2. Construct, Indicators, Mean and Standard Deviations

Construct	Indicators	Mean	Standard Deviation
Perceived Autonomy	PA1	4.367	0.756
	PA2	4.274	0.877
	PA3	4.588	0.628
Perceived Competence	PC1	4.372	0.708
	PC2	4.137	0.835
	PC3	4.301	0.788
Perceived Relatedness	PR1	4.442	0.646
	PR2	4.080	0.779

	PR3	4.088	0.806
Confirmation	CF1	4.071	0.757
	CF2	3.960	0.774
	CF3	4.155	0.723
Intrinsic Motivation	IM1	4.155	0.771
	IM2	4.177	0.774
	IM3	4.204	0.726
Satisfaction	SF1	4.102	0.796
	SF2	3.996	0.830
	SF3	3.978	0.808
Parental Involvement	PI1	3.659	1.013
	PI2	3.947	0.781
	PI3	3.907	0.921
Intention to Continued Adopt RME	ICA1	3.535	1.020
	ICA2	3.602	1.075
	ICA3	4.084	0.741

The measurements for each factor's convergent validity and internal consistency were shown in Table 3. This research employed Dillon–Goldstein's rho (RHO) to evaluate the internal consistency and validity of each concept. As shown in the experiments, all RHOs had values more than 0.7, making them reliable in excess of the recommended threshold (Hwang & Takane, 2014). Convergence levels may be calculated in a number of ways, one of which is the Average Variance Extracted (AVE). Hair Jr et al. (2021) recommended that a value of AVE >= 0.5 implies that the latent variable would explain more than half of the variance of its observable variables, and that the scale has strong convergence. The results of the experiments showed that all AVE's values were more than 0.5, which is indicative of convergent validity.

Table 3. Construct quality measures

Construct	Item	Rho	AVE
Autonomy	3	0.897	0.767
Competence	3	0.725	0.833
Relatedness	3	0.78	0.802
Confirmation	3	0.711	0.756
Motivation	3	0.7	0.818
Satisfaction	3	0.783	0.808

Parental Involvement	3	0.769	0.798
Continued RME adoption	3	0.786	0.807

Table 4 displays the GSCA-provided experimental data, which include FIT, Adjusted FIT (or AFIT), standard error, and lower- and upper-bounds of the 95% bootstrap confident interval. If there is not a zero value between the lower and upper bounds, then the parameter estimate is statistically significant (Hwang & Takane, 2014). Table 4 shows FIT value which measures how much variation can be explained by a given model specification. The model in this experimental setup explains 57.9% of the observed variation (SE = 0.039, 95% CIs = 0.562 - 0.589). AFIT is comparable to FIT, but it accounts for the complexity of the model. The model with the greatest AFIT score, AFIT = 0.574 (SE = 0.032, 95 % CIs = 0.558 - 0.567), may be chosen above the others. Similarity between the sample covariance and the covariance is then represented by the goodness-of-fit index (GFI) and the standardized root mean square residual (SRMR) as an additional measure of overall model fit. Scores close to 1 on the GFI and SRMR values close to 0 are indicative of a good fit. The SRMR value was nearly zero (0.077, SE = 0.002, CIs = 0.069 - 0.082), while the GFI value was close to one (GFI = 0.944, SE = 0.008, CIs = 0.932 - 0.965).

Table 4. Model FIT

	Estimate	**Std. Error**	**95%CI_LB**	**95%CI_UB**
FIT	0.579	0.039	0.562	0.589
Adjusted FIT (AFIT)	0.574	0.032	0.558	0.567
GFI	0.944	0.008	0.942	0.955
SRMR	0.077	0.002	0.069	0.082

The experimental results from Table 5 indicated that Perceived Competence positively affected Teachers' Confirmation on utilizing RME approach in primary schools (H2 = 0.525*, SE = 0.049, 95% CIs = 0.425 – 0.609). In turn, Teachers' confirmation positively affected their Intrinsic Motivation (H5 = 0.548*, SE = 0.081, 95% CIs = 0.369 - 0.716) as well as Satisfaction on utilizing RME approach in primary schools (H6 = 0. 218*, SE = 0.081, 95% CIs = 0.016 – 0.327). Furthermore, Teachers' Intrinsic Motivation had a positive and statistically significant impact on their Satisfaction (H7 = 0.477*, SE = 0.083, 95% CIs = 0.345 – 0.673) and Teachers' Satisfaction was verified as a positive predictor of their Intention to continued adopt RME approach in primary schools (H9 = 0.204*, SE = 0.096, 95% CIs = 0.01 – 0.408). Finally, Parental Involvement had a positive and statistically significant impact on Teachers continued adopt RME approach in the long run (H10 = 0.503*, SE = 0.074, 95% CIs = 0.329 – 0.647).

The inclusion of zero between the CIs led to the rejection of four hypotheses. In this regard, Perceived Autonomy was not clear to influence Teachers' Intrinsic Motivation (H1 = 0.125, SE = 0.102, 95% CIs = -0.028 – 0.367). Similarly, Perceived Competence could not be considered as a reliable predictor of Teachers' Intrinsic Motivation on utilizing RME approach in primary schools (H3 = 0.025, SE = 0.105, 95% CIs = -0.207 – 0.19). In addition, Perceived Relatedness was not verified to influence Teachers' Intrinsic Motivation (H4 = 0.023, SE = 0.099, 95% CIs = -0.126 – 0.263). And finally, Teachers' Intrinsic Motivation was not confirmed to influence their Intention to continued adopt RME approach in primary schools (H8 = -0.001, SE = 0.084, 95% CIs = -0.172 – 0.144).

Table 5. Estimates of path coefficients

	Estimate	Std. Error	95%CI_LB	95%CI_UB
(H1) Perceived Autonomy → Intrinsic Motivation	0.125	0.102	-0.028	0.367
(H2) Perceived Competence → Confirmation	0.525*	0.049	0.425	0.609
(H3) Perceived Competence → Intrinsic Motivation	0.025	0.105	-0.207	0.19
(H4) Perceived Relatedness → Intrinsic Motivation	0.023	0.099	-0.126	0.263
(H5) Confirmation → Intrinsic Motivation	0.548*	0.081	0.369	0.716
(H6) Confirmation → Satisfaction	0.218*	0.081	0.016	0.327
(H7) Intrinsic Motivation → Satisfaction	0.477*	0.083	0.345	0.673
(H8) Intrinsic Motivation → Intention to Continued adopt RME	-0.001	0.084	-0.172	0.144
(H9) Satisfaction → Intention to Continued adopt RME	0.204*	0.096	0.01	0.408
(H10) Parental Involvement → Intention to Continued adopt RME	0.503*	0.074	0.329	0.647

Several scholars have suggested that an average score of 4 or higher on the 5-point Likert scale for determining the strength of a tendency may be helpful in its interpretation (Holsapple & Lee-Post, 2006; Nguyen et al., 2022). Reason being scores of 4 and 5 show comparable behavior (degree and strongly agree) but with varying degrees of agreement. The overall mean score of all indicators in this study was 4.09, indicating a slightly positive attitude toward teachers' dimensions on RME. Specifically, the average response scores of perceived autonomy, perceived competence, relatedness, confirmation, intrinsic motivation, and satisfaction were all above 4.0. The only exceptions were attributed to parental involvement (3.84) and continuance intention (3.74), implying a relatively weak agreement of RME teachers on these two factors. In terms of the profiles of participants, the imbalance between males and females was not only presented in the current study but also found in previous research (Cushman, 2005; Johnston et al., 1999). The reason behind this imbalance was attributed to several factors, such as status, salary, working environment, and communicating children (Cushman, 2005). In addition, primary teachers whose ages were above 45 accounted for 41.58%, implying that they had been in the field for quite a long time (around 20 years) and that adopting a new method or technique may be a challenge. This issue was even more stressful when many respondents finished high school, took intermediate and vocational training, and were employed as teachers in primary schools (64.37%). Only a fraction of them got a master's degree (2.65%). Furthermore, more than half of RME teachers resided in urban or rural areas, contributing to the explanation of why salary would affect the retention of primary male teachers, especially for those living in a city. The scarce supply of high-quality human resources in primary schools, especially in math topic in this study may also help explain the shortage of quantitative publications in Vietnam, considering the knowledge of scientific research, and writing in English. In this regard, this study shared similar characteristics with the findings of Prahmana et al. (2020) in Indonesia.

Perhaps, one of the most notable findings in the current study was the amount of variance explained by the extended Self-Determination Theory specification (57.9%). Furthermore, the proposed

conceptual model validated six out of ten hypotheses. The notable exceptions were that perceived autonomy was not considered a reliable predictor of intrinsic motivation, perceived competence did not affect intrinsic motivation, teachers' relatedness did not influence their intrinsic motivation, and in turn, intrinsic motivation was not confirmed to influence teachers' RME continuance intention. The current experimental result did not validate the assumption made by Ryan and Deci (2000) where the authors asserted that teachers' desire to control their experience and behavior could influence their intrinsic motivation. A plausible explanation for this insignificant behavior may be attributed to the 2018 curriculum reform (Do et al., 2021) that forced teachers to re-create teaching/learning materials they had used for years, especially for elderly teachers (accounted for 41.58% in this research), which may lead to dissatisfaction and disengagement (Hanson et al., 2022). The current finding was also consistent with previous research (Do et al., 2021). As such, prospective researchers should pay attention to this assumption when applying in it their setting, particularly during educational reform. The effect that teachers' ability to complete tasks and gain experience was not found to affect their intrinsic motivation. This is a departure from the assertion of Ryan and Deci (2000), where the authors posited that competence was a reliable predictor of intrinsic motivation. One tentative explanation for this unexpected result was that teachers may have the competence to utilize the RME approach but find it boring (Ryan & Moller, 2017), or they had to focus on another job for living (Hanson et al., 2022). Consequently, the motivator needed more than competency requirements (Ryan & Moller, 2017). In terms of H4, teachers' sense of belonging with others was not considered to be a reliable predictor of intrinsic motivation. The current result was deviated from the assertion of Ryan and Deci (2000) but was aligned with the finding of Holzer et al. (2021). One potential reason for this assumption's lack of significance is that relatedness must be assessed using situationally RME-oriented measures, such as those attributing RME teachers as a group, and not with universal work context measures (Sørebø et al., 2009). However, this recommendation does not seem to be valid in Vietnam, where math teachers appear to have strong levels of self-confidence, indicating that they may make decisions about their work activities autonomously, such as whether to use RME or not (Do et al., 2021). In terms of H8, the lack of a significant relationship between intrinsic motivation with RME and teachers' RME continuance intention was contradictory to previous research reports (Panisoara et al., 2020; Ryan & Deci, 2000). One possible explanation for this non-significant finding is that intrinsic motivation was deemed unstable, or "time and context dependent" (Shan, 2020), which may result in primary teachers becoming bored and disenchanted with RME strategy over time (Alam, 2022).

In summary, the experimental results of the current study added to the corpus of knowledge in two ways. Firstly, it verified six out of eight prior assumptions in the context of RME in primary schools, thus enriching the number of confirmations. As such, prospective and interested scholars can utilize these results as references in their study with respect to similar setting and characteristics. Secondly, for unexpected experimental outcomes, more research is needed to re-examine these nonsignificant findings.

Since RME is of paramount importance in the modern world (Kilpatrick, 2012; Robitaille & Travers, 2003; Van den Heuvel-Panhuizen, 2010), the study is situated within a body of work that has previously focused exclusively on curriculum design (Prahmana et al., 2020). Teachers' perspectives are equally important to understand for the sake of advancing mathematics education, and research in this area may shed light on the factors that influence children's math experiences (Rifandi et al., 2021). In terms of H2, the current finding validated prior assumption, implying that to increase the level of confirmation in utilizing the RME approach, intervention should be made by educators or policymakers to improve teachers'

competence. This calls for a greater number of synchronically and asynchronously delivered training packages tailored to individual teachers' needs and preferences. Only until teachers acquire competence in RME adoption will their dedications be justified. The confirmation of H5 suggests that intervention to enhance confirmation is needed to ensure that teachers maintain their intrinsic motivation over the long term. In this regard, national RME standards should be developed at the earliest convenience. However, this is a challenging issue since RME is still in its early stages in Vietnam and RME adopters lack knowledge of RME theory (Do et al., 2021). Similarly, the validation of H6 also stresses the role of confirmation over satisfaction. Further, the significant relationship between intrinsic motivation and satisfaction in H7 indicates that for teachers to be satisfied with the RME approach, there is a need to increase the level of intrinsic motivation. In this respect, it is advisable that educators and policymakers should : 1) hold a regular meeting or workshop so that RME teachers can discuss and share their RME experience, thus enhancing their motivation (Uyen & Vien, 2021); 2) have a detail policy with respect to RME's topic in which teachers are awarded for their RME adoption, and 3) provide funding from institutional leaders that might be seen as a practical approach encouraging teachers to be RME-engaged (Hanson et al., 2022). In terms of H9, the validation of the relationship implies the role of teachers' satisfaction to maintain long term RME adoption. As such, it is advisable that educators and policymakers should maintain school climates, such as principal support and teacher cooperation (Olsen & Huang, 2019). In another word, teachers were more satisfied when their principals provided them with a positive work environment where they were recognized and appreciated. More initiatives, such as jointly sponsored research projects or a standardized RME curriculum, that emphasize collaboration and cooperation should be developed and implemented by school administrators. Finally, the significant effect of parental involvement over teachers' intentions to continue adopting RME implies that communication between parents and teachers should be maintained and enhanced. In this respect, a communication channel might first be established by the school administration for both groups. It is easier to assist students in studying RME at home when parents and instructors are interacted (Baxter & Toe, 2021; Nguyen et al., 2022).

Although the study provided promising outcomes by confirming a number of assumptions, it was ultimately limited by a number of constraints. In combination with the unexpected results, these constraints provide a plausible avenue for further study. First, this study recruited participants from three areas of Vietnam using a nonprobability sampling technique. This sample method restricts the generalizability of the results, despite widespread acceptance in the academic literature. The second limitation is the sample size compared to the target population at large. Nevertheless, using an excessive number of samples may impair statistical power, or the ability to make inferences. Accordingly, as indicated in the methods section, the researchers maintained a suggested sample fraction. Lastly, this study ignored a substantial number of other factors that may affect RME adoptions.

CONCLUSION

This study investigated the factors that influence teachers' perceptions to adopt RME in the long term. Based on the analysis of 226 primary teachers from various regions, the experimental results validated six out of ten expected relationships between the factors in the extended self-determination theory model. That is, perceived competence affected confirmation; confirmation influenced both intrinsic motivation and satisfaction; intrinsic motivation influenced satisfaction; and satisfaction and parental involvement were both considered reliable predictors of RME continuance intention. The remaining hypotheses were

not validated, that is, autonomy, relatedness, and competence were not found significant on intrinsic motivation, and intrinsic motivation did not influence RME's continuance intention. Overall, the model explains 57.9% the amount of variance in the data. The impact of the current research was justified through its theoretical and practical implications.

Declarations

Author Contribution	:	GTCN: Conceptualization, Writing - Original Draft, Editing and Visualization, Validation, and Supervision CP: Writing - Review & Editing, Formal analysis, and Methodology
Conflict of Interest	:	The authors declare no conflict of interest.
Additional Information	:	Additional information is available for this paper.

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