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Gender Differences in Research Self-Efficacy among Vietnamese Master's Students: The Influence of Sociocultural Factors

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ABSTRACT: *Research self-efficacy (RSE) plays a crucial role in shaping students' engagement, persistence, and performance in research-related activities, particularly at the postgraduate level. Recent research has not fully explained the reasons underlying gender differences in RSE or identified the specific aspects of RSE in which males and females differ. The present study addressed these gaps by combining socio-cognitive theory (SCT) with a gender perspective and using a mixed-methods sequential explanatory design to study gender differences in RSE among Vietnamese master's students. The results showed that there were significant male-female differences in two dimensions: self-efficacy in research planning and self-efficacy in research skills and communication. The biggest differences were found in the areas that students perceived as requiring analytical, mathematical, or reasoning skills. The regression analysis showed that females' RSE scores were lower than those of males. Sociocultural factors such as family encouragement, role models, and family-research conflict benefited men more than women. The study underscored the necessity of applying a gender perspective to contextualize SCT and the application of the mixed methods design to reveal the cognitions driving the gender disparities. Suggestions were provided to improve female students' RSE in Vietnam and similar contexts.*

KEYWORDS: **Gender differences, mixed-methods, research self-efficacy, sociocultural factors.**

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1. Introduction

The socio-economic shifts have paved the way for more women to be present in academic environments (Meyer & Leslie, 2015). There are, however, significant gender disparities that still exist in the fields with high male concentration such as math-related areas (Breda *et al*., 2023) and STEM (Science, Technology, Engineering, and Mathematics) (Matete, 2022). Gender differences are also shown in scientific research work. Men, for instance, are more active in research (Bierer *et al*., 2022) and their research output is also more productive (Nielsen *et al.*, 2024). Men are better than females at using technology in research (Goswami & Dutta, 2016), are more self-efficacious in logical reasoning and spatial ability (Syzmanowicz & Furnham, 2011) and achieve better performance in math and statistics (Breda *et al*., 2023). Males are more interested in natural sciences topics and STEM, while females often participate in social science-related activities (Phillips *et al*., 2022).

One of the concepts that helps to understand gender differences in research activities is research self-efficacy (RSE), which is the belief of an individual in completing a research task (Forester *et al.*, 2004, p. 4). RSE relies on Bandura's (1997) socio-cognitive theory (SCT), which claims that the personal factors (individual characteristics), environmental factors (assistance from colleagues), and behaviour (asking for help) are all constantly interacting with one another. RSE reflects perceived capability in performing research tasks rather than objective research skills or actual performance outcomes. A person's RSE is determined by his/her active selection, comprehension, and assimilation of the efficacy-relevant information received from various sources such as previous experiences, social feedback, performance observation, and emotional reactions. There are several factors influencing the way individuals perceive self-

efficacy information, among which are the social contexts (Petersen & Treagust, 2014) and cultural variables (Robinson *et al.*, 2020). Furthermore, Butz and Usher (2015) argued that the shared convictions, norms, and societal expectations may not only play a role in the availability of efficacy information but also in the psychological processing of these sources. Therefore, under the impact of a range of personal and external factors, males and females may develop RSE differently, together with the variations in their focus, selection, and understanding of the efficacy-relevant information.

The research on the role of demographic factors to predict RSE yielded mixed results. For example, Baker and DeDonno (2020), Hill *et al*. (2022), and Seng *et al.* (2020) all reached the same conclusion that gender predicted RSE. However, the conclusion of these researchers contrasted with that of Gaoat *et al*. (2023) and Ashrafi-Rizi *et al.* (2015) who did not find gender to be a predictor. Baker and DeDonno (2020) found research experience to play a role in predicting RSE, while Hill *et al*. (2022) did not. Field of study was a factor in RSE prediction according to Baker and DeDonno (2020) and Seng *et al*. (2020), but Hill *et al*. (2022) did not support this view. Robinson *et al.* (2020) suggested that the reason for the conflicting findings might be the differences in research contexts and methodologies.

There are few studies examining the RSE beliefs of men and women in academic settings (Robinson *et al*., 2020). Moreover, researchers (e.g., Hill *et al.,* 2022; Seng *et al*., 2020) have offered numerical evidence of the disparities between men and women concerning RSE levels. Nevertheless, their studies have not pointed out which aspects of RSE males and females differ in, nor have they provided thorough explanations of the forces causing them, most likely because gender has been treated simply as a demographic factor and studied together with other variables. Such an approach limits understanding of how gendered social norms and expectations structure RSE in specific research tasks, rather than simply producing overall score differences. To capture gendered patterns in RSE and the underlying causes of the disparities, a more helpful theoretical lens is needed. A gender perspective by Eagly and Wood (2016) focuses on examining sociocultural elements (such as gender stereotypes and family customs) that are ingrained in the social environment and influence how men and women develop attitudes and behaviors. In addition, SCT (Bandura, 1997) suggests that the learning and the behaviour of individuals can be affected by the interaction of both contextual factors (such as social environment and cultural norms) and personal factors (for instance, backgrounds and beliefs). People form their RSE by selecting and interpreting efficacy-relevant information coming from four main sources: mastery experiences, vicarious experiences, social persuasion, and emotional states. Consequently, the combination of these theoretical viewpoints can allow for a dimension-specific and mechanism-focused examination of RSE, highlighting how socially constructed gender roles and expectations may differentially shape men's and women's access to and interpretation of key efficacy-relevant information, thereby contributing to gender differences in RSE across distinct research tasks.

Most available studies in RSE bear the same methodological limitation due to the application of quantitative approaches (Usher *et al*., 2019). They fail to capture the complex experiences shaped by social practices, cultural norms, and home environments that likely influence individuals' construction of RSE. The effective integration of qualitative and quantitative data to uncover underlying cognitions of self-efficacy (SE) has been evident in the literature. Carroll *et al.* (2024) collected interview data on students' experience of school science and SE information to spotlight how implicit gender biases resulted in gender disparities in science SE. Likewise, Usher *et al*. (2019) used open-ended questions in addition to a survey, which helped to discover that boys' and girls' math and science SE were shaped by their community connections and family relationships. Gender differences in math SE were due to a stereotypical belief that girls were less competent in math than boys.

In Vietnam, a noticeable lack of research investigating RSE in academic settings is

observed, despite its importance to research engagement, research performance, and research motivation (Seng *et al*., 2020). Scholars have investigated topics related to undergraduates' RSE and provided valuable insights. For instance, English majors in Le and Hoang's (2021) study tended to overestimate their research abilities and demonstrated a limited understanding of key research components. Pham *et al*. (2018) discovered that teachers exerted the greatest influence on students' research motivation compared to other factors, such as university policies, internships, students themselves, and research activities. More recently, Pham and Bui (2023) found that the integration of research into teaching can develop the research capacity of undergraduates and improve their overall learning experiences. However, the scarcity of studies examining RSE and gender-based differences in RSE beliefs in Vietnamese academic settings makes it challenging to foster equitable participation in research and improve the research potential of all students, regardless of gender.

The literature indicates that gender conceptualization in Vietnam remains influenced by traditional beliefs about the roles of girls/women and boys/men. According to T. N. Nguyen *et al*. (2020), the encouragement of boys to follow careers in science and technology comes from both families and educational systems; while girls, on the other hand, are supported to be caregivers or study social sciences. Women in textbooks, as well as in the media, usually have their characters defined negatively or as family-oriented, while men are mostly characterized as competent and knowledgeable (Vu & Pham, 2021). These tendencies influence the students' self-perceptions gradually which in turn move girls to the areas of lower interest and self-efficacy in STEM (Tran, 2019) and leading to the retention of gaps in education and employment (M. L. Nguyen *et al*., 2020). The persistence of gender stereotypes and norms, and their manifestation in various aspects of Vietnamese sociocultural life, suggest they may contribute to gender differences in RSE.

Given this context, this study aimed to examine differences in RSE between male and female master's students at a public university in Vietnam, using SCT (Bandura, 1997) and a gender perspective (Eagly & Wood, 2016) as a theoretical framework, and employing a mixed-methods sequential explanatory design. The study's insight into RSE gender differences helped promote equal participation in research activities, encourage different viewpoints, and increase research ability for all students in Vietnam and similar contexts. The current study answered the following research questions:

1. Are there any significant differences in Vietnamese male and female students' research self-efficacy?

2. Do sociocultural factors contribute to the differences between males and females?

3. If sociocultural factors contribute, how do the factors influence the construction of research self-efficacy between genders?

2. Methodology

The mixed-methods sequential explanatory design was selected because qualitative findings can be used to explain and contextualize quantitative results, particularly when investigating complex sociocultural phenomena such as gender differences in RSE (Creswell & Clark, 2017). Quantitative data from an online survey were analysed to investigate differences in RSE levels of both genders, while semi-structured individual interviews provided qualitative data to uncover the reasons for the disparities.

2.1. Research Participants

The study was conducted at a public university in Vietnam, with participants for the survey and interviews selected through convenience sampling. Convenience sampling, although not statistically representative, is commonly used in exploratory research where the aim is to identify patterns and generate insights (Creswell & Clark, 2017). In the present study, the choice of convenience sampling was largely guided by feasibility considerations rather than by an intention to achieve representativeness, as the researcher could practically access the male and female students who enrolled in a research

methods course within the same university, which facilitated timely recruitment under limited time and resource constraints. While this sampling enabled efficient data collection, the researcher acknowledged that the sample may not be representative of all master's students, limiting the generalizability of the findings. The results should, therefore, be interpreted as context-specific, with limited applicability beyond the institutional setting in which the data were collected. The demographic profiles of the students are in Table 1.

2.2. Instruments

2.2.1. The Questionnaire

Quantitative data were collected through an online questionnaire designed to examine significant differences in RSE levels between genders. Section 1 of the questionnaire gathered students' demographic information, including gender, age, research experience, field of study, and marital status. Section 2 contained a 24-item scale from a study conducted by Phan (2024), which was developed within a social cognitive perspective to examine the RSE of Vietnamese students. It consists of three dimensions: research planning (RP) (6 items, e.g., "I can select appropriate sources for research needs"), research skills and communication (RSC) (12 items, e.g., "I can defend my research results in front of an audience"), and scientific writing (SW) (6 items, e.g., "I can use an academic writing style"). Self-efficacy in RP is the self-efficacy of an individual to effectively plan and organize the foundational components of a research project. Self-efficacy in RSC refers to the self-efficacy of an individual to execute core research tasks and communicate research outcomes. Self-efficacy in SW is an individual's self-efficacy to produce and integrate scholarly written work according to academic conventions. Participants responded to SE items on a five-point Likert scale, starting with 1 (strongly disagree) and ending with 5 (strongly agree), with higher scores indicating higher levels of RSE. A Cronbach's alpha of 0.96 for the overall scale was achieved in the study of Phan (2024). The three sub-scales showed high reliability, with 0.88 for RP, 0.87 for RSC, and 0.95 for SW.

The content validity of the questionnaire

Table 1. Demographic Profiles

		Survey participants (n=95)		Interview participants (n=16)	
		Frequency	**Percent**	**Frequency**	**Percent**
Gender	Male	43	45.3	7	43.7
	Female	52	54.7	9	56.3
Study major	Accounting	29	30.5	3	18.8
	Business Management & Administration	36	37.9	6	37.5
	English Language	30	31.6	7	43.7
Age	Under 25	51	53.7	4	25
	From 26–30	15	15.8	6	37.5
	Above 30	29	30.5	6	37.5
Research experiences	Fewer than 2	15	15.8	4	25
	From 2 to 3	32	33.7	7	43.8
	Above 3	48	50.5	5	31.2
Marital status	Married	38	40	7	43.8
	Single	57	60	9	56.2

utilized in the present research was verified through consultation with two colleagues who are teaching research methodology. After being translated into Vietnamese through the back-translation method, the questionnaire was pilot tested with 20 students for clarity, phrasing, and technical usability on the online platform, and no problem was reported. The whole scale had strong internal consistency, with a Cronbach's alpha of 0.82. Its sub-scales had similarly high values of 0.73, 0.72, and 0.80 for RP, RSC, and SW, respectively.

2.2.2. Individual Interviews

To examine the potential effects of sociocultural contexts on gender differences in RSE, sixteen students were interviewed through individual semi-structured interviews. A semi-structured set of questions in the Vietnamese language was created in accordance with the research questions and the current literature on RSE and sociocultural influences (Bandura, 1997; Carroll *et al*., 2024). The questions were tested on five students to confirm their clarity and cultural acceptability, which resulted in no changes. The duration of each interview was around 30 minutes and was audio-recorded with the consent of the participants. Examples of the questions include: "Could you tell me what family expectations there are regarding subjects and careers you choose?", "What difficulties have you gone through in relation to research? How have they impacted your self-efficacy in conducting research?", and "What would build up your confidence in finishing a research task? What might lower your confidence?" Pseudonyms were used to protect participants' privacy.

2.3. Data Analysis

The researcher performed quantitative data analysis using SPSS 25.0 for Windows and used the Kolmogorov-Smirnov test to check for normality of the RSE variable. Because the p-value (0.20) was higher than 0.05, normal distribution was concluded for the variable. Descriptive analysis, t tests, and regression analyses were performed to examine gender differences among students regarding their levels of research self-efficacy in three constructs. The correlation coefficients guidelines of Cohen (1988) were adhered to in this research. Thematic analysis (Braun & Clarke, 2006) was conducted on the data gathered from the interviews. All interviews were transcribed word for word. Although the researcher worked as a single coder, several strategies were applied to ensure the trustworthiness and reliability of the qualitative analysis. A systematic coding process was used, involving repeated reading of transcripts, generating codes and themes, reviewing and naming themes, and writing up the findings. All the codes and themes were discussed with a peer, who is experienced in qualitative research as a means of confirming the credibility and reliability of the findings. The peer did not independently code the data but reviewed and provided feedback on the coding and themes to ensure clarity and consistency. Member checking was undertaken by inviting participants to review the summaries of findings to confirm that the interpretations accurately reflected their experiences.

2.4. Procedure

Following approval from the Human Ethics Review Committee (Reference Number 01/2024-KHCB-ĐĐNC), email invitations with the questionnaire included were sent to 120 participants, who were master's degree students registering at different learning programs at the university. The study received one hundred responses and ninety-five of them were valid after the data cleaning process. Participation was voluntary, and students' privacy and rights were respected throughout the study. Following the quantitative analysis, an invitation for semi-structured individual interviews was sent to thirty students via email and sixteen students were finally recruited due to conflicted schedules. Individual interviews were conducted at a convenient coffee shop one month after the survey was completed.

3. Results

3.1. Gender Differences in RSE Levels

An independent-samples t test was conducted

to examine potential gender differences in RSE among Vietnamese students across three dimensions. There are significant differences between the two genders in the RP and the RSC subscales (Tables 2 and 3). Male students (M = 3.40, SD = 0.36) scored higher than their female counterparts (M = 3.11, SD = 0.35) in the RP subscale. A t test showed a significant difference, t (93) = 3.96, p < .001, along with a large effect size (d = 0.83). Male students (M = 3.35, SD = 0.41) were also found to score higher on the RSC subscale than the female students (M = 3.09, SD = 0.29). A t test revealed a significant difference, t (93) = 3.37, p < .005, with a medium to large effect size (d = 0.74). For the SW subscale, male students (M = 3.34, SD = 0.25) achieved slightly better than female students (M = 3.29, SD = 0.29). However, an independent-samples t test revealed that the difference was not statistically significant, t (93) = .93, p > 0.05. The effect size was small (d = 0.18).

The descriptive analysis results of the RP and RSC sub-dimensions are shown in Table 4. For the RP sub-scale, significant gender differences were observed in items requiring analytical, mathematical, and reasoning skills. The largest difference was in Item 9, SE in ensuring the validity and reliability of research tools, where the males (M = 3.35, SD = 0.57) scored significantly higher than the females (M = 2.73, SD = 0.77), with a large effect size (d = 0.90). This was followed by Item 8, SE in identifying key concepts related to the research topic, where males (M = 3.26, SD = 0.72) also scored higher than females (M = 2.65, SD = 0.71) with a large effect size (d = 0.85). The ability to ensure the validity and reliability of research tools requires mathematical ability to interpret reliability

Table 2. Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean	Cohen's d
Scientific Writing	Male	43	3.34	.25	.04	0.18
	Female	52	3.29	.29	.04	
Research Planning	Male	43	3.40	.36	.06	0.83
	Female	52	3.11	.35	.05	
Research Skills & Communication	Male	43	3.35	.41	.07	0.74
	Female	52	3.09	.29	.04	

Table 3. Independent Samples t Test Results for RSE

Sub-scale	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI of the Difference	
								Lower	Upper
SW	.32	.576	.93	93	.36	.05	.057	-.06	.17
			.94	92.86	.35	.05	.056	-.06	.16
RP	.07	.788	3.96	93	.000	.28	.071	.14	.43
			3.94	87.03	.000	.28	.072	.14	.43
RSC	7.37	.008	3.48	93	.001	.25	.072	.11	.39
			3.37	73.00	.001	.25	.074	.10	.40

Note: SW: Scientific Writing, RP: Research Planning, RSC: Research Skills & Communication

coefficients, validity indices, and measurement scales. Analytical and reasoning skills support the conceptual analysis and abstraction needed to identify key concepts related to research topics. The large effect sizes in the RP subscale indicate notable differences in male and female students' perceived capabilities in core research planning activities within this sample. Lower self-efficacy in these areas may constrain students' abilities to independently conceptualize research problems and make informed methodological decisions, potentially affecting the rigor and quality of their research outputs.

For the RSC subscale, gender differences were also found in items requiring analytical, mathematical, and reasoning skills. The most notable difference was in Item 16, SE in determining an appropriate sample size, where the males (M = 3.74, SD = 0.82) scored higher than the females (M = 3.04, SD = 0.63), with a large effect size (d = 0.97). The next largest gender gap was in Item 19, SE in performing the data cleaning process, where the males (M = 3.30, SD = 0.80) also scored higher than the females (M = 2.73, SD = 0.53), with a large effect size (d = 0.85). Similarly, Items 13, SE in synthesizing previous research articles, and 15, SE in identifying gaps in the literature, showed medium-to-large effect sizes (d = 0.65 and d = 0.78, respectively), with males scoring higher than females. While identifying gaps in the literature and synthesizing previous research articles require analytical and reasoning skills to critically evaluate, compare studies, and integrate findings, determining an appropriate sample size and performing the data cleaning process require

Table 4. Mean Scores on the RSE Sub-Scales

Research self-efficacy sub-scale	**Male (n=43)**		**Female (n=52)**		**Cohen's d**
Self-efficacy in research planning	**Mean**	**SD**	**Mean**	**SD**	
7. I can formulate a research question or hypothesis.	3.05	.78	2.73	.68	0.44
8. I can identify key concepts related to the research topic.	3.26	.72	2.65	.71	0.85
9. I can ensure that my research tools are valid and reliable.	3.35	.57	2.73	.77	0.90
10. I can select appropriate sources for research needs.	3.49	.73	3.46	.69	0.04
11. I can organize research materials.	3.53	.55	3.44	.60	0.15
14. I can develop data collection procedures.	3.72	.73	3.67	.64	0.07
Self-efficacy in research skills and communication					
12. I can store my research records.	3.35	.61	3.42	.94	-0.09
13. I can identify gaps in the literature.	3.72	.67	3.17	.73	0.78
15. I can synthesize previous research articles.	3.56	.91	3.00	.82	0.65
16. I can determine an appropriate sample size.	3.74	.82	3.04	.63	0.97
17. I can select a suitable research design.	2.98	.83	2.81	.84	0.20
18. I can choose appropriate research methods.	3.02	.87	2.96	.63	0.07
19. I can perform a data cleaning process.	3.30	.80	2.73	.53	0.85
20. I can analyse data using statistical software.	3.09	.84	2.94	.73	0.19
21. I can analyse data using qualitative analysis tools.	3.07	.96	3.06	.61	0.01
22. I can present quantitative data by using graphs and tables.	3.14	.86	3.00	.67	0.18
23. I can present qualitative data by using descriptive texts.	3.98	.74	3.87	.69	0.15
24. I can defend my research results in front of an audience.	3.23	.81	3.17	.87	0.07

strong analytical and mathematical skills for statistical reasoning, quantitative judgement, error detection, and numerical verification. The medium-to-large and large effect sizes found in the RSC subscale suggest substantial gender differences in self-efficacy for performing analytical and quantitatively demanding research tasks. Lower perceived capabilities in these areas may lead to weaker study designs and greater susceptibility to analytical errors.

The absence of statistically meaningful gender differences in the SW subscale indicates comparable perceived competence among the two genders, suggesting that the observed disparities are concentrated in methodological reasoning and analytical execution, rather than in self-efficacy related to producing and integrating scholarly written work.

A multiple regression analysis was conducted to determine whether gender predicted RSE, controlling for age, research experience, field of study, and marital status. As can be seen in Tables 5 and 6, the model was statistically significant ($F(5, 89) = 5.99$, $p < 0.001$), accounting for 25% of the variance in RSE ($R^2 = 0.25$, Adjusted $R^2 = 0.21$). The Durbin-Watson statistic was 1.75, suggesting no evidence of autocorrelation in the residuals. Table 7 shows that gender had a

Table 5. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.50	.25	.21	.25	1.75

Note: Predictors: (Constant), field of study, gender, age, research experience, marital status. Dependent Variable: RSE

Table 6. ANOVA Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.90	5	.38	5.99	.000
	Residual	5.65	89	.06		
	Total	7.56	94			

Note: Dependent Variable: RSE. Predictors: (Constant), Field of Study, Gender, Age, Research Experience, Marital Status

Table 7. Coefficients

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig. Tolerance	Collinearity Statistics	
		Std. Error	Beta				VIF	
1	(Constant)	3.71	.16		24.0	.000		
	Gender	-.28	.05	-.49	-5.20	.000	.95	1.05
	Age	-.00	.03	-.02	-.17	.867	.98	1.03
	Research Experience	-.01	.04	-.07	-.38	.705	.94	1.07
	Marital Status	-.04	.05	-.06	-.67	.512	.97	1.03
	Field of Study	-.00	.03	-.01	-.10	.920	.97	1.04

Note: Dependent Variable: Research Self-Efficacy

significant negative effect on RSE (B = -0.28, β = -0.49, t = -5.20, p < .001). This indicates that females scored significantly lower on RSE than males, after controlling for other variables. Age, research experience, field of study, and marital status did not significantly predict RSE, as all p-values exceeded 0.05.

Individual interviews were conducted in the second phase of the study to further explain the gender differences observed in quantitative analysis. Three sociocultural mechanisms—family encouragement, research role models, and family–research conflict—were identified, which contextualize the quantitative findings by showing how gender norms and expectations influenced the availability and interpretation of efficacy-relevant information, thereby contributing to gender differences in RSE.

3.2. Sociocultural Factors Influencing Research Self-efficacy

3.2.1. Family Encouragement

This theme demonstrated how gender roles within the family structured social persuasion, access to mastery experiences, and interpretation of such experiences, thereby leading to gender differences in RSE in research tasks requiring analytical, mathematical, and reasoning skills. The qualitative data showed that females lacked motivation and confidence in using math and analytical skills, while males reported greater confidence. The difference in confidence levels stemmed from variations in parental support or investment in these areas during foundational learning stages. Most female students linked their low levels of confidence with either parents' advice to avoid learning the skills because of perceived unsuitability for their family roles or future jobs, or to a lack of parents' support in developing them. In contrast, male students acknowledged parents' funding and effort to help them learn these skills from an early age, with the aim of securing high-paid jobs or a comfortable life in the future.

"My parents said that learning math and complex problems was a waste of time which led me to believe I was not naturally inclined toward skills typically associated with boys." (ST6)

"My parents and teachers suggested it was acceptable for girls not to excel in math and that these skills were not necessary for me." (ST8)

Confidence in math and analytical abilities was fostered among male students from an early age, as they were encouraged to develop these skills and taught about their benefits. As these skills translated into RSE, they further reinforced males' self-efficacy.

"My dad drove me to extra math or STEM classes on weekends when I was a kid. He hoped that I would learn math and analytical skills through the courses to get benefits later when I entered the job market. I have benefited from my proficiency in these skills, especially when conducting quantitative research." (ST1)

"I attended math and calculation classes throughout primary and secondary schools because my parents believed boys should excel in these skills." (ST7)

Taken together, these findings suggest that parental expectations and norms functioned as a form of social persuasion, whereby female students felt discouraged from developing math/analytical skills, while male students were encouraged to do so. At the same time, different parental investment influenced access to mastery experiences, as male students were more likely to receive financial support and training opportunities to build competence. The norms also shaped how such experiences were interpreted. Female students internalized discouragement and limited learning opportunities as lack of ability, whereas men perceived encouragement and investment as evidence of their competence.

3.2.2. Role Models in Research

In this study, gender roles determined the availability and interpretation of vicarious experiences by influencing the visibility and relatability of research role models. When asked about role models in research, both male and female students predominantly mentioned male researchers. Male students viewed these figures as motivating role models for similar career paths, which boosted their RSE. In contrast, female students found no commonalities with male role models, which diminished their RSE.

In the following excerpts, female students expressed admiration for their male role models' accomplishments but noted a lack of female representatives and disparities in research opportunities and resources, leading to negative emotions.

"I have noticed that nearly all the honourees of research achievements on my university's fan page are male. They appear to have more opportunities and resources than I do, and most are either young or trained overseas. I feel discouraged." (ST11)

"I have rarely seen women recognized for research achievements from my primary school textbooks and online stories. I admire some math professors working overseas with remarkable accomplishments. But I feel a sense of distance from their success because the resources and opportunities they have seem quite different from mine." (ST9)

In the study, research accomplishments of role models had a significant impact in terms of giving motivation to male students. Male students gained confidence in their potential and skills when they compared their strengths and weaknesses with those of the successful ones to the point that they believed research would be their success area.

"I can think of some male friends who were once my schoolmates and are now publishing in reputed journals and getting promotions. Their research skills make me feel that I must try it." (ST15)

"There is a young colleague of mine at the university whom I admire because he is talented and has been awarded for his contributions to the field of technology research. I have learned a great deal from his research experiences. I am working hard to be able to do research with him." (ST12)

Overall, this qualitative theme demonstrates that gender norms framed who is visible and recognized as successful researchers. Male students had greater access to vicarious experiences with similar others, while female students faced limited or less relatable models. At the same time, the same type of information (i.e., successful researchers) was internalized differently across genders. Males identified with role models and interpreted their success as attainable and motivating, while females perceived distance and interpreted such success as less attainable due to unequal access to resources. Differing patterns of identification resulted in variations in RSE.

3.2.3. Family-research Conflict

Qualitative data suggest that sociocultural expectations structured opportunities for research practice and skills development for male and female students. Norms also influenced their emotional reactions, which affected self-efficacy judgements. The students of both genders had different views on the impact of family obligations on their RSE. Female students, either married or single, considered family duties as the main reason for not being able to develop their research skills. Therefore, they felt the RSE was deadlocked, causing them to feel disappointed, sad, and anxious when they had to give up family commitments for doing some research tasks. Male students, on the other hand, outright said that family commitments had no impact on their RSE. Moreover, four female students who were able to cope with both research tasks and family responsibilities at the same time mentioned tiredness. They were aware of their weaknesses in research but at the same time said they did not have enough time to improve them.

"I must do a lot around the house which takes away my time for drafting my thesis. After work, I feel drained from doing the house chores but still must do my research." (ST9)

"It is sad not to have enough time to sharpen my research skills. I want to take a data analysis course, but I cannot because there would be no one to look after my daughter at night during the three-month duration of the course." (ST3)

In general, male participants did not report feeling pressure regarding household chores or taking care of kids. Some even said that they felt "lucky" because their family members did most of the responsibilities for them.

"I have few responsibilities at home, so I can concentrate on my research." (ST4)

"I feel lucky that I am not like my married

female friends whose work on their thesis proposals was disrupted, as my mom takes care of most household duties." (ST7)

Collectively, the findings suggest that gender norms assigned caregiving and domestic responsibilities primarily to women, thereby reducing their access to mastery experiences (opportunities for practice and skill development) and resulting in negative emotional responses. Male students had fewer constraints and more time to engage in research, thereby maintaining more stable confidence compared to their female counterparts.

4. Discussions

This study contributes to the literature by drawing on Social Cognitive Theory and a gender perspective to explore gender differences in RSE in the Vietnamese context, an under-researched area. SCT helps to explain the mechanisms through which RSE develops while the gender perspective explains why those mechanisms are uneven across genders due to social norms and expectations. The quantitative data indicated that there were notable differences between genders in the RP and RSC subscales, with the differences mainly occurring in items that were perceived as requiring mathematical, analytical, or reasoning skills. Gender negatively impacted RSE with women reporting lower self-efficacy than men on every item. The interviews disclosed that these gendered patterns of RSE were not just individual-level phenomena but were also ingrained in the bigger social contexts. The gender perspective makes explicit how gendered social structures condition access to efficacy-relevant information, thereby producing differentiated RSE trajectories for men and women. In this study, the findings should be interpreted as reflecting socially and contextually shaped variations in RSE, rather than indicators of actual competence.

The study revealed that gender had a negative effect on RSE, which is contradictory to the results of Ashrafi-Rizi *et al*. (2015) and Gaoat *et al*. (2023), both of which reported an absence of gender differences in RSE. Nevertheless, it is consistent with the studies of Seng *et al.* (2020) and Stewart *et al*. (2020) where higher self-efficacy scores for males were indicated. This study differs from the previous quantitative studies that characterized gender differences in RSE within a binary framework in that it pointed out certain areas where males and females differed most, notably in self-efficacy related to statistical, analytical, and reasoning skills. The current research supported the view that women often perceive themselves as having less ability in the areas of logical reasoning, statistical analysis, and related skills. For example, Lin and Tsai (2018) identified the case in which male students displayed more self-efficacy than female students in terms of understanding and applying scientific concepts. Additionally, the literature reveals a pattern of higher male students' confidence in their logical reasoning, spatial abilities (Syzmanowicz & Furnham, 2011), and math-related skills (Breda *et al*., 2023), as well.

One variable, gender, had a strong direct correlation with RSE in this study, while the other variables did not. In this study, differences in age did not significantly affect RSE, as students in master's programs might be considered to have comparable academic experiences irrespective of their ages. The same might be true for formal research training and exposure, which, though present among the participants, might be so similar that they did not introduce variability in the prediction of RSE. At the local university where the research was conducted, research students have limited access to advanced facilities and global academic connections. Master's programs usually offer a common structure involving coursework, research, and thesis writing, with little participation in industry-related projects (Tran & Nguyen, 2022). This common structure and lack of resources might have equalized differences between RSE in different disciplines. Although age, research experience, field of study, and marital status did not significantly predict RSE in this study, these factors may still interact with gender in shaping RSE in more nuanced ways. For example, gender differences in RSE may be experienced differently by younger or older students, or by those with varying family responsibilities, which may influence time

availability and engagement in research activities. Similarly, research experience and field of study may interact with gender through differences in research cultures or mentoring opportunities. Future research could use larger and more diverse samples to statistically investigate interaction effects between gender and these variables.

The influence of gender-related stereotypes on SE disparities has been documented in the literature. In the study by Carroll *et al*. (2024), encouragement from both parents and teachers enhanced boys' SE in learning physics. On the other hand, girls had an adverse view of the subject through a perception of the lack of support and even cultivated beliefs of being powerless in learning the subject. This current study confirmed the manifestation of gender stereotypes through family support and demonstrated its impact on how both boys and girls built up their early confidence in certain knowledge and skills. These results show the mutual influence of sociocultural contexts and personal beliefs, as suggested by SCT (Bandura, 1997). Family support works as a tool of social persuasion, which is gradually weakening girls' self-efficacy and reinforcing boys' self-efficacy at the same time.

The powerful impact of gender stereotypes rooted in Vietnamese family traditions suggests that improving females' RSE should begin within Vietnamese families. It appears that girls and boys should be provided with equal support and investment to select the skills and knowledge they would like to follow. Educational systems can significantly influence girls' interests and self-beliefs with respect to the traditionally male-associated skills and knowledge. The more analytical, statistical, and reasoning tasks are offered to females through inside and outside classroom teaching, the more their perceived capability in these areas may be increased and they will possibly be able to get into higher education with a desire to excel in research.

Male and female participants of this study were subject to the influence of the predominance of male research role models in different ways. The females reported having their RSE reduced because of the perceived differences in the amounts and quality of research opportunities and resources and underrepresentation in research. In contrast, the males drew RSE from the male role models and their accomplishments. This interaction posits observational learning in the context of SCT, where it was highlighted that for successful modelling, the observer must perceive some degree of similarity with the model; without having relatable female role models, women's RSE was reduced (Bandura, 1997). The literature has indicated that women's access to such role models can facilitate their interest, motivation, and self-confidence in occupations that have been traditionally dominated by men. For example, Porter and Serra (2020) and Usher *et al.* (2019) advocated women's requirement for role model exposure to whom they could relate to bolster their thoughts about their research potential and curb the adverse effects of gender stereotypes. If women's RSE is to be increased, then it should be the case that acknowledgment and acceptance of successful female researchers become common practice. Narratives of female researchers along with their motivational talks should take a larger share of textbooks, the media, and academic courses (T. N. Nguyen *et al*., 2020).

Findings from the interview data provided strong evidence that gender role-related sociocultural expectations were a major factor negatively influencing the RSE of female students (Bandura, 1997). Adherence to the traditional understanding of the gender roles, such as prioritizing home duties over research responsibilities led to a decline in the RSE of some female students. For other women, dealing with both research responsibilities and family obligations resulted in stress and exhaustion. The negative impact of work-family conflict on women's SE has been underlined by previous research (Lapierre *et al*., 2018; Levy & Myers, 2023). A flexible schedule for online research training programs can be one way of reducing the impact of family-research conflict on female students' RSE and at the same time enabling women at the local university to learn research skills without any interference with their family roles. Onsite or online research communities

led by experienced female researchers can offer mentorship to female students who want to reduce stress caused by the research-family conflict and gain a balancing act between family and research duties.

5. Conclusions

The application of a gender perspective to SCT in this research revealed the interplay of psychological mechanisms and sociocultural settings to generate and maintain gender disparities in RSE in Vietnam. The gender perspective contextualizes SCT by specifying how gendered social norms and expectations shape individuals' access to and interpretation of the efficacy sources proposed by the theory. The current research showed that men and women differed in their RSE, with the largest gaps evident in tasks perceived as demanding math, analytical, or reasoning skills. Moreover, specific social-cultural factors in Vietnam contributed to the effect of gender on RSE.

It is important to consider the limitations of the study when drawing conclusions. First, participants were not randomly selected, making it difficult to generalize the results. Second, the use of the questionnaire and interviews in the current study bears the limitations associated with self-reported measures of RSE. Participants may not have provided fully accurate information due to social desirability or difficulties in remembering past events, thereby threatening internal validity. In addition, students' responses may have been shaped by culturally influenced norms such as tendencies toward modesty or self-enhancement, which can affect how individuals evaluate and report their research capabilities. Accordingly, results should be interpreted with caution because they may reflect students' perceptions and socially mediated beliefs rather than their actual research behaviors, competencies, or experiences. Third, the relatively small number of 95 students in the survey may have made it difficult to detect subtle patterns and reduced the generalizability of the results. Therefore, future researchers should adopt random sampling methods, increase the number of survey participants, and include participants from different universities or institutions. Triangulation of self-reported data with behavioral observations can also enhance the validity of the results.

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