

Article

An Investigation into the Perspectives of Elementary Pre-Service Teachers on Sustainable Development

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Abstract: Teachers in elementary schools play a crucial role in educating children about sustainable development. Therefore, the concept of sustainable development is essential for elementary pre-service teachers to be ready for their future careers. This study used the sequential mixed methods design to investigate the relationship between the sustainable development perspectives of elementary pre-service teachers in Southern Vietnam and the current teacher training curriculum. The EDINSOST sustainability questionnaire was distributed to 392 participants in order to measure four dimensions of sustainable development: critical contextualization of knowledge, sustainable use of resources, participation in community processes, and ethics. A set of six interview questions was conducted with eight participants, focused on their understandings of sustainable development and the evaluation of the curriculum on sustainable development. Quantitative findings revealed that elementary pre-service teachers rate moderately on all dimensions; however, the knowledge is slightly higher than the behavior. Moreover, there were variations in perspectives based on pre-service teachers' grade level and gender. Qualitative findings suggested the lack of sustainable development perspectives amongst pre-service teachers and the gaps in the teacher training curriculums regarding sustainable development. Finally, detailed discussions regarding the implementation of sustainable development in the training curriculum were provided.

Keywords: education for sustainable development; elementary pre-service teacher; teacher education; training curriculum; sustainable development



Citation: Nguyen, L.-H.-P.; Bui, N.-B.-T.; Nguyen, T.-N.-C.; Huang, C.-F. An Investigation into the Perspectives of Elementary Pre-Service Teachers on Sustainable Development. *Sustainability* **2022**, *14*, 9943. <https://doi.org/10.3390/su14169943>

Academic Editors: Teen-Hang Meen, Chun-Yen Chang, Charles Tijus and Po-Lei Lee

Received: 30 June 2022

Accepted: 10 August 2022

Published: 11 August 2022

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1. Introduction

Environmental and social challenges have always captured the focus of global public opinion for many decades. The greenhouse effect, global warming, and pollution have had a significant impact on biodiversity in the natural world [1,2]. Furthermore, the overuse of natural resources to promote economic development and fulfill the requirements of a rising population is one of the hazards to our world [3–7]. As a result, sustainability has emerged as the new paradigm of development to tackle these issues [1,2,8]. In this context, UNESCO stated that education is the essential tool for achieving sustainability by increasing knowledge, skills, and attitudes and by empowering future generations to make changes in our world [9].

Sustainable development was defined as “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [10] (p. 43). The 2030 Agenda proposes a worldwide action plan with seventeen Sustainable Development Goals (SDGs). Quality education (Goal 4) is the key to attaining all the SDGs by promoting responsible actions for environmental integrity, economic viability, and just society [9,11]. To become a practical solution, education for sustainable

development (ESD) must be fostered in higher education [12]. Higher education institutions play an important role because they are responsible for forming next-generation professionals, which will have a decisive impact on their different professional contexts and social engagements [13,14].

Nowadays, universities have considered sustainability strategy as a part of their responsibility [15]. Even though higher education plays a crucial role in sustainable development [12], its contribution to sustainable society and economic growth has been underestimated [16,17]. Despite the contradicting findings, all university disciplines agreed on the need to support teacher education, especially at the elementary level [18]. This is the first stage in the compulsory education system, and future teachers will become role models for children [8]. Elementary pre-service teachers are responsible for shaping children's minds [19,20] and providing children with the knowledge to act in sustainable ways [21,22]. Most pre-service teachers are in late adolescence, a critical age for identity development. They are also young enough to be more easily influenced by the ideas discussed in their classrooms than senior teachers [23]. Hence, pre-service teachers are viewed as "changing agents" and "catalysts" in sustainable development issues [24].

In recent literature, the majority of studies about sustainability development focused on the environmental knowledge of pre-service teachers [6,20,22,25,26], while some studies used three components, including knowledge, attitudes, and behaviors, to examine their sustainable development competence [21]. Similar findings showed that pre-service teachers had an insufficient understanding of "sustainable development". They felt unsure about the meaning of this concept [27] with many definitions, where "everything can be sustainable development" [28]. However, elementary pre-service teachers' attitudes regarding environmental issues were quite positive, while their actions were moderate [21]. Based on the levels of competencies from Miller's Pyramid (1990) [29], a lower sustainability competence of pre-service teachers is observed at the first level of the taxonomy (know) than at the other two levels of the taxonomy (understand and do) [30,31]. In addition, there was no homogeneity regarding pre-service teachers' perspectives on sustainability among universities [31]. The perspective on sustainability in which pre-service teachers achieved the worst results was the action in the community. In contrast, the perspective on ethical principles of sustainability was developed more in higher education [31–33].

In addition, pre-service teachers improved their sustainable development competencies from the first to the fourth year of university, although the results they achieved were far from expected [31,32]. The seniors showed a higher level of understanding of sustainability concepts as well as acting in their teaching process in sustainable ways than the freshmen [33]. Their development of sustainable development competencies was confirmed by the contributions of the training curriculum [34,35], in which citizenship education was considered a key aspect [31]. The literature regarding strategies for integrating sustainability into the higher education curriculum was especially abundant [36]. Some ESD courses (e.g., board games, augmented reality applications) or integrating this topic into higher education had a positive effect on pre-service teachers' environmental awareness [33,37,38]. Besides, the teaching content and lecturers' teaching skills were among the elements contributing to the enacted curriculum's success towards the sustainability competence of pre-service teachers [19,20,39,40]. In higher education, there was still a gap between sustainability awareness and pedagogy skills, in which lecturers focused on content-based teaching with memorization activities instead of developing the pre-service teachers' competencies [41]. This led to the reality that pre-service teachers' sustainability competencies did not meet learning goals [42].

Moreover, the gender variable influencing pre-service teachers' perceptions of sustainability was still a controversial issue [21,25]. Some research studies found that there was no significant difference in their attitudes and perceptions about sustainability based on gender [21,43,44]. However, another research study pointed out a link between the gender of pre-service teachers and the components of environmental literacy (environmental knowledge, attitudes, and behaviors). For instance, female pre-service teachers have

been highlighted as having more positive environmental attitudes [45] and having more eco-friendlier behaviors than their male peers [21]. For instance, females were more likely to engage in sustainable consumer behavior and judge environmental issues to be more problematic than males, because they consider safety and health more [46]. Meanwhile, results from another quantitative study showed that male pre-service teachers have more environmental knowledge than females [21]. This can be explained by the fact that men seem to be more disciplined and tend to seek sustainability information [47,48].

In Vietnam, the government has adopted the World Commission on Environment and Development (1987) [10] definition of sustainable development, which makes close associations between the concepts of economic development, social progress, and environmental protection [49]. Vietnam has shown an explicit commitment to this movement in the form of a policy statement [49,50]. The Vietnamese National Action Plan for ESD stated: “As a member of the United Nations and UNESCO, Vietnam will continue its active involvement in activities under the framework of the ESD” [51]. The Ministry of Education and Training has integrated environmental issues into the education curriculum since 2009 and has promoted some ESD principles. However, this is not a comprehension approach [52] because only a few topics related to sustainable development were integrated into teaching, such as population, saving energy, and heritage. Additionally, they appeared to be “add-on knowledge” in an overloaded curriculum [53].

Most studies in Vietnam on sustainable development focused on the perspectives of general teachers and education stakeholders, such as school administrators and policymakers [54]. ESD implementation challenges in teacher education institutions were considered [41]. However, the perspectives of elementary pre-service teachers on this issue were expanding but were still not as broad as in other areas. Meanwhile, they will be the main influencers and decision-makers of the future for children and the community [55]. Implementing ESD for elementary students does not guarantee quality unless the pre-service teachers’ views on this issue are noted. Therefore, an investigation of their perspectives on sustainable development in the Vietnamese context is worth conducting.

Based on this view, this paper aims to examine the perspectives of elementary pre-service teachers on sustainable development and analyze their sustainable development competencies through the current teacher training curriculum. This paper seeks to answer the following research questions:

1. Which level are the perspectives and competencies of elementary pre-service teachers on sustainable development?
2. How are elementary pre-service teachers’ perspectives and competencies on sustainable development varied by gender?
3. To what extent do elementary pre-service teachers receive sustainable development from the training curriculum?

2. Materials and Methods

2.1. Research Design

This study adopted a sequential mixed-methods design to explore research questions. A mixed-method approach builds a more robust study than only qualitative or quantitative research [56]. In the field of ESD, mixed methods research provided a wealth of information and allowed a more thorough analysis of individual perspectives toward sustainable development [57,58]. For this study, the quantitative method would provide a basis and broader picture of the level of elementary pre-service teachers’ competencies and perspectives on sustainable development based on different dimensions, but to gain deeper insight, the qualitative method was added. The qualitative method would complement this picture by adding more detailed information about pre-service teachers’ correct and incorrect (or incomplete) understanding of sustainable development and how they apply strategies for sustainable development in their own teaching as an explanation for the quantitative results. Moreover, it is important to develop a qualitative method aimed at assessing whether an effective integration of sustainability into the training curriculum and

into university teaching exists and to determine whether or not pre-service teachers achieve better learning outcomes in sustainable competencies from the enacted curriculum. In other words, the quantitative data were collected first. The qualitative data were collected after the quantitative data and were meant to explain the results of the quantitative data.

2.2. Participants and Sampling Design

For the quantitative method, a random sample of 480 elementary pre-service teachers enrolled in a four-year program in the elementary education department at a university of education in Southern Vietnam was invited by email to participate in this research. In total, we received 392 responses (81.67%) from the invited sample. Participants consisted of 101 freshmen, 95 sophomores, 98 juniors, and 98 seniors, with no missing data. There are 307 females (78.32%) and 85 males (21.68%), which reflects the distribution of gender in the teaching sources in Vietnamese elementary education [59], with over 70% of female teachers in elementary education in Vietnam from 2010 to 2020. The detailed demographic information is described in Table 1.

Table 1. The summary of participant demography ($n = 392$).

Background	Frequency (n)	Percent (%)
Gender		
Male	85	21.68
Female	307	78.32
Year at university		
Freshman	101	25.77
Sophomore	95	24.23
Junior	98	25.00
Senior	98	25.00
How well do you know education for sustainable development?		
Do not know	36	9.18
Know name only	197	50.26
Know a few	154	39.29
Know well	5	1.28

For the qualitative method, the interview sampling literature suggests that the ideal individual size is between 6 and 12 people [56]. Most themes in the study were identified within six interviews, and no new codes emerged after conducting ten interviews [60]. A number of new codes were identified in the first eight individual interviews with over 80% saturation [61]. Based on these results, we started the interview and continued until we recognized data saturation to have been reached. After the analyzing process, the interview data were gathered from eight Vietnamese elementary pre-service teachers.

The criterion sampling method was used in selecting interviewees for this research. The main criterion in the selection of pre-service teachers is that they have experience learning with the elementary education curriculum for at least one semester. Another criterion was that pre-service teachers were concerned about reflecting on the current training curriculum because this study attempted to both understand pre-service teachers' perspectives on sustainable development and assess the effectiveness of implementing sustainable development in the training curriculum. The demographic features of the elementary pre-service teachers are shown in Table 2.

Table 2. The information of interviewees ($n = 8$).

Pseudo	Gender	Year at University	Self-Perception of Education for Sustainable Development	Interview Date
A12	Female	1st year	Do not know	12 April 2022
A17	Male	1st year	Know name only	17 April 2022
A24	Female	2nd year	Know a few	24 April 2022
A30	Female	2nd year	Know well	30 April 2022
M01	Female	3rd year	Do not know	1 May 2022
M04	Female	3rd year	Know name only	4 April 2022
M05	Male	4th year	Know a few	5 April 2022
M07	Female	4th year	Know well	7 May 2022

2.3. Instruments

2.3.1. EDINSOST Sustainability Questionnaire

For the collection of the quantitative data, this study used the EDINSOST sustainability questionnaire [28]. This questionnaire consists of 18 questions concerning four dimensions of sustainability competencies: critical contextualization of knowledge, sustainable use of resources, participation in community processes, and ethics. The items of each dimension were sorted by three competency levels, including “Know” (level 1), “Know-how” (level 2), and “Demonstrate and Do” (level 3) (see Table 3). The participants were asked to state how much they agree with these statements on a four-point Likert scale ranging from “strongly disagree” to “strongly agree”.

Table 3. The validities and reliabilities of the EDINSOST sustainability questionnaire.

Dimension	Items	Cronbach's Alpha	Items (Competency Level)			Sample Item
			Level 1	Level 2	Level 3	
1. Critical contextualization of knowledge	1–6	0.81	1, 4	2, 5	3, 6	I know the interrelation between natural, social, and economic systems.
2. Sustainable use of resources	7–9	0.70	7	8	9	I know how to develop educational actions that minimize negative socio-environmental impacts.
3. Participation in community processes	10–12	0.78	10	11	12	I design and carry out socio-educational activities in participatory community processes that promote sustainability, feeling myself an integral part of my environment.
4. Ethics	13–18	0.77	13, 16	14, 17	15, 18	I consider the promotion of sustainable human development as a fundamental purpose of citizen education.
Total	18	0.91	6	6	6	

Because the original questionnaire [33], which is in English, has not been translated to Vietnamese, the survey was first translated into Vietnamese by all the authors. Then the translated survey was translated back into English as a validity check by a university lecturer that is an expert in ESD and one university lecturer that is from the English Department. After checking the transferability and accuracy of the translation, a pilot study with $N = 30$ was conducted to check if the instrument was understood by the participants. The information on the reliability and validity of the questionnaire is shown in Table 3.

As shown in Table 3, the reliability statistic indicated that the internal consistency of all dimensions was reliable enough; Cronbach's Alpha was from 0.70 to 0.81. Overall, the Cronbach's alpha coefficient in the questionnaire of this study was 0.91, showing that the reliability level of this research is high enough. It means the reliability of this questionnaire was considered acceptable.

2.3.2. The Set of Interview Questions

For the collection of the qualitative data, this study used a set of open-ended questions adapted from a previous study [62]. Of the eight initial questions, this research used four questions. Furthermore, we decided to add two more questions based on the literature review regarding the effectiveness of transferring sustainability in the curriculum [32,33]. These added questions related to the perspectives on sustainable development and the evaluation of the curriculum on sustainable development. Finally, a full set of interview questions with a total of six questions (see Table 4).

Table 4. Guiding interview questions.

Interview Question	Source
1. What do you understand by the concept of sustainable development?	[52]
2. What are the SDGs? Can you list some of them?	[52]
3. What is ESD? Is it necessary for education? Why (not)?	[27]
4. How can you incorporate ESD in the classroom and in the community? List some methods.	[52]
5. How is sustainable development shown in the Bachelor Curriculum of the Elementary Education Department? Which courses or activities?	[27,28]
6. With your current training curriculum, do you feel capable of including ESD in the elementary classroom? What is your suggestion?	[52]

2.4. Data Collection and Data Analysis

For the quantitative data collection, an online survey was distributed by the authors to all participants in March 2022 by email. Before administering the study, the researchers emphasized that the participation was voluntary. Their personal information would be treated confidentially, and all data would be used for research purposes only. The data collection occurred from 7 March to 31 March 2022. Finally, we gathered 392 responses.

The quantitative data were analyzed by SPSS Statistics 27.0. The analytic strategy was as follows: The means (M) and standard deviations (SD) were calculated for sustainable development perspective variables of male and female pre-service teachers across four years at university. An independent *t*-test was performed to test the differences between these two genders, while a one-way ANOVA was conducted to determine if there was a statistically significant difference among the groups of four years at university. We are not only interested in knowing if there are differences, but also how big those differences are. Thus, Cohen's *d* was calculated for each question to measure the size of the effect.

For the qualitative data collection, semi-structured interviews were used. Before the interviews were conducted, the participants were explained the purpose of the interviews by the interviewer (in that case, the author). It was emphasized that there were no right or wrong answers, and the participants were encouraged to share as much of their views as possible. The privacy of the participants was ensured, and pseudonyms were used for all the participants. Due to the COVID-19 pandemic, all the interviews were individually conducted online using Zoom meetings on different days from 12 April to 7 May 2022. Each interview lasted around 40 min. All the interviews were video-recorded for the subsequent transcription and analysis of the data.

The qualitative data were analyzed following thematic analysis guidelines [63] to investigate the answers of participants related to their understanding and application of sustainable development, as well as their evaluations of the implementation of sustainable development in the training curriculum. Firstly, the interview audio recordings were

transcribed verbatim. To have an overall understanding of the data, the researchers listened to the recordings and read the manuscript repeatedly before the coding and analysis began. Next, the codes were then generated by grouping sentences and phrases with similar meanings. Once the coding of the first set of data (the interview of one of the participants) was completed, the researchers revised and refined the codes to eliminate any overlap and redundancy. After that, the researchers continued coding the remaining data set. The final set of codes was then revised and refined to form broader themes for report and discussion.

The research procedure is illustrated in Figure 1.

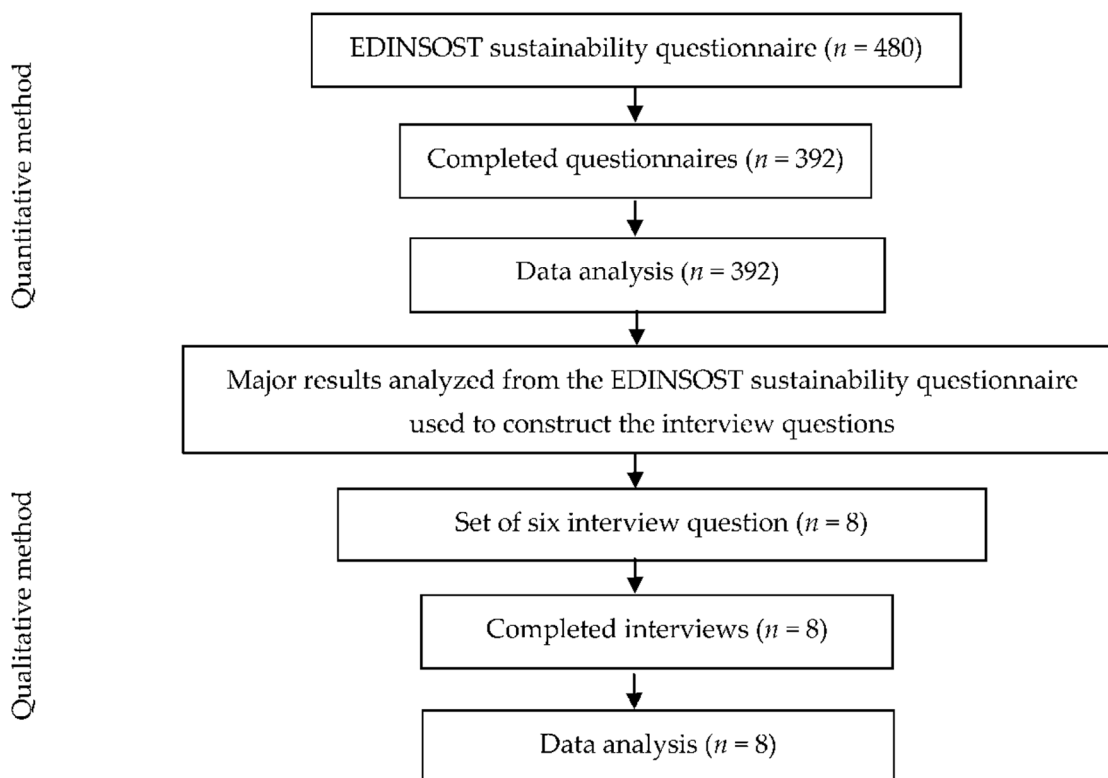


Figure 1. Mixed-methods design study flow chart.

3. Results

3.1. Quantitative Findings

3.1.1. Sustainable Development Perspectives and Competency Levels across Grade Levels

Research question 1: Which level are the perspectives and competencies of elementary pre-service teachers on sustainable development? This study applies the one-way ANOVA to determine if there is a statistically significant difference among the groups of four years at university.

Table 5 indicates that elementary pre-service teachers' perspectives on sustainable development from four dimensions were moderate for all grade levels, ranging from 2.67 to 2.98 in total. It could be said that these participants' self-reflection on their own perspectives of sustainable development is not high. Despite the moderate scores, their perspectives had a rising trend from the first year to the fourth year. With the dimension of sustainable use of resources, there was $t(392) = 3.27, p < 0.05$. With the dimension of participation in community processes, there was $t(392) = 4.12, p < 0.01$. With the dimension of ethics, there was $t(392) = 3.72, p < 0.05$. That meant these three dimensions had statistically significant differences over the four years of university. It could be understood that the ideas of freshmen seem to be more simplistic than those of seniors, since they have yet to complete a course or receive extracurricular training in sustainability [64–66]. However, the improvement of pre-service teachers' sustainability perspectives from the first year to the fourth year was not as much as expected because all items scored lower than 3.00 on the

4-Likert scale. Only the first dimension (critical contextualization of knowledge) does not show any statistically significant change during their academic studies, with $t(392) = 2.50$, $p > 0.05$.

Table 5. Summary of one-way ANOVA across grade levels.

Dimension	Freshman (<i>n</i> = 101)		Sophomore (<i>n</i> = 95)		Junior (<i>n</i> = 98)		Senior (<i>n</i> = 98)		F-Value
	M	SD	M	SD	M	SD	M	SD	
Perspective									
Critical contextualization of knowledge	2.50	0.58	2.68	0.59	2.68	0.67	2.71	0.70	2.50
Sustainable use of resources	2.82	0.61	2.97	0.60	2.95	0.58	3.08	0.57	3.27 **
Participation in community processes	2.70	0.66	3.01	0.56	2.95	0.63	3.06	0.62	4.12 ***
Ethics	2.71	0.67	2.83	0.52	2.93	0.50	2.97	0.65	3.72 **
Competency level									
Know	2.91	0.63	3.05	0.55	2.99	0.51	3.11	0.59	2.25
Know-how	2.58	0.57	2.86	0.54	2.81	0.59	2.89	0.66	5.50 ***
Demonstrate and do	2.54	0.63	2.69	0.59	2.73	0.55	2.79	0.74	2.74 **
Total	2.67	0.57	2.95	0.47	2.87	0.51	2.98	0.57	7.06 ***

Note. ** $p < 0.05$; *** $p < 0.01$.

Moreover, the Tukey post hoc test results suggested that the difference between the sophomore and junior groups was insignificant. Only the comparison between the senior and freshman groups was significant among the four groups of grade level. The senior group ($M = 3.08$, $SD = 0.57$) had a better score than the freshman group ($M = 2.82$, $SD = 0.61$) for the dimension of sustainable use of resources. The senior group ($M = 3.06$, $SD = 0.62$) had a better score than the freshman group ($M = 2.70$, $SD = 0.66$) for the dimension of participation in community processes. The senior group ($M = 2.97$, $SD = 0.65$) had a better score than the freshman group ($M = 2.71$, $SD = 0.67$) for the dimension of ethics (see Table 5). It could be explained that the sophomores and juniors were in the learning process with a general knowledge base optimized for being ready to join specialized sustainability courses in the future, so their sustainability perspective did not show development in the two middle years of university [65].

Additionally, Table 5 also described the competency dimension of sustainable development in three levels: Know, Know-how, Demonstrate and Do. Pre-service teachers rated Know level with the highest scores ($2.91 < M < 3.11$), while they rated the Demonstrate and do level with the lowest scores ($2.54 < M < 2.79$). With the dimension of the Know-how level, there was $t(392) = 5.50$, $p < 0.01$. With the dimension of the Demonstrate and Do level, there was $t(392) = 2.74$, $p < 0.05$ (see Table 5). That meant there were statistically significant differences in two dimensions during the four years of university. However, the data did not show statistically significant changes in the dimension of the Know level with $t = 2.25$, $p > 0.05$. Noticeably, as can be seen from the data presented in Table 5, the sophomore group states that in some dimensions of perspectives (Critical contextualization of knowledge, sustainable use of resources, participation in community processes) and some levels of competencies (Know, Know-how) they have higher scores than the junior group. This situation can be explained by the effect detailed by Kruger and Dunnin [67], according to which an individual with fewer competencies and less knowledge has an illusory feeling of superiority, considering themselves to be more intelligent than another, better-prepared individual. The freshmen and the seniors were more consistent in their answers.

For more details, the result of pre-service perspectives is applied to each question. As shown in Figure 2, the X-axis contains the 18 questions of the EDINSOST Sustainability Questionnaire. The Y-axis on the left identifies the mean scores of sustainable development

perspectives corresponding to each question, while the Y-axis on the right presents the p -value obtained for each question.

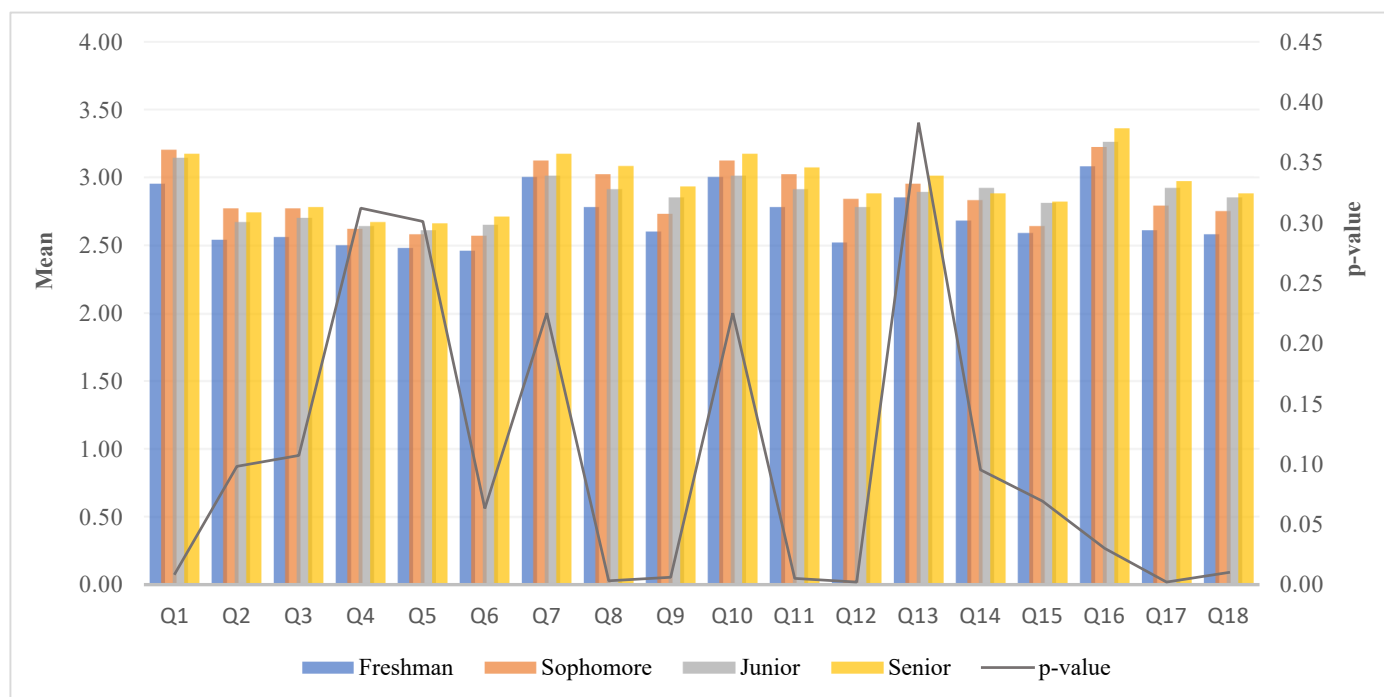


Figure 2. Detailed scores on sustainable development perspectives across grade levels.

Figure 2 shows the senior group rated higher scores than the freshman, sophomore, and junior groups for all 18 items. However, there are only significant differences ($p < 0.05$) in eight questions, including Q1, Q8, Q9, Q11, Q12, Q16, Q17, and Q18. Therefore, the data corresponding to these eight questions will be analyzed in more detail by Cohen's d to know how different they are (see Figure 3). In these questions, pre-service teachers are asked whether they know how to interrelate between natural, social, and economic systems (Q1); develop educational actions to minimize negative socio-environmental impacts (Q8), and design educational activities with concern about the negative socio-environmental impacts and corrective actions (Q9), develop myself in community educational projects (Q11), carry out socio-educational activities in the community (Q12), consider the sustainable human development as a fundamental purpose of citizen education (Q16), analyze the consequences that personal performance may have on the integral development of students (Q17), design educational intervention proposals that integrate sustainability values (Q18).

Figure 3 illustrates the Cohen's d for eight questions to measure the effect size. The size of all measured effects was small, with the Cohen's d ranging from 0.13 to 0.39. However, the effect sizes corresponding to questions Q9, Q11, Q12, and Q17 were quite larger than the remaining questions, with significant differences at 0.22, 0.33, 0.26, and 0.39, respectively.

It could be concluded that elementary pre-service teachers' perspectives on the sustainable development concept have a noticeable improvement over the four years at university, especially in the following aspects: participation in community processes ($d = 0.33$ for Q11 and $d = 0.26$ for Q12), ethics ($d = 0.39$ for Q17), and sustainable use of resources ($d = 0.22$ for Q9) (see Figure 3). Taken together, the data of this study should not be interpreted as a generalized increase in the sustainability perspectives and competencies of pre-service teachers corresponding to all the eighteen questions analyzed, but rather that a minority of questions in which participants have greatly increased their learning.

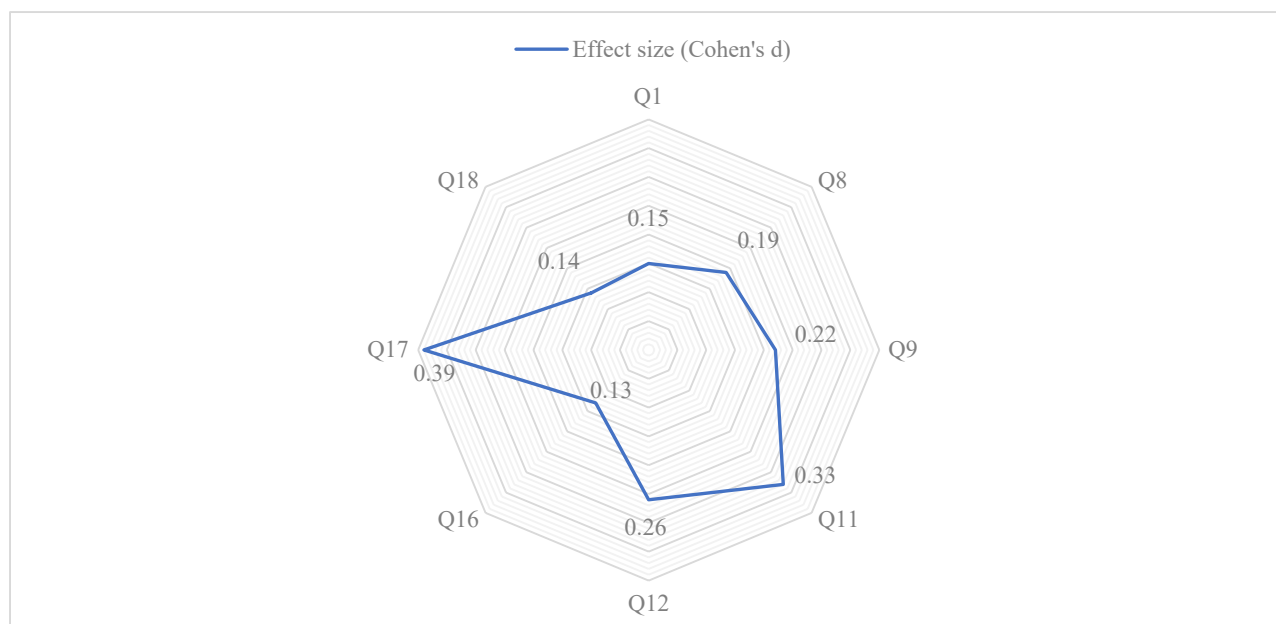


Figure 3. The effect size of sustainable development across the grade levels.

3.1.2. Sustainable Development Perspectives and Competency Levels across the Genders

Research question 2: How are elementary pre-service teachers' perspectives and competencies on sustainable development varied by gender? An independent *t*-test was performed to test the differences between these two genders regarding perspectives on sustainable development.

Table 6 presented the perspectives and competency levels of sustainable development between male and female elementary pre-service teachers. In general, the total score of both perspective and competency level dimensions rated by the male group ($M = 3.06$, $SD = 0.61$) were higher than the female group ($M = 2.81$, $SD = 0.52$).

Table 6. Summary of independent *t*-test across the genders.

Dimension	Male (<i>n</i> = 85)		Female (<i>n</i> = 307)		t-Value
	M	SD	M	SD	
Perspective					
Critical contextualization of knowledge	2.86	0.71	2.58	0.61	3.57 ***
Sustainable use of resources	3.08	0.67	2.92	0.55	2.26 **
Participation in community processes	3.06	0.78	2.95	0.58	1.87
Ethics	3.11	0.59	2.79	0.60	4.40 ***
Competency level					
Know	3.19	0.63	2.97	0.55	3.16 ***
Know-how	2.98	0.67	2.73	0.57	3.40 ***
Demonstrate and Do	2.91	0.68	2.63	0.60	3.64 ***
Total	3.06	0.61	2.81	0.52	3.82 ***

Note. ** $p < 0.05$; *** $p < 0.01$.

Regarding the perspective dimensions, the male group showed significantly higher scores than the female group on three dimensions: critical contextualization of knowledge, sustainable use of resources, and ethics. With the dimension of critical contextualization of knowledge, there was $t(392) = 3.57$, $p < 0.01$. With the dimension of sustainable use of resources, there was $t(392) = 2.26$, $p < 0.05$. With the dimension of ethics, there was $t(392) = 4.40$, $p < 0.01$. The only third dimension, participation in community processes, did not show a statistically significant difference between males and females with $t = 1.87$,

$p > 0.05$. That meant the perspectives on sustainable development of the female group were significantly lower than those of the male group, except for how they participate in community processes that promote sustainability.

Regarding the competency level dimensions, all three dimensions of competency levels showed statistically significant differences across the genders. With the dimension of the Know level, the male group ($M = 3.19$, $SD = 0.63$) had a significantly higher score than the female group ($M = 2.97$, $SD = 0.55$) with $t(392) = 3.16$, $p < 0.01$. With the dimension of the Know-how level, the male group ($M = 2.98$, $SD = 0.67$) also had a significantly higher score than the female group ($M = 2.73$, $SD = 0.57$) with $t(392) = 3.40$, $p < 0.01$. With the dimension of the Demonstrate and Do level, the male group ($M = 2.91$, $SD = 0.68$) had a significantly higher mean than the female group ($M = 2.63$, $SD = 0.60$) with $t(392) = 3.64$, $p < 0.01$. Thus, gender differences were observed in all levels of sustainability competency. Male pre-service teachers' competencies were at higher levels than those of females following the gradation: demonstrate and do level < Know-how level < Know level. The findings of this study confirmed the findings of others [21], that male pre-service teachers have better environmental competencies than females, especially in their knowledge. This can be explained by the fact that men seem to be more disciplined and tend to seek sustainability information [47,48].

To add more detail about elementary pre-service teachers' perspectives, Figure 4 depicts the scores of the sustainable development perspectives of males and females, corresponding to 18 questions on the left Y-axis and the p -value obtained for each question on the right Y-axis.



Figure 4. Detailed scores on sustainable development perspectives across the genders.

As shown in Figure 4, the analysis by gender groups showed that male pre-service teachers rated the sustainable development perspectives with higher scores than female pre-service teachers for all 18 items. However, the significant differences ($p < 0.05$) only appeared in four questions, including Q3, Q7, Q13, and Q18. These questions came from level 1 and level 3 of the three competency levels, in which Q7 and Q13 are at level 1 (the Know level), while Q3 and Q18 are at level 3 (the Demonstrate and Do level). This means

the significant difference between males and females is the level of knowledge and the level of action toward sustainable development issues.

Based on the significant difference questions, the data corresponding to these four questions were analyzed in more detail by Cohen's *d* (see Figure 5). In these questions, elementary pre-service teachers are asked whether they know how to anticipate the repercussions of changes in natural, social, and economic systems (Q3); identify the possible socio-environmental impacts derived from my educational activities (Q7); know the ethical principles of sustainability (Q13); and design educational intervention proposals that integrate sustainability values (Q18).

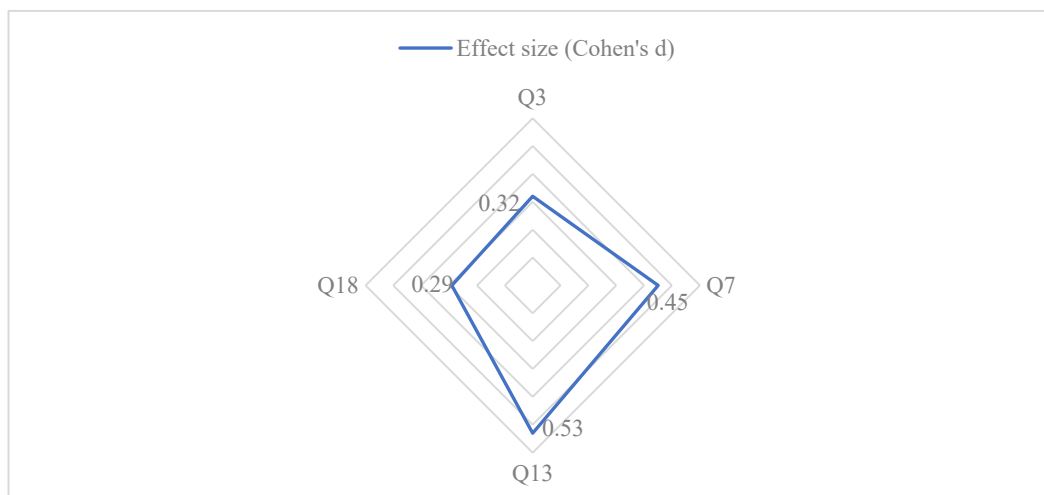


Figure 5. The effect size of sustainable development across the genders.

Although there is a significant difference between genders in sustainable perspectives from these four questions, Figure 5 indicates that there was no large effect size on these questions with Cohen's *d* ranging from 0.29 to 0.53. The effect sizes of Q7 and Q13 are medium between two groups of genders, ranging from 0.45 to 0.53, but they are larger than those of Q3 and Q18. In contrast, Cohen's *d* of questions Q3 and Q18 shows small size effects between two groups of genders at 0.32 and 0.29, respectively.

Hence, it could be concluded that the result of this study showed a significant difference between the male and female pre-service teachers in the sustainable perspectives. However, the differences were more significant in terms of knowledge (level 1—Know) than action (level 3—Demonstrate and Do) between male and female pre-service teachers.

3.2. Qualitative Findings

Research question 3: To what extent do elementary pre-service teachers receive sustainable development from the training curriculum? From eight interviews, the interview data have been analyzed with coding. The lead question for the analysis was: What do pre-service teachers understand ESD, apply ESD and assess the integration of ESD into the enacted curriculum? Altogether, fourteen categories could have been found in Table 7.

The categories can be sorted according to the following six sub-themes: definitions of sustainable development, role of sustainable development, applying ESD within the classroom, applying ESD within the community, curriculum assessment, and curriculum suggestions. Six sub-themes were organized into three main themes: understanding sustainable development, applying sustainable development, and integrating sustainable development. Table 8 lists and defines each major theme and sub-theme with representative quotes from the participants.

Table 7. Categories of content analysis.

Interview Question	Category
Question 1	Sustainable development is diverse and broad. Sustainable development links to ecological problems. Sustainable development deals with social issues.
Question 2	SDGs are classified by environmental, social, economic spheres. SDGs are often the natural resource and climate change goals.
Question 3	ESD is a necessity and a teaching mission. ESD deals with the SDGs.
Question 4	ESD content depends on the teacher in schools. ESD is not always obvious in elementary school classrooms. ESD is relevant to actions in the daily life and in the community.
Question 5	Some courses in university are related to sustainable development. Extra activities can improve the sustainability competencies.
Question 6	The courses should be changed to the required credits. Lecturers should use active teaching methods.

Table 8. Qualitative sub-themes and representative quote for elementary pre-service teachers' perspective on sustainable development.

Theme	Sub-Theme	Representative Quote
Understanding sustainable development	Definitions of sustainable development	I believe that concept of sustainable development refers to environmental protection.
	Roles of sustainable development	I think ESD helps learners connect learning content to real-world problems.
Applying sustainable development	Applying ESD within the classroom	As a future teacher, I can give my children projects like making their own toys out of old things.
	Applying ESD within the community	I believe that engaging in the “Earth Hour” activity will reduce negative effects on the planet.
Integrating sustainable development	Curriculum assessment	I think the Environmental Education course in the training curriculum is closely related to sustainable development.
	Curriculum suggestions	I think it is better if the course Environmental Education can be changed to a required course.

3.2.1. Understanding Sustainable Development

Definitions of sustainable development: elementary pre-service teachers from the first year to the fourth year at the university shared fundamental understandings of sustainable development. Although their presented definitions were different, the content showed that sustainable development was related to “reasonable use of natural resources” (A17, M01), “ensuring harmonization and balance between economy and environment” (M04, M07), “individuals and organizations need to work together to find answers to problems like pollution, poverty, and the loss of biodiversity” (M05), and “addressing global challenges based on a multidisciplinary approach” (M07). These answers expressed the extensive range of sustainable development definitions, which consists of social, environmental, and economic issues. However, most of these answers came from juniors and seniors.

Most freshmen and sophomores did not define the sustainable development concept comprehensively. They mainly focused on environmental issues: “sustainable development

refers to environmental protection" (A12) and *"increasing recycling activities"* (A24, A30), while sustainable development includes three components: society, the environment, and the economy. Moreover, interviewees frequently mentioned the environmental and natural resource goals as well as climate change goals among the 17 SDGs of the United Nations, such as *"Climate Action"* (A12, A17, A24, M04), *"Life on Land"* (A30), and *"Clean Water and Sanitation"* (M12, M07). In contrast, the remaining SDGs were not mentioned by interviewed participants. This qualitative data showed that pre-service teachers had insufficient knowledge about the "sustainable development" concept and the 17 SDGs of the United Nations.

Roles of sustainable development: All eight interviewees agreed that sustainable development issues should be included in education. However, when asked why it is important, most pre-service teachers could not answer clearly. There were four out of the eight pre-service teachers who could provide an explanation, such as *"connected to economic, social, and environmental development"* (M05), *"expressing solutions to social challenges which children need to tackle at present and in the future"* (A12), *"connecting learning content to real-world problems"* (M01) and *"promoting the development of critical thinking science and making decisions based on scientific knowledge"* (M04, M07). Most answers came from the juniors and seniors. These findings suggest that pre-service teachers begin their higher education studies with a confused conception of sustainability, which could influence their perception of the importance of sustainable development and their professional development.

3.2.2. Applying Sustainable Development

Applying ESD within the classroom: Pre-service teachers agreed on the important role of future teachers as *"role models for their students, and if they act in sustainable ways, it will help elementary students become more aware of the sustainable development concept."* (M04), *"Elementary students spend most of the day at school, so the school is a great place to learn good habits toward the environment."* (M05, M07). Therefore, all the interviewees expressed they need self-training in knowledge and skills about sustainable development at the university to create a positive classroom or school learning environment in their teaching career in the future.

Furthermore, when asked about ideas for ESD in the classroom, the freshmen and sophomores mostly mentioned two topics: *"environmental protection"* (A12, A24 A30) and *"climate change"* (A30). While juniors and seniors not only provided topics but also gave example activities such as *"a project like making toys, pen boxes, or plant pots out of old things"* (M01, M05), *"donating leftover clothes and school supplies to the disadvantaged residents"* (M07), and *"organize tours of handicraft villages like A Glance at Vietnamese Folk Painting or Making Pottery"* (M04). From this finding, the ideas of the freshman and sophomore groups were simpler than those of the junior and senior groups when they applied sustainability in their teaching. It could be explained that they have yet to complete the whole training course at university and the internships in sustainability [64–66].

However, some pre-service teachers expressed that males were better at organizing field trips than females because it *"requires good health for a long trip"* (M01, M05) and *"the ability to bring the materials"* (A12) and *"manage large numbers of students outside the school campus"* (A30, M07). At the same time, the females are more suitable for types of activities such as arts and crafts *"When children reuse the carton to complete their toys, pen boxes, or plant pots, teachers need to evaluate the products and give feedback. I think the female teachers are better than males."* (M01, M05). This proves that the difference in sustainable development perspectives of elementary pre-service teachers is not only in their levels of competencies but also in how they choose activities to organize for their class.

Applying ESD within the community: Pre-service teachers believed that engaging in community activities, such as *"Earth Hour"* or *"Earth Day"* (A12, A17, M07), was one of the ways to reduce the negative effects on our planet. Individuals could *"use of public transportation"* (A24), *"use ecologically friendly goods"* (M05), *"limit the use of plastic bags and excessive shopping"* (M07) and *"move toward a simpler life"* (M07). One of the junior

interviewees remarked, *“In order to contribute to sustainable development, I believe it is vital to minimize waste and purchase the right things in order to become a smart consumer.”* (M04).

3.2.3. Integrating Sustainable Development

Curriculum assessment: Pre-service teachers recognized a connection between the current Bachelor Curriculum of the Elementary Education Department and the content of sustainable development through a few required and elective courses, including Foundations of Natural Science in elementary schools, Foundations of Social Studies in elementary schools (A17, A24, A30), Teaching natural and social sciences in elementary schools, and environmental education (M01, M04, M05, M07). On the other hand, participants pointed out that some lecturers integrated sustainable development issues into their lectures even though the course content does not go in-depth on ESD (A24, M01, M05, M07). However, participants noted that economic issues were rarely brought up in their attended courses, and that instead, environmental and social issues were the most frequently brought up.

Most interviewees agreed that science would be the most logical area to implement ESD (M01, M05, M07). However, three of them felt ESD could be integrated into the overall curriculum, not only a few courses, because *“Science alone would be very challenging due to the diversity of the real-world problems.”* (M04, M05, M07). Besides the courses in the training curriculum, pre-service teachers also mentioned extracurricular activities that could help them improve awareness of sustainable development issues, such as Green Summer, Books for rural areas, Earth Hour, Earth Day, and World Environment Day (M04, M07). In explaining the need to include sustainable development issues within the teacher training curriculum, the elementary pre-service teachers said that *“This is crucial content integrated into elementary schools, so I need this knowledge to be a good teacher in the future.”* (A30), *“Teachers gain confidence in educating students when they have a comprehensive grasp of sustainable development.”* (M04, M07).

Curriculum suggestions: Pre-service teachers provided three recommendations for the teacher training curriculum in terms of sustainable development. Firstly, learning and teaching about this topic at the university should take an interdisciplinary approach, not only in the science field (M05, M07). Especially, *“STEM/STEAM education and project-based learning are good ways to help the pre-service teachers gain more knowledge, attitude and take actions about sustainable development issues.”* (M07). Secondly, adjusting course content and lecturers’ teaching methods at the university (A30, M04, M05, M07). In particular, *“social and economic issues should be increased in the syllabus content.”* (M04, M05, M07) and *“lecturers should reduce the traditional teaching methods, increase the project-based learning and experiential learning methods.”* (M01, M05). Thirdly, changing the sustainable development courses from elective to required credits (M04, M07) because *“I really hope sustainable development can be more integrated into the existing curriculum, and all pre-service teachers must learn this topic before graduation. It is better for our teaching career in the future.”* (M07). This finding explains the expectations of pre-service teachers towards the enacted training curriculum in the Elementary Education Department, which at present has not yet derived enough value to help them achieve their sustainability competencies to meet their expectations.

3.3. General Findings

While the questionnaire offered predefined statements about sustainable development, in the interviews the pre-service teachers were able to elaborate on their views, opinions, and attitudes freely based on six interview questions. Both sets of data complemented each other, and the results can give valuable insight into pre-service teachers’ perspectives and competencies towards ESD. Based on both quantitative and qualitative data analysis, the following common findings were drawn:

In the questionnaire, the pre-service teachers showed high scores on “sustainable use of resources”, followed by “participation in community processes”. In contrast, they presented low scores on “ethics” and “critical contextualization of knowledge”. Moreover, pre-service teachers’ competence on the “Know level” seems to be higher than the

“Know-how level”, while the lowest score is the “Demonstrate and Do level”. Noticeably, juniors and seniors showed a more detailed understanding and application of sustainable development than freshmen and sophomores. Although there was an improvement in the sustainability perspectives of elementary pre-service teachers during their academic studies at the university, they got the average scores of sustainable development perspectives on all eighteen items. This was not further investigated in the questionnaire, but in the interviews, the pre-service teachers explained that their understandings of sustainability were insufficient. In particular, they understood ESD dealt with the SDGs and ecological issues and that ESD is a broad and diverse issue. The interviewees focused more on the environmental component, while the social and economic components of the concept of “sustainable development” were not mentioned deeply in their answers.

Regarding gender in the sustainability competencies of pre-service teachers, the quantitative results concluded that gender was an element that impacted the competence of elementary pre-service teachers’ understanding and applying ESD in their future careers. In particular, male pre-service teachers scored higher on all three levels of sustainability competencies and three out of four dimensions of perspectives, except only the dimension “participation in community processes”. Furthermore, the interview results complement the findings of the questionnaire results that gender not only impacted the sustainability competencies of elementary pre-service teachers but also the types of potential activities they carried out in their classroom.

Lastly, the majority of the pre-service teachers expressed that ESD was important to include in teacher education to prepare for their teaching careers in the future. There is even a strong suggestion for the inclusion of more ESD content in the enacted curriculum in higher education because the elementary pre-service teachers evaluated the integration of sustainability issues into the training curriculum at a low level at present. They recognized some content courses addressed environmental issues but lacked economic and social content. Therefore, social and economic content should be included more in the teacher training curriculum. It was also necessary to consider changing the type of course from elective to required courses that could help pre-service teachers have adequate knowledge of sustainable development for future teaching. In the interviews, the elementary pre-service teacher even declared ESD as a teaching mission and a duty. They strongly believe that teachers have an important role in solving sustainability-oriented challenges through education. Teachers play a central role in ESD. A critical comment was mentioned that sustainable development is not always obvious in elementary school classrooms. There should also be more content in accordance with the implementation of ESD in higher education.

4. Discussion

In their role as future teachers, elementary pre-service teachers are the key elements for developing children’s awareness, attitudes, and behaviors toward sustainable development [1]. As a result of the survey on sustainable development perspectives, all participants from the first year to the fourth year at the university showed moderate scores. In fact, the Vietnamese Ministry of Education and Training has integrated environmental issues into the education curriculum since 2009 [52]. Only a few topics such as population, saving energy, and heritage were integrated into teaching in higher education [53]. This led to the sustainability competencies of elementary pre-service teachers not being reached as expected. Thus, it is important for higher education in Vietnam to focus on the holistic nature of the concept of “sustainable development”, which includes three elements: environmental, social, and economic elements, and introduces the 17 SDGs to pre-service teachers through different methods. Moreover, the teaching skills of lecturers in universities should be discussed. As stated by Kieu et al. [41], lecturers should develop collaborative and competency approaches in university teaching as the active teaching methods not only help pre-service teachers develop solid knowledge but also sustainable competencies.

Despite the moderate scores, seniors showed higher scores than freshmen on the sustainable development perspectives. This result was not surprising since topics related to ESD were included in teacher education in Vietnam, although it was not enough [38]. Overall, this finding is consistent with the previous studies [33,62]. The perspectives of elementary pre-service teachers on sustainable development improved after the training process. It was interesting to find that the difference in mean scores between the sophomores and juniors was insignificant. That means there was no outstanding improvement in these two middle years at the university on sustainable development perspectives. It could be explained that pre-service teachers in the second year and the third year were in the process of gaining their knowledge of sustainable development through courses at the university. Accordingly, their understanding of this concept reached a peak in the fourth year, when they had experienced courses and two internships. Based on this situation, the curriculum developers in higher education need to have a thorough discussion and analysis of the progress and content of the enacted training curriculum for each grade level to meet the 17 goals of sustainable development, especially in the second year and the third year at university.

In particular, the scores of freshmen were not significantly lower than those of seniors in their knowledge of sustainable development. The recent literature showed a similar result and explained this finding [68]. This fact is probably due to the Kruger–Dunnin effect [67], as an individual with less competence and less knowledge has an illusory sense of superiority, considering themselves to be more intelligent than other better-prepared individuals. This meant perhaps that freshmen were confident in their understanding, but it did not ensure that they were knowledgeable about it. This analysis was discussed more in the qualitative data. Pre-service teachers knew the concept of sustainable development, but their understanding was not comprehensive. This finding was an essential basis for administrators to design the curriculum content that meets pre-service teachers' needs. University administrators must create courses that provide more solid knowledge about sustainable development because accurate and sufficient knowledge leads pre-service teachers to have suitable awareness and act in sustainable ways.

In terms of sustainability competencies, level 1 (Know) was the lowest of the three levels, while level 3 (Demonstrate and Do) was the highest. The low learning achieved at level 1 for all four dimensions of perspectives can be understood as a failure in the development of sustainability competence in teacher education since one of the specific competencies to be developed in teacher education is precisely “knowing the interrelation between natural, social, and economic issues”. Meanwhile, this result means that pre-service teachers know how to function satisfactorily in community educational projects. In a similar way, the pre-service teachers answered in the interview part that they know how to work well in community educational projects through extra activities or volunteer programs. These results were consistent with the conclusions of other studies [69,70] that found little or no transfer from theory to practice in teacher training. The results obtained show, for competency level, the gap that exists between theory and practice. According to these results, pre-service teachers perform in four dimensions of sustainable development perspectives without having solid basic training. Thus, the training curriculum should be distributed with a balanced proportion of sustainability theory and practice because if pre-service teachers' knowledge is insufficient, their attitudes and behaviors will not be suitable [21].

Regarding gender, pre-service teachers showed a significant difference in the perspectives on sustainable development between males and females. These quantitative data supported the findings suggested by previous research [21] and denied the findings of “no significant difference based on gender” [43] in the context of University Sains, Malaysia. However, the interview findings did not present the evidence to conclude a significant difference in the competencies of ESD between male and female pre-service teachers. It requires more research on gender stereotypes. A male seems to be the leader in an elementary school because they are more disciplined and can easily persuade others to act

sustainably [47,48]. From this view, gender stereotypes may become a reason to explain the higher scores of male pre-service teachers than female ones in this research.

The results of the enacted training curriculum revealed that elementary pre-service teachers have a basic understanding of sustainable development and have quite a good ability to integrate sustainability issues into their teaching process, particularly juniors and seniors. This could be explained by the efficacy of well-trained courses in universities [68]. However, the teacher training curriculum was still assessed as lacking comprehensiveness about the concept of sustainable development. Hence, higher education institutes need to develop a suitable curriculum framework for ESD and apply more modern teaching methods to real-world problems in order to increase pre-service teachers' understanding, attitudes, and actions in ESD. Moreover, the university should promote the sustainable development model through all the actions of lecturers, pre-service teachers, and other staff in the university.

Besides the value of results from the mixed-method design, this study has several limitations that should be taken into account. First, the sample size is not representative because all participants come from the Department of Elementary Education at a university in Southern Vietnam. It would have better if this study could have conducted and collected data from more universities of education.

Second, the gender distribution of the sample in this study was unequal (85 males and 307 females), although this distribution matched the gender distribution of the population. This study tried to increase the number of male pre-service teachers to make the distribution of gender groups more balanced. However, despite the efforts, this study did not find an equal number of males and females for the quantitative data analysis. So the gender of the sample may well be representative if the number of male participants could be increased.

Third, other types of demographics, such as knowledge about the sociocultural, discipline, including natural science education and social science education fields, living area in rural or in urban, and family background, could influence their responses. These demographic data related to their perspectives on sustainable development are not analyzed in the present study.

Finally, a more detailed analysis of the implementation of sustainable development in the training curriculum needs to be clarified. The number of courses that develop ESD in the analyzed curriculum is also small, and therefore probably few learning outcomes of the sustainability map are developed in the curriculum. This fact makes it difficult to draw clear conclusions due to the limited available data. It would provide more informative results if the sustainability perspective of pre-service teachers were compared with the number or quality of courses and activities in the training curriculum by the survey in order to analyze which courses achieve their learning objectives and which do not. These limitations leave other suggestions for future studies on the sustainable perspective of pre-service teachers.

5. Conclusions

Both quantitative and qualitative research questions were utilized in this study. Three key research questions were examined during this study.

Regarding the first research question, both quantitative and qualitative results showed that pre-service teachers' perspectives on the sustainable development concept changed positively following four years of their academic study. Seniors had a significantly higher score for most sustainable development perspectives than freshmen; while only the dimensions of "critical contextualization of knowledge" and "Know level" did not show any significant difference in sustainable development perspectives. Significantly, the level of knowledge was rated with higher scores than the level of action by pre-service teachers. Despite the improvement in perspectives about sustainable development, the interview results showed that pre-service teachers had insufficient knowledge about this concept. They focused on environmental issues, while the definition of sustainable development is broader, including environmental, social, and economic components. Moreover, juniors

and seniors had a higher ability to make the lesson plans integrating sustainability into their class than freshmen and juniors.

Regarding the second research question, quantitative results showed significant differences in all dimensions of sustainable development perspectives between male and female pre-service teachers, except for the dimension “participation in community processes”. Male pre-service teachers rated higher scores than female ones on perspectives of sustainable development, especially knowledge and action. However, the qualitative data found that no major significance when analyzing pre-service teachers’ gender. It could be explained that the number of male interview samples was insufficient and gender stereotypes need to be considered.

Regarding the third research question, qualitative data revealed that some courses in the training curriculum integrated sustainable development content. However, they suggested these courses should be changed from elective to required courses because of the essential role of the ESD in their teaching career in the future. In addition, some lecturers in the university have integrated the issue of sustainable development into their lectures. However, they should use more STEM/STEAM, project-based learning, and experiential learning methods to develop pre-service teachers’ awareness, attitudes, and behaviors towards sustainable development.

Based on the findings of this study and their limitations, it would also be interesting to examine the interactions between pre-service teachers’ other demographics (e.g., discipline, living area, characteristics, and family background) and their perspectives on sustainable development. Moreover, this study did not find an equal number of males and females. It could be suggested to increase male samples to find out if gender factors influenced the pre-service teachers’ perspective on sustainable development. However, future studies should pay more consideration to the representativeness with the sample distribution matching the population distribution. Last, it would not be enough if this study only measured the presence of sustainable development in the enacted curriculum; future researchers need to measure how many hours are spent developing sustainability competencies and the types of activities that are carried out to achieve them. Since the fact that there are other elements to impact the success of the training curriculum for developing sustainability competencies of pre-service teachers, not only the number of courses is great or small.

Author Contributions: Conceptualization, L.-H.-P.N. and C.-F.H.; methodology, L.-H.-P.N., N.-B.-T.B., T.-N.-C.N. and C.-F.H.; investigation, L.-H.-P.N., N.-B.-T.B. and T.-N.-C.N.; writing—original draft preparation, L.-H.-P.N. and N.-B.-T.B.; writing—review and editing, T.-N.-C.N. and C.-F.H.; data curation and project administration, C.-F.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Vietnam and approved by the Department of Science, Technology and Environment in Ho Chi Minh City University of Education as an Ethics Committee on 28 February 2022.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: The authors acknowledge the support of the EDINSOST team for their questionnaire provision; the Department of Science, Technology and Environment in Ho Chi Minh City University of Education, the Department of Elementary Education and all the pre-service teachers that participated in this research study.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Türkoğlu, B. Opinions of preschool teachers and pre-service teachers on environmental education and environmental awareness for sustainable development in the preschool period. *Sustainability* **2019**, *11*, 4925. [CrossRef]
2. Vågsholm, I.; Arzoomand, N.S.; Boqvist, S. Food security, safety, and sustainability—Getting the trade-offs right. *Front. Sustain. Food. Syst.* **2020**, *4*, 16. [CrossRef]
3. Choudhary, S.; Saha, A.R.; Tiwary, N.K. The role of compulsory environmental education in higher learning: A study in the University of Delhi. *Appl. Environ. Educ. Commun.* **2020**, *19*, 389–401. [CrossRef]
4. Gürbüz, R.; Çalık, M. Intertwining mathematical modeling with environmental issues. *Probl. Educ. 21st Century* **2021**, *79*, 412–424. [CrossRef]
5. Sánchez-Carracedo, F.; Romero-Portillo, D.; Sureda-Carbonell, B.; Moreno-Pino, F.M. Education for sustainable development in Spanish higher education: An assessment of sustainability competencies in engineering and education degrees. *Int. J. Sustain. High. Educ.* **2022**, *23*, 940–959. [CrossRef]
6. Saqib, Z.A.; Zhang, Q.; Ou, J.; Saqib, K.A.; Majeed, S.; Razzaq, A. Education for sustainable development in Pakistani higher education institutions: An exploratory study of students' and teachers' perceptions. *Int. J. Sustain. High. Educ.* **2020**, *21*, 1249–1267. [CrossRef]
7. Sustainable Development Goals 2021. Available online: <https://unstats.un.org/sdgs/report/2021> (accessed on 15 June 2022).
8. Ferguson, T.; Roofe, C.; Cook, L.D. Teachers' perspectives on sustainable development: The implications for education for sustainable development. *Environ. Educ. Res.* **2021**, *27*, 1343–1359. [CrossRef]
9. Issues and Trends in Education for Sustainable Development. Available online: <https://unesdoc.unesco.org/ark:/48223/pf0000261954> (accessed on 23 June 2022).
10. Report of the World Commission on Environment and Development: Our Common Future towards Sustainable Development. Available online: <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf> (accessed on 10 May 2022).
11. Transforming Our World: The 2030 Agenda for Sustainable Development. Available online: <https://sdgs.un.org/2030agenda> (accessed on 10 May 2022).
12. Žalėnienė, I.; Pereira, P. Higher education for sustainability: A global perspective. *Geogr. Environ. Sustain.* **2021**, *2*, 99–106. [CrossRef]
13. Findler, F.; Schönherr, N.; Lozano, R.; Reider, D.; Martinuzzi, A. The impacts of higher education institutions on sustainable development: A review and conceptualization. *Int. J. Sustain. High. Educ.* **2019**, *20*, 23–38. [CrossRef]
14. Usak, M.; Hsieh, M.Y.; Chan, Y.K. A concretizing research on making higher-education sustainability count. *Sustainability* **2021**, *13*, 2724. [CrossRef]
15. Obrecht, M.; Feodorova, Z.; Rosi, M. Assessment of environmental sustainability integration into higher education for future experts and leaders. *J. Environ. Manag.* **2022**, *316*, 115223. [CrossRef]
16. Fehlnér, W. Educating for sustainability: The crucial role of the tertiary sector. *J. Sustain. Dev.* **2019**, *12*, 18–28. [CrossRef]
17. Xu, H.; Hsu, H.L.; Meen, T.H.; Zhu, J.H. Can higher education, economic growth and innovation ability improve each other? *Sustainability* **2020**, *12*, 2515. [CrossRef]
18. Second National Communication of Maldives to the United Nations Framework Convention on Climate Change. Available online: <https://www.environment.gov.mv/v2/en/download/4312> (accessed on 24 May 2022).
19. Durrani, R.; Malik, S.; Jumani, N.B. Education for sustainable development (ESD) in pre-service teachers education curriculum at Pakistan: Current status and future directions. *Pak. J. Distance Online Learn.* **2019**, *5*, 67–84.
20. Imara, K.; Altinay, F. Integrating education for sustainable development competencies in teacher education. *Sustainability* **2021**, *13*, 12555. [CrossRef]
21. Álvarez-García, O.; García-Escudero, L.A.; Salvà-Mut, F.; Calvo-Sastre, A. Variables influencing pre-service teacher training in education for sustainable development: A case study of two Spanish universities. *Sustainability* **2019**, *11*, 4412. [CrossRef]
22. Timm, J.M.; Barth, M. Making education for sustainable development happen in elementary schools: The role of teachers. *Environ. Educ. Res.* **2021**, *27*, 50–66. [CrossRef]
23. Lertpratchya, A.P.; Besley, J.C.; Zwickle, A.; Takahashi, B.; Whitley, C.T. Assessing the role of college as a sustainability communication channel. *Int. J. Sustain. High. Educ.* **2017**, *18*, 1060–1075. [CrossRef]
24. Shields, R. The sustainability of international higher education: Student mobility and global climate change. *J. Clean. Prod.* **2019**, *217*, 594–602. [CrossRef]
25. Gilal, F.G.; Ashraf, Z.; Gilal, N.G.; Gilal, R.G.; Channa, N.A. Promoting environmental performance through green human resource management practices in higher education institutions: A moderated mediation model. *Corp. Soc. Responsib. Environ. Manag.* **2019**, *26*, 1579–1590. [CrossRef]
26. Jose, S.; Patrick, P.G.; Moseley, C. Experiential learning theory: The importance of outdoor classrooms in environmental education. *Int. J. Sci. Educ. B Commun. Public. Engagem.* **2017**, *7*, 269–284. [CrossRef]
27. Guerra, A.; Smink, C.K. Students' perspectives on sustainability. In *Encyclopedia of Sustainability in Higher Education*, 1st ed.; Filho, W.L., Ed.; Springer: Cham, Switzerland, 2019; Volume 3, pp. 1560–1568. [CrossRef]
28. Guerra, A.; Holgaard, J.E.; Smink, C.K. Barriers towards sustainability integration in engineering education. In Proceedings of the 8th Conference on Engineering Education for Sustainable Development (EESD), Bruges, Belgium, 4–7 September 2016.

29. Miller, G.E. The assessment of clinical skills/competence/performance. *Acad Med.* **1990**, *65*, 63–67. [\[CrossRef\]](#) [\[PubMed\]](#)
30. Albareda-Tiana, S.; Ruíz-Morales, J.; Azcárate, P.; Valderrama-Hernández, R.; Muñoz, J.M. The EDINSOST Project: Implementing the sustainable development goals at university level. In *World Sustainability Series: Universities as Living Labs for Sustainable Development*, 1st ed.; Filho, W.L., Salvia, A.L., Pretorius, R.W., Brandli, L.L., Manolas, E., Alves, F., Azeiteiro, U., Rogers, J., Shiel, C., Paco, A.D., Eds.; Springer: Cham, Switzerland, 2020; Chapter 1; pp. 193–210. [\[CrossRef\]](#)
31. Sánchez-Carracedo, F.; Moreno-Pino, F.M.; Romero-Portillo, D.; Sureda, B. Education for sustainable development in Spanish University education degrees. *Sustainability* **2021**, *13*, 1467. [\[CrossRef\]](#)
32. Sánchez-Carracedo, F.; Ruiz-Morales, J.; Valderrama-Hernández, R.; Muñoz-Rodríguez, J.M.; Gomera, A. Analysis of the presence of sustainability in Higher Education Degrees of the Spanish university system. *Stud. High. Educ.* **2021**, *46*, 300–317. [\[CrossRef\]](#)
33. Valderrama-Hernández, R.; Sánchez-Carracedo, F.; Rubio, L.A.; Limón-Domínguez, D. Methodology to analyze the effectiveness of ESD in a higher degree in education. A case study. *Sustainability* **2020**, *1*, 222. [\[CrossRef\]](#)
34. Caniglia, G.; John, B.; Bellina, L.; Lang, D.J.; Wiek, A.; Cohmer, S.; Laubichler, M. The glocal curriculum: A model for transnational collaboration in higher education for sustainable development. *J. Clean. Prod.* **2018**, *171*, 368–376. [\[CrossRef\]](#)
35. Zguir, M.F.; Dubis, S.; Koç, M. Embedding Education for Sustainable Development (ESD) and SDGs values in curriculum: A comparative review on Qatar, Singapore and New Zealand. *J. Clean. Prod.* **2021**, *319*, 128534. [\[CrossRef\]](#)
36. Meen, T.H.; Tijus, C.; Tu, J.C. Selected papers from the Eurasian Conference on Educational Innovation 2020. *Sustainability* **2020**, *12*, 6069. [\[CrossRef\]](#)
37. Lo, J.H.; Lai, Y.F.; Hsu, T.L. The study of AR-Based Learning for natural science inquiry activities in Taiwan's elementary school from the perspective of sustainable development. *Sustainability* **2021**, *13*, 6283. [\[CrossRef\]](#)
38. Tsai, J.C.; Liu, S.Y.; Chang, C.Y.; Chen, S.Y. Using a board game to teach about sustainable development. *Sustainability* **2021**, *13*, 4942. [\[CrossRef\]](#)
39. Barnes, A.E.; Zuilkowski, S.S.; Mekonnen, D.; Ramos-Mattoussi, F. Improving teacher training in Ethiopia: Shifting the content and approach of pre-service teacher education. *Teach. Teach. Educ.* **2018**, *70*, 1–11. [\[CrossRef\]](#)
40. García-González, E.; Jiménez-Fontana, R.; Goded, P.A. Approaches to teaching and learning for sustainability: Characterizing students' perceptions. *J. Clean. Prod.* **2020**, *274*, 122928. [\[CrossRef\]](#)
41. Kieu, T.K.; Singer, J.; Gannon, T.J. Education for sustainable development in Vietnam: Lessons learned from teacher education. *Int. J. Sustain. High. Educ.* **2016**, *17*, 853–874. [\[CrossRef\]](#)
42. Rubio, R.M.; Uribe, D.; Moreno-Romero, A.; Yáñez, S. Embedding sustainability competences into engineering education: The case of informatics engineering and industrial engineering degree programs at Spanish Universities. *Sustainability* **2019**, *11*, 5832. [\[CrossRef\]](#)
43. Azhar, S.N.F.S.; Akib, N.A.M.; Sibly, S.; Mohd, S. Students' attitude and perception towards sustainability: The case of University Sains Malaysia. *Sustainability* **2022**, *14*, 3925. [\[CrossRef\]](#)
44. Muda, A.; Ismail, N.S.; Suandi, T.; Rashid, N.A. Analysis of cognitive and affective component of environmental literacy of pre-service teachers from institute of teacher education Malaysia. *World Appl. Sci. J.* **2011**, *14*, 114–118.
45. Tuncer, G.; Tekkaya, C.; Sungur, S.; Cakiroglu, J.; Ertepinar, H.; Kaplowitz, M. Assessing pre-service teachers' environmental literacy in Turkey as a mean to develop teacher education programs. *Int. J. Educ. Dev.* **2009**, *29*, 426–436. [\[CrossRef\]](#)
46. Luchs, M.; Mooradian, T. Sex, personality, and sustainable consumer behavior: Elucidating the gender effect. *J. Consum. Policy.* **2012**, *35*, 127–144. [\[CrossRef\]](#)
47. Bloodhart, B.; Swim, J.K. Sustainability and consumption: What's gender got to do with it? *J. Soc. Issues* **2020**, *76*, 101–113. [\[CrossRef\]](#)
48. Filho, W.L.; Eustachio, J.; Caldana, A.C.F.; Will, M.; Salvia, A.; Rampasso, I.S.; Anholon, R.; Platje, J.; Kovaleva, M. Sustainability leadership in higher education institutions: An overview of challenges. *Sustainability* **2020**, *12*, 3761. [\[CrossRef\]](#)
49. Nguyen, H.N. Policies for environmentally sustainable development: Perspectives from Vietnam. In *Environmental Policies in Asia*, 1st ed.; Huang, J., Gupta, S., Eds.; World Scientific: Singapore, 2014; Volume 1, pp. 57–72. [\[CrossRef\]](#)
50. Nguyen, T.P. Education for sustainable development in Vietnam: Exploring the geography teachers' perspectives. *Int. Res. Geogr. Environ. Educ.* **2018**, *27*, 341–356. [\[CrossRef\]](#)
51. Seventeen Sustainable Development Goals of Vietnam. Available online: <https://moit.gov.vn/tin-tuc/tiet-kiem-nang-luong/17-muc-tieu-phat-trien-ben-vung-cua-viet-nam.html> (accessed on 10 April 2022).
52. National Journeys towards Education for Sustainable Development, 2011: Reviewing National Experiences from Chile, Indonesia, Kenya, The Netherlands, Oman. Available online: <https://unesdoc.unesco.org/ark:/48223/pf0000192183> (accessed on 11 May 2022).
53. Nguyen, T.P.; Leder, S.; Schrufer, G. Recontextualising education for sustainable development in pedagogic practice in Vietnam: Linking Bernsteinian and constructivist perspectives. *J. Environ. Educ. Res.* **2021**, *27*, 313–337. [\[CrossRef\]](#)
54. Nguyen, T.P. Searching for education for sustainable development in Vietnam. *J. Environ. Educ. Res.* **2019**, *25*, 991–1003. [\[CrossRef\]](#)
55. Aleixo, A.M.; Leal, S.; Azeiteiro, U.M. Higher education students' perceptions of sustainable development in Portugal. *J. Clean. Prod.* **2021**, *327*, 129429. [\[CrossRef\]](#)
56. Creswell, J.W.; Poth, C.N. *Qualitative Inquiry and Research Design: Choosing among Five Approaches*, 4th ed.; Sage: Thousand Oaks, CA, USA, 2018; pp. 54–66.

57. Jakob, J. Pre-service Teachers' Attitudes towards Education for Sustainable Development: An Empirical Study at the University Col-Lege of Teacher Education Vienna/Krems (Kph Wien/Krems). Master's Thesis, University of Gothenburg, Gothenburg, Sweden, 2020.
58. Tomas, L.; Girgenti, S.; Jackson, C. Pre-service teachers' attitudes toward education for sustainability and its relevance to their learning: Implications for pedagogical practice. *J. Environ. Educ. Res.* **2017**, *23*, 324–347. [[CrossRef](#)]
59. Share of Female Primary Education Teachers in Vietnam from 2010 to 2020. Available online: <https://www.statista.com/statistics/733543/vietnam-female-primary-education-teachers/> (accessed on 5 June 2022).
60. Francis, J.J.; Johnston, M.; Robertson, C.; Glidewell, L.; Entwistle, V.; Eccles, M.P.; Grimshaw, J.M. What is an adequate sample size? Operationalising data saturation for theory-based interview studies. *Psychol. Health* **2010**, *25*, 1229–1245. [[CrossRef](#)]
61. Namey, E.; Guest, G.; McKenna, K.; Chen, M. Evaluating bang for the buck: A cost-effectiveness comparison between individual interviews and focus groups based on thematic saturation levels. *Am. J. Eval.* **2016**, *37*, 425–440. [[CrossRef](#)]
62. García-González, E.; Jiménez-Fontana, R.; Azcárate, P. Education for sustainability and the sustainable development goals: Pre-service teachers' perceptions and knowledge. *Sustainability* **2020**, *12*, 7741. [[CrossRef](#)]
63. Merriam, S.B. *Qualitative Research: A Guide to Design and Implementation*, 3rd ed.; John Wiley & Sons: San Francisco, CA, USA, 2009; pp. 120–129.
64. Clark, I.F.; Zeegers, Y. Challenging students' perceptions of sustainability using an Earth Systems Science approach. *J. Geogr. High. Educ.* **2015**, *39*, 260–274. [[CrossRef](#)]
65. Corney, G. Student Geography teachers' pre-conceptions about teaching environmental topics. *Environ. Educ. Res.* **2000**, *6*, 313–329. [[CrossRef](#)]
66. Zeegers, Y.; Clark, I.F. Students' perceptions of education for sustainable development. *Int. J. Sustain. High. Educ.* **2014**, *15*, 242–253. [[CrossRef](#)]
67. Kruger, J.; Dunning, D. Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *J. Pers. Soc. Psychol.* **1999**, *77*, 1121–1134. [[CrossRef](#)] [[PubMed](#)]
68. Sánchez-Carracedo, F.; Sureda, B.; Moreno-Pino, F.M.; Romero-Portillo, D. Education for sustainable development in Spanish engineering degrees. Case study. *J. Clean. Prod.* **2021**, *294*, 126322. [[CrossRef](#)]
69. Zeichner, K.; Tabachnik, B.R. Are the effects of university teacher education washed out by school experiences? *J. Teach. Educ.* **1981**, *32*, 7–11. [[CrossRef](#)]
70. Cole, A.L.; Knowles, J.G. Teacher development partnership research: A focus on methods and issues. *Am. Educ. Res. J.* **1993**, *30*, 473–495. [[CrossRef](#)]