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FACTORS INFLUENCING TEACHERS' INTENTIONS TO USE REALISTIC MATHEMATICS EDUCATION IN VIETNAM: AN EXTENSION OF THE THEORY OF PLANNED BEHAVIOR

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Abstract

Although Realistic Mathematics Education (RME) has become familiar to many mathematics teachers, we still have little understanding of the extent to which mathematics teachers are willing to employ RME rather than traditional teaching approaches. Based on the theory of planned behavior, in conjunction with some other factors, including facilitating conditions and perceived autonomy, this study investigated a model explaining the continued intention of mathematics teachers to use Realistic Mathematics Education. A structural equation model was used to access data from an online survey involving 500 secondary school mathematics teachers in Vietnam. The results revealed that while attitude, perceived behavioral control and perceived autonomy have positive significant impacts on intention to use RME, it appears that subjective norms and facilitating conditions do not. These findings are of significance to stakeholders, including policymakers, school managers, and mathematics teachers.

Keywords: Realistic Mathematics Education, Theory of Planned Behavior, Vietnam, Mathematics Teacher

Abstrak

Walaupun Pendidikan Matematika Realistik (PMR) sudah familiar bagi banyak guru matematika, kami masih memiliki sedikit pemahaman tentang sejauh mana guru matematika bersedia untuk menggunakan PMR daripada pendekatan pengajaran tradisional. Berdasarkan teori perilaku yang terencana, dalam hubungannya dengan beberapa faktor lain, termasuk kondisi fasilitas dan persepsi otonomi, penelitian ini menyelidiki model yang menjelaskan tujuan lanjutan guru matematika untuk menggunakan Pendidikan Matematika Realistik. Model persamaan struktural digunakan untuk mengakses data dari survei online yang melibatkan 500 guru matematika sekolah menengah di Vietnam. Hasil penelitian menunjukkan bahwa meskipun sikap, kontrol perilaku dan otonomi yang dipersepsikan memiliki pengaruh positif yang signifikan terhadap tujuan untuk menggunakan PMR, hal ini terlihat pada tidak adanya tujuan pada norma subjektif dan kondisi fasilitas. Temuan ini penting bagi para pemangku kepentingan, termasuk pembuat kebijakan, manajemen sekolah, dan guru matematika.

Kata kunci: Pendidikan Matematika Realistik, Teori Perilaku yang Terencana, Vietnam, Guru Matematika

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Initiated in the Netherlands in the 1970s by Hans Freudenthal and his colleagues (Van den Heuvel-Panhuizen & Wijers, 2005), RME has subsequently been introduced to other countries, including both developed countries, such as the US (Nicol & Crespo, 2006) and developing countries such as Indonesia (Arsaythamby & Cut, 2014; Sembiring et al., 2008; T.-T. Nguyen et al., 2020). Prior studies have identified several advantages of RME compared with the traditional teaching approaches in mathematics, including increased effectiveness for slow learners and greater curricular flexibility (Makonye, 2014; Revina & Leung, 2019).

First introduced in Vietnam in the mid-2000s by two expatriate returnees, who had obtained PhDs in the Netherlands, RME has been gradually attracting attention from the mathematics education community in Vietnam (T.A. Le, 2006; T.-T. Nguyen, 2005; T.-T. Nguyen et al., 2020). However, we still have little understanding of the extent to which mathematics teachers use RME rather than traditional teaching approaches. In Vietnam today, teachers in general, and mathematics teachers in particular, are encouraged to update their teaching methods as part of the overall reform of the education system, which was initiated in 2013 (Hoang et al., 2020). In 2018, the Ministry of Education and Training released the New General Education Curriculum (NGEC) in which schools and teachers are granted more autonomy to design their own school curricula, based on the NGEC (Vietnam Ministry of Education and Training, 2018). Vietnamese mathematics teachers thus have more room to implement new and updated teaching methods, such as RME, in their daily practices.

To address the existing research gap, this study proposed a hypothetical model to explain the intention of Vietnamese mathematics teachers to use RME. Specifically, attitude, subjective norms and perceived behavioral control were extracted from the theory of planned behavior (TPB) to predict the intention of mathematics teachers in Vietnam to use RME. The TPB is a powerful framework that may help to explain human intention and behavior, including in teachers in general (Teo, 2011) and mathematics teachers in particular (Armah & Robson, 2019; Sadaf et al., 2012). However, since the TPB did not explain all variations in mathematics teachers' intentions to use RME, we integrated some factors from other perspectives into the hypothetical model, including facilitating conditions and perceived autonomy.

The paper is organized as follows. In the second section, the Literature Review, the development of RME worldwide, RME in Vietnam, the TPB, facilitating conditions and perceived autonomy are discussed, and hypothetical models and hypotheses are proposed. In the third section (the present study), we present the questionnaires, data collection and data analysis. The fourth section (findings) provides confirmatory factor analysis findings and path analysis findings. The paper ends with a discussion and conclusions.

The Development of RME Across the Globe

Developed by the famous Dutch mathematician-educator, Hans Freudenthal, in the 1970s, RME brought a new approach to mathematics education all over the world (Van den Heuvel-Panhuizen, 2020; Vos, 2018). At present, there are at least 15 countries where RME has become popular in daily teaching activities in formal schools. Notable countries leading the trend include the Netherlands, the US and Indonesia (Van den Heuvel-Panhuizen, 2020).

RME is characterized by rich "real" situations that have a prominent place in the learning process. These situations serve as a resource to initiate the development of mathematical concepts, tools, and procedures. These situations also serve as a context in which students can later apply their mathematical knowledge, which gradually becomes more formal and general and with less specific context (Van den Heuvel-Panhuizen & Drijvers, 2014). RME theory has helped mathematics teachers to renovate their teaching process and teaching effciency, and improve students' interest in learning. RME is also used to develop mathematics education programs and textbooks (Dickinson & Hough, 2012; Dossey et al., 2016; Gravemeijer et al., 2016; Venkat et al., 2009)

The mathematization of the world requires authentic problem solving, with student-centered problems and teacher instruction (Webb & Peck, 2020). Therefore, teachers have an important role in the light of RME theory. Previous studies have identified challenges in the use of RME that may arise, such as students' unfamiliarity with RME-designed learning materials (Laurens et al., 2017), teachers' reluctance to switch to a new teaching method (Van den Heuvel-Panhuizen, 2020), and teachers who lack the appropriate competencies and skills needed for RME (Barnes & Venter, 2008). In the next sub-section, we discuss the introduction of RME to Vietnam and its evolution in the Vietnamese context.

RME in Vietnam

RME was first introduced inVietnam by two Vietnamese graduate students (T.A. Le, 2006; T.-T. Nguyen, 2005) who conducted their PhDs in the Netherlands in the mid-2000s. Since then, RM has been gradually introduced into Vietnamese's mathematics education research and mathematics teaching practice (T.-T. Nguyen et al., 2019; T.-T. Nguyen et al., 2020; Tran et al., 2020). However, until the end of the 2010s, the application of RME in Vietnam was still at a very early stage (T.-T. Nguyen et al., 2020). Generally, mathematics teachers' practices are not guided by RME theory and it is hard for students to develop "realistic" mathematical thinking in such mathematics courses.

An important milestone for RME in Vietnam was reached in 2018. The Ministry of Education and Training released the New General Education Curriculum (NGEC), applying to the whole primary and and secondary education system. NGEC specifically emphasized the competency outputs of students in all subjects. With regard to mathematics in particular, Vietnamese mathematics teachers were granted more autonomy and requested to alter their teaching methods to become more "realistic" (VMoET, 2018).

Following the recommendations of the NGEC, several efforts have been made to promote new innovative teaching and learning methods in mathematics education: RME is one of the options. Some local governments, including that in Ho Chi Minh City, have pioneered moving RME to a central position in mathematics education practice, especially in testing and assessment practices (T.T. Le et al., 2021). Some schools introduced RME into their curricula as part of formal courses or extra-curricular activities (e.g., T.-T. Nguyen et al., 2020). RME has been gradually introduced as part of formal programs in mathematics education in some universities (e.g., see Dong Thap University, n.d.). Some mathematics teachers/researchers have published books on RME or delivered open executive training courses and seminars/workshops to disseminate the concepts of RME among their colleagues and communities (e.g., Hung Vuong University, 2020; Q.-T. Nguyen, 2017). However, few of these endeavours are top-down ones, i.e., initiated by the Ministry of Education and Training. RME appears to be familiar to mathematics teachers but not to other stakeholders, such as policymakers, university managers, and school principals. In the next subsection, we examine the theory of planned behavior, which is regarded as the basis for the hypothetical model in this study.

Theory of Planned Behavior

The theory of planned behavior (TPB) originates from the theory of reasoned action (TRA). The TRA proposes that human behavior is predicted by human behavioral intention (Ajzen, 1991). In turn, human behavioral intention is determined by rational choices, including attitudes and subjective norms. Specifically, attitude *"refers to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question"* (p.188). Subjective norm *"refers to the perceived social pressure to perform or not to perform the behavior"* (p.188). In 1991, Ajzen extended the TRA to establish the TPB with perceived behavioral control, which *"refers to the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles"* (p.188). Behavioral control was added as an antecedent of behavioral intention, in juxtaposing attitude and subjective norm. By including perceived behavioral control, Ajzen enhanced the power of the TRA to explain human behavioral intention. However, the extant literature also showed that in many circumstances, even the TPB is insufficient to explain human behavioral intention; and thus, more antecedents should be added (Chen & Hung, 2016; Hsu et al., 2006; Kim et al., 2016; Pelling & White, 2009; Zoonen et al., 2014). For instance, Kim et al. (2016) integrated narcissism (involving an inflated sense of self-importance) with three antecedents of the TPB into a single model to explain behavioral intention in Instagram users posting selfies. In the same vein, to explain the variation of intention to use social media for work-related activities among 514 Dutch employees, Zoonen et al. (2014) adopted social identity expressiveness and self-identity expressiveness as two antecedents, in addition to attitude, subjective norm and perceived behavioral control.

Within the education sector, education scholars also extended the TPB to explain teachers' behavioral intention in various contexts. Teo (2011) used an extended model of the TPB, applying specifically to technology usage intention, to predict behavioral intentions in 592 Singaporean teachers. The model is composed of five predictors, including perceived usefulness, perceived ease of use, subjective norm, facilitating conditions, and attitude. Mathematics education scholars have also used the TPB (Armah & Robson, 2019; Sadaf et al., 2012) and its extensions to predict the behavioral intentions of mathematics teachers (Stols et al., 2015).

Given the above arguments, it is suggested that the TPB should be extended with additional factors to explain the behavioral intentions and actual behaviors of mathematics teachers, depending on contexts and circumstances. In this study, we extended the TPB by adding facilitating conditions and perceived autonomy as two determinants of teachers' intentions to use RME in Vietnam. In the next two subsections, these two factors are discussed and justified.

Facilitating Conditions

Previous studies have had a variety of perspectives on facilitating conditions. From a non-technological perspective, Triandis (1979) asserted that without supportive facilitating conditions, an intentioned behavior could not occur. Teo (2011) revealed that Sri Lankan women's involvement in the management of forests was highly dependent on facilitating conditions, including high levels of gender interaction and non-restriction of women in public spaces. From the perspective of the universal theory of acceptance and use of technology (UTAUT), facilitating conditions refer to one individual's perceptions of their ability to perform a certain behavior, given available resources and support (Venkatesh et al., 2003). Within the context of educational technology, facilitating conditions refer to the support that an institution provides for users (i.e., teachers, students or parents) when a new technology is adopted. We therefore hypothesized that given favorable facilitating conditions, teachers will have high intentions to adopt RME in their professional teaching practice.

Perceived Autonomy

Perceived autonomy is a well-established concept in behavioral science. From the viewpoint of self-determination theory, autonomy is regarded as an important antecedent that drives individuals' intrinsic motivation (Niemiec & Ryan, 2009; Ryan & Deci, 2000). Within the education sector, many scholars, including Pearson and Moomaw (2005) and Short (1994) have stated that teacher autonomy is an essential driver of school reform. According to Mausethagen and Mølstad (2015), there are multiple approaches to conceptualizing teacher autonomy. The first approach stems from "control-freedom dichotomies". Using this approach, Ingersoll (2003) defined autonomy as the extent to which one individual is able to control an issue directly. Similarly, Molander and Terum (2008) regarded autonomy as an individual's control over the terms and content of his/her professional work. The second approach, which has received less attention, defines teacher autonomy as an individual's level of self-governance, or capacity to develop, monitor and defend his or her knowledge base (Cribb & Gewirtz, 2007).

Previous studies have shown the relationship between teacher autonomy and his/her intentions in various professional activities. For instance, Rosenholtz and Simpson (1990) and You and Conley (2015) asserted that teacher autonomy is an essential antecedent of teachers' loyalty/retention in their current school. In the same vein, McConnell (2017) surveyed 6588 secondary mathematics and science teachers in the US and revealed that teacher autonomy, administrative support and satisfaction with salary were the three direct determinants of their intentions to remain in STEM education. Given these findings, we propose that teacher autonomy should be an important driver in mathematics teachers' intentions to adopt RME in their professional practice.

The Hypothetical Model and Hypotheses

The hypothetical model of this study is presented in Figure 1. The endogenous variable is the intention of teachers to use RME in the future. The five determinants of teachers' intentions to use RME are attitude, subjective norm, perceived behavioral control, facilitating conditions and perceived autonomy. The first three determinants are adopted from the TPB and the other two are the extended variables.

Following this hypothetical model, we aimed to answer the following research question: "How do the three components of the TPB, along with facilitating conditions and perceived autonomy, influence the continued intention of Vietnamese mathematics teachers to use RME?". Specifically, five hypotheses were developed from this research question, as follows:

H1. Attitude has a positive effect on teachers' continued intentions use RME.

H2. Subjective norms have a positive effect on teachers' continued intentions to use RME.

H3. Perceived behavioral control has a positive effect on teachers' continued intentions to use RME.

H4. Facilitating conditions have a positive effect on teachers' continued intentions to use RME.

H5. Perceived autonomy has a positive effect on teachers' continued intentions to use RME.

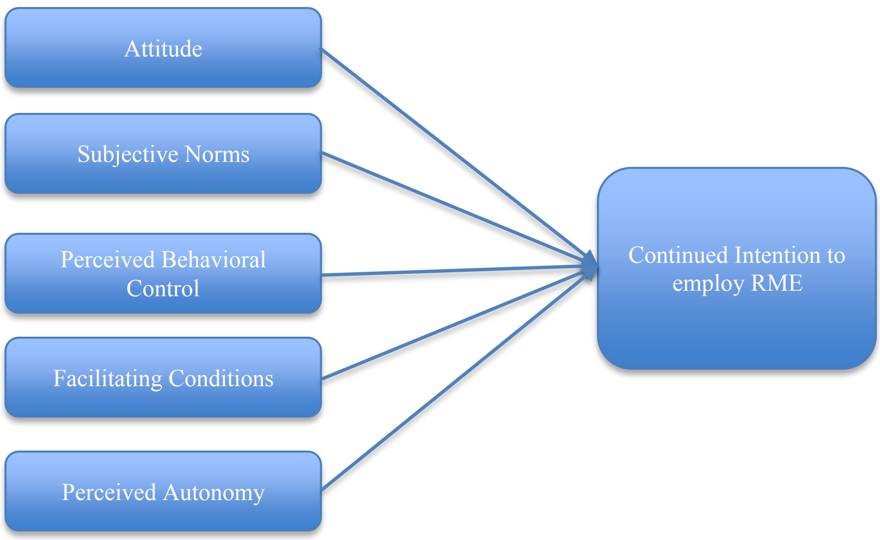

Figure 1. The Conceptual Model

METHOD

The Questionnaire

Our survey questionnaire was composed of two parts. In the first part, we aimed to collect the personal profiles of our targeted respondents, including gender, age, highest qualification obtained, and type of school. The second part aimed to measure the items associated with the latent variables included in the conceptual model. The development of questionnaire items was as follows. In the first step, we adopted these items from well-established instruments in the extant literature (see Table 1). Second, we adjusted these items to fit with our research context. Third, face validity (Nevo, 1985) was determined in consultation with two Vietnamese mathematics education scholars. Fourth, we translated the adjusted questionnaire items into Vietnamese and then commissioned a back-translation (Brislin, 1970) to English. Fifth, the two English versions and the Vietnamese version (after step 3 and step 4) were compared, and some small adjustments were made. The final questionnaires, written in Vietnamese, were sent to our respondents via email (the English version is presented in Table 1).

Table 1. Results for Items' Means, Standard Deviations, and Factor Loadings

Factor/Item	Mean	Standard Deviation	Factor loading
Attitude (adapted from Teo, 2011): 5-point Likert scale			
ATU1: Once I start using RME in teaching mathematics, I find it hard to stop.	3.68	.854	0.728***
ATU2: I look forward to those aspects of my job that require the use of RME	3.86	.862	0.899***
Subjective Norms (adapted from Teo, 2011): 7-point Likert scale			
SN1: My colleagues think that I should use RME in teaching mathematics	4.93	1.318	0.916***
SN2: My leaders/managers think that I should use RME in teaching mathematics	5.05	1.357	0.888***
Perceived Behavioral Control (adapted from Teo, 2011): 5-point Likert scale			
PBC1: I feel confident that I could prepare the necessary materials to use RME in teaching mathematics	3.49	.865	0.704***
PBC2: For me to use RME in teaching mathematics would be easy	3.04	.902	0.591***
PBC3: I feel confident that I could answer questions posed to me while using RME in teaching mathematics	3.24	.884	0.899***
Facilitating Conditions (adapted from Teo, 2011) 5-point Likert scale			
FC1: When I encounter difficulties in using RME in teaching mathematics, a specific person is available to provide assistance.	3.26	.815	0.809***
FC2: When I encounter difficulties in using RME in teaching mathematics, I know where to seek assistance.	3.56	.740	0.844***
FC3: When I encounter difficulties in using RME in teaching mathematics, I AM NOT given timely assistance. (reversed code)	3.60	.713	0.666***
Perceived Autonomy (adapted from (Teo, 2011): 5-point Likert scale			
PAU1: I feel I can have a lot of input to deciding how I use RME in teaching mathematics	3.24	.915	0.830***

PAU3: I am free to express my ideas and opinions on using RME in teaching mathematics	3.36	.928	0.732***
PAU4: When I am using RME in teaching mathematics, I have to do what I am told (reverse code)	3.70	.784	0.809***
PAU6: I feel like I can pretty much use RME in teaching mathematics as I want to at work	3.19	.956	0.809***
Intention (adapted from Teo, 2011): 5-point Likert scale			
IN1: I intend to continue to use RME in teaching mathematics in the future.	3.77	.759	0.936***
IN2: I expect that I will use RME in teaching mathematics in the future.	3.83	.771	0.852***

Note: *** implies $p < 0.001$

Data Collection

The data collection was conducted from September to November 2020. A convenience sampling snowball approach was used. Specifically, we sent an online survey via email to a network of mathematics teachers in Vietnam. This is an informal network of former mathematics education students at pedagogical universities in Vietnam: all of them are currently teachers at upper and lower secondary schools in Vietnam. Those who had no knowledge of the concept of RME were requested to not answer the questionnaire. Given that the participants were located in different regions of Vietnam, an online survey was an appropriate method of data collection (Wright, 2006). An email was sent in September 2020 to 2000 targeted respondents. They were asked to click on a URL that redirected them to the Google Forms-based survey questionnaire. Google Forms was chosen for the online survey as it is free for public use and does not require significant administrative input (Tran et al., 2020). One follow-up email was sent in October 2020 to those who had not so far responded. By November 2020, we had received 578 responses. The rate of return of our survey was thus 28.9%. However, of the 578 respondents, 78 were eliminated due to incomplete answers, leaving 500 valid responses. These 500 respondents had learned about RME through different channels: some had encountered RME in their masterate programs in mathematics education (94 respondents, 18.8%); others learned about RME through short-course executive training (246 respondents, 49.2%) or seminars/workshops (500 respondents, 100%) (see Table 2). The personal profiles of the final respondents are represented in Table 2.

Table 2. Personal Profile of the Respondents

Characteristic	Frequency	%
Gender		
Male	254	50.8
Female	239	47.8
Not disclosed	7	1.4
Age		
Under 25	46	9.2
26-35	119	23.8
36-45	307	61.4
Over 45	28	5.6
Highest Degree		
PhD	4	0.8
Master's	153	30.6
Bachelor's	326	65.2
Other	17	3.4
School level		
Upper secondary	253	50.6
Lower secondary	247	49.4
Type of school ownership		
Private	28	5.6
Public	472	94.4
School location		
Rural	364	72.8
Urban	136	27.2
Learned about RME through		
Master's program in mathematics education	94	18.8%
Executive training	246	49.2%
Seminar/workshop	500	100%

Data Analysis

Following Anderson and Gerbing (1988), we conducted a two-step structural equation modeling. The first step involved confirmatory factor analysis to ensure measurement validity. To this end, multiple fit indices, convergent validity and discriminant validity were determined (Kline, 1994; Fornell & Larcker, 1981) Subsequently, path analyses were performed to estimate the impacts of our five exogenous variables (Attitude, Subjective Norms, Perceived Behavioral Control, Facilitating Conditions and Perceived Autonomy) on the endogenous variable (Intention to use RME).

RESULTS AND DISCUSSION

Results of Confirmatory Factor Analysis

As shown in Table 3, all results pertaining to multiple fit indices, including Chi square/degrees of freedom, GFI, AGFI, NFI, CFI and RMSEA were higher (or lower) than the respective acceptable levels. To access the convergent validity, we estimated all items' factor loadings, construct reliabilities (CR) and average variance extracts (AVE). As shown in Table 1, as advised by Kline (1994), we only retained items with factor loadings higher than 0.6. With regard to CR and AVE, as shown in Table 4, all values of CRs and AVEs were higher than their respective acceptable levels (i.e., 0.7 for CR and 0.5 for AVE) (Fornell & Larcker, 1981).

Table 3. Results of Multiple Fit Indices

Index	Result	Acceptable level
Chi-square	311.656	-
Degree of freedom	88	-
Chi-square/ Degree of freedom	3.542	< 5
GFI	0.942	0.9
AGFI	0.897	0.8
NFI	0.933	> 0.9
IFI	0.951	> 0.9
RFI	0.908	>0.8
TLI	0.932	> 0.9
RMSEA	0.071	< 0.08
CFI	0.950	> 0.9

To determine the discriminant validity, we compared the square roots of AVEs and estimated correlation coefficients of our construct variables (Fornell & Larcker, 1981). As shown in Table 4, the square roots of AVEs (figures in bold and italic, ranging from 0.728 to 0.902) were higher than all estimated correlation coefficients of our construct variables (ranging from 0.326 to 0.669); thus the discriminant validity of our empirical data was confirmed.

Table 4. Convergent and Discriminant Validity

	CR	AVE	ATT	SUB	PBC	PAU	FAC	INT
ATT	0.800	0.669	***0.818***					
SUB	0.897	0.813	0.654	***0.902***				
PBC	0.781	0.551	0.649	0.633	***0.742***			
PAU	0.813	0.530	0.326	0.435	0.478	***0.728***		
FAC	0.819	0.604	0.522	0.595	0.538	0.550	***0.777***	
INT	0.889	0.801	0.669	0.592	0.656	0.463	0.655	***0.895***

Note: Figures on the diagonal are the square roots of the AVEs of respective construct variables

Results of Path Analyses

The results of the path analyses are provided in Table 5. Of the three components of the TPB, our empirical results revealed that only two components had significant impacts on teachers' intentions to use RME. Specifically, Attitude was found to have a positive and significant impact on Intention (β = 0.137; $p < 0.001$), Perceived Behavioral Control was found to have a significant positive impact on Intention (β = 0.238; $p < 0.001$); while Subjective Norms were found to have no significant impact on Intention ($\beta < 0.019$; $p = 0.749$). Thus, H1 and H3 were accepted while H2 was rejected. With regard to the role of Facilitating Conditions and Perceived Autonomy, our analyses revealed mixed findings. Specifically, while Facilitating Conditions was found to have a significant impact on Intention (β = 0.314; $p < 0.001$). , Perceived Autonomy did not (β = 0.065; $p = 0.175$). On this basis, H4 was accepted while H5 was rejected. Overall, our model explained 61.5% of the variation in the dependent variable (i.e., Intention to use RME).

Table 5. Results of Structural Equation Model

	Coefficient β	p-value	Hypothesis
Dependent variable: Intention to use RME			
Attitude (ATT)	0.317	***	H1 is supported
Subjective Norms (SUB)	0.019	0.749	H2 is not supported
Perceived Behavioral Control (PBC)	0.238	***	H3 is supported
Facilitating Conditions (FAC)	0.314	***	H4 is supported
Perceived Autonomy (PAU)	0.065	0.175	H5 is not supported
R^2	61.5%		

Note:

- *Chi-square = 311.656; degree of freedom = 88; Chi-square/degree of freedom = 3.542; GFI = 0.939; AGFI = 0.886; NFI = 0.933; RMSEA = 0.072; TLI = 0.932 and CFI = 0.950*
- *ATT: Attitude, SUN: Subjective Norms, PBC: Perceived Behavioral Control; PAU: Perceived Autonomy; FAC: Facilitating Conditions*

Academic Implications

Our empirical findings are in line with some previous authors who also examined the determinants of mathematics teachers' intentions, but dissimilar from others. For instance, Hsu et al. (2006) and Kim et al. (2016) also found that the TPB may only partly explain intentions relating to mathematics teaching. A plausible interpretation for the finding that only two components of the TPB (attitude and perceived behavioral controls) had a significant relationship with the intention to use RME while subjective norms did not is as follows. Mathematics teachers in Vietnam appear to be self-confident and they may tend to make decisions on their professional activities (such as using or not using RME) without consulting other people. Another possible reason for the insignificant association between subjective norms and intention to use RME may be the actual implementation of RME in Vietnam. Despite RME having been introduced to Vietnam more than a decade ago, its implementation is still in the early stages. Currently, RME is only being discussed among mathematics teachers. Thus, subjective norms, especially from people outside the mathematics teaching community, may not yet be sufficiently well formed in Vietnam to impact on mathematics teachers' intentions.

Our study also confirmed the assertion that the TPB does not provide full explanatory power for human intentions (Chen & Hung, 2016; Hsu et al., 2006; Kim et al., 2016; Pelling & White, 2009; Zoonen et al., 2014). Our study indicated that facilitating conditions are significantly associated with intention, similar to the findings of Wang et al. (2017), but perceived autonomy was not significantly associated with intention, unlike the findings of McConnell (2017). This constitutes another theoretical contribution of this study.

Practical Implications

The study has several implications for policymakers, school managers and mathematics teachers with regard to improving mathematics teaching. First, given the importance of attitude and perceived behavioral control as two key determinants of intention to use RME, and since RME is currently only popular among a small circle of mathematics teachers in Vietnam, we suggest more effort should be made to introduce RME to the wider community. RME could be incorporated as part of the formal curriculum in mathematics teacher education in pedagogy universities/colleges. Continued programs to develop skills for mathematics teacher may also adopt RME as part of their syllabi. Second, a shift from traditional mathematics teaching to RME will not succeed without facilitating conditions, such as professional instruction and guidance from senior experts (Hadi, 2002) or devices for implementing new, innovative lectures (Putri et al., 2019). At present, as noted in the Literature Review section, all efforts to promote RME seem to be bottom-up among a small circle of mathematics teachers, rather than top-down. In the future, appropriate support from central/local governments and schools would enable mathematics teachers to undertake RME more effectively.

CONCLUSIONS

Vietnam is implementing several measures to reform the education system (Hoang et al., 2020). Among others, adopting new and innovative teaching approaches is identified as part of this reform agenda. RME is well-known as an effective and flexible approach to teaching mathematics. RME was introduced in Vietnam more than a decade ago, and has started to attract attention from mathematics teachers, school managers and policymakers in Vietnam in recent years (T.-T. Nguyen et al., 2020). The primary aim of this study was to investigate the intention to use RME in a sample of 500 Vietnamese mathematics teachers. To this end, we extended the TPB with facilitating conditions and perceived autonomy to build a hypothesized model. Our empirical findings indicate that overall, our model explained 61.5% of the variation in the surveyed mathematics teachers' intentions to use RME in their professional activities. Of five hypothesized determinants of intention, three, including attitude, perceived behavioral controls, and facilitating conditions were found to have positive, significant associations with mathematics teachers' intentions to use RME. Two other potential determinants – subjective norms and perceived autonomy – were not associated with the uptake of RME.

Limitations and Direction for Further Studies

All studies have limitations and there are still several avenues for further investigation in this area (Vuong, 2020). First, as R^2 obtained in our path analysis was 61.5%, there is room for investigation of the roles of antecedents other the five included in this study. Also, this study focused only on the intention of mathematics teacher to adopt RME, not the effectiveness of RME. Thus, another direction with potential for further elaboration is to investigate the effectiveness of RME. Researchers who want to pursue this aspect may refer to similar studies from other countries (see Karaca & Ozkaya, 2017; Laurens et al., 2017; Yuanita et al., 2018). Third, as we collected data using the snowball technique, this may have led to biased results. Further studies may avoid this limitation by employing random data collection methods. Fourth, this study emphasized the direct antecedents of intention to use RME but not indirect ones or moderators. This is an area for future studies to investigate. Last, the sample size for this study was only 500 teachers, which may not reflect the overall population of mathematics teachers in Vietnam. Further study may avoid this limitation by using a larger sample size.

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