Exploring Sustainability Education: Perspectives of Finnish Pre-Service Teachers

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ABSTRACT

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The study investigates sustainability education (SE) in the context of teacher education in Finland. It focuses specifically on pre-service teachers enrolled in teacher education programs at the University of Jyväskylä (JYU). The study explores how preservice teachers perceive sustainability and how teacher education programs could be strengthened to promote sustainability as a key component of pedagogy.

Two research questions guided the study: 1) What is the understanding of sustainability education among Finnish pre-service teachers? 2) How is sustainability education embedded in the teacher education curriculum at JYU, and in what terms? Data for this study was collected through six (6) one-on-one interviews with pre-service teachers from different cohorts of the University of Jyväskylä's teacher education program and document analysis, including the 'Teacher Education Curriculum 2014–2017' and the 'JYU Teacher Training Values OPS 2020–23'. Thematic analysis was employed to analyze the interview data with the help of a qualitative data analysis tool, Atlas.ti.

The findings showed that respondents hold different perspectives on the topic of sustainability education, with some focusing primarily on the environmental dimension. Other respondents expressed views on a social perspective. However, none of the respondents identified all four perspectives—economic, cultural, social, and environmental—coherently. The study also found that study programs on sustainability are few, with pedagogy and curriculum inadequate to prepare teachers for sustainability education. Respondents mentioned only three courses that address sustainability: KTKP020, Kasvatus, yhteiskunta ja muutos (education, society, and change); POMM 1093, ympäristö-

ja tiedekasvatus (environmental and science education); and POMMI 1043, Käsityökasvatus (handicraft and science).

The findings suggest gaps in student teachers' awareness of sustainability, as well as a lack of courses explicitly focused on sustainability-related themes within the University of Jyväskylä's teacher education program. Thus, integrating sustainability courses into teacher education programs, with a special emphasis on educating prospective teachers with the knowledge and skills needed to create a sustainable future through education, is recommended.

Keywords: sustainability, teacher education, pre-service teachers

CONTENT

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LIST OF ABBREVIATIONS

Abbreviation	Description
EE	Environmental Education
EfS	Education for Sustainability
ESD	Education for Sustainable Development
FGD	Focused Group Discussion
MDG	Millennium Development Goals
SDG	Sustainable Development Goal
SE	Sustainability Education
UNESCO	United Nations Educational, Scientific, and Cultural Organization
WCED	World Commission on Environment and Development

1   INTRODUCTION

Sustainability and global education aim to create sustainable living conditions for the planetary system for present and future generations. This has also become a priority for several countries across the globe (UN, 2012). The study proposes a critical analysis of how global concerns and goals are addressed in teacher education curricula to explore the potential of education to educate students and society about these challenges. This exploration is specifically focused on the concept of sustainability education. Education with a specific emphasis on sustainability is referred to as sustainability education (hence referred to as SE) (Bianchi, 2020).

Sustainability education endeavors to address the needs of all entities and 'emergencies' within a significantly evolving global context (de Sousa Santos, 2016). Education possesses the capacity to engender transformative societal shifts. According to McFarlane (2011), the achievement of a sustainable existence on Earth necessitates a transformation in education, with a specific emphasis on addressing fundamental concerns essential for survival. In his influential publication concerning ecological discourse, E.F. Schumacher posited that despite the escalating quantity of education, there has been a parallel rise in pollution, resource depletion, and the perils associated with ecological calamity. If education is to serve as a means of salvation, it must be of a distinct nature — one that delves into the profound aspects of existence (Schumacher 1997, p. 208). Schumacher's predicament exemplifies a basic dilemma: the extent to which education, traditionally considered crucial in addressing environmental and sustainability challenges, can be effective. Emergencies of various natures, including climate change, biodiversity loss, pandemics, and war, have historically necessitated worldwide attention due to their implications for both humanity and the broader ecosystem (Kortetmäki et al., 2021). Hence, it is imperative for education to contribute to the establishment and maintenance of sustainable societies (Bianchi, 2020). It implies that sustainable development goals (SDG) can be significantly facilitated by investing in education. In

international politics, there is a desire for public education to pave the path for a long-term, sustainable future.

Sustainability Education is often looked at through the lenses of economic, social, ecological, and cultural sustainability in the field of education policy and practice (Leal Filho et al., 2018). As per the United Nations (2012), it is imperative for educational institutions to provide students and learners of all age groups with the necessary knowledge and skills to address the present and future challenges related to sustainability. To attain a substantial number of learners who are actively engaged in problem-solving, it is vital that education adopt a transformative approach. This approach empowers individuals to make well-informed decisions and take both individual and collective action to effect positive changes within our society and promote environmental stewardship (Leal Filho et al., 2018). However, the expectations and aims set forth by the United Nations (2012) and Leal Filho et al. (2018) are comprehensive in nature, necessitating more elaboration.

In this study, the concept of sustainability education refers to education aiming for a transformation towards more sustainable societies. Sustainability is used in reference to the UN Sustainable Development Goals (2015). These goals guide education policies in Finland, where this study takes place.

Today's school policies prioritize how important it is for future teachers and educators to have a deep understanding of all the different ideas and information about sustainability in education (Rieckmann, 2012). According to the World Commission on Environment and Development (WCED), educators have a pivotal role in effecting societal transformation and have the potential to guide humanity towards a sustainable future (WCED, 1987). Sustainability Education (SE) was also highlighted in Sustainable Development Goal 4, Target 4.7, which is one of the 17 Sustainable Development Goals established by the United Nations in 2015. This goal emphasizes the importance of equipping all learners with the necessary knowledge and skills to advance sustainable development. This includes education for sustainable development, fostering sustainable lifestyles, promoting human rights, achieving gender equality,

cultivating a culture of peace and nonviolence, fostering global citizenship, and recognizing the value of cultural diversity and its contribution to sustainable development (UN, 2015; Leal Filho, 2019) The United Nations (2015) states that to effectively reach Target 4.7, it is important to give students an education that makes them aware of environmental crises, like attacks on the environment, and gives them the skills and knowledge they need to handle these kinds of emergencies. Therefore, education should prioritize the cultivation of students' motivation, aspiration, and competencies, enabling them to make meaningful contributions towards the attainment of a sustainable future. UNESCO's "roadmap" for education for sustainable development, however, indicates that we are still far from there because, in many nations, sustainability education is not reflected in educational policy, teacher preparation programs, and curricula with a holistic approach that can enable the transformation (Mykrä, 2023).

The present study revolves around the core concept of sustainability education (SE), and the study report is split into multiple chapters, each dedicated to examining a distinct facet of the investigation. The initial part of the manuscript introduces the fundamental terminology and definitions of key concepts that are relevant to the research being conducted. It also offers a comprehensive overview of the literature pertaining to sustainability education. The subsequent section of the paper explores the conceptualization of sustainability at both the global and local scales. Furthermore, this chapter examines relevant frameworks, including European Union policies and Agenda 2030, that offer a contextual backdrop for understanding the research.

The third and fourth chapters provide a full examination of the theoretical framework, which encompasses the research problem, objectives, and questions of this study.

Chapter 5 provides a detailed account of the research design, methodology, research instrument, ethical considerations, data analysis, and the researcher's position within the study.

The final chapters, six and seven, present the research results and findings. This chapter concludes by providing a concise overview of the conducted

research, emphasizing its importance, and deliberating on prospective directions for further investigation.

The research report is structured into several chapters that collectively cover several facets of the investigation, ranging from the identification of the research topic through the presentation of the findings and their consequences.

2   KEY CONCEPTS

2.1   Sustainability Education

The word 'sustainability' is a complex term that defies simplistic definitions. It is often used only in the environmental context; however, this term concerns balancing environmental conservation, economic development, social justice, and responsibility (Sterling 2001, 2010). The concept of sustainability is often perceived as a goal to be achieved in the long run, while sustainable development is regarded as a strategy or approach to attaining sustainability (UNESCO, 2019). The term sustainable development is typically used to refer to three main domains: ecological, social, and economic (UN, 2012). The Brundtland Report provides a more comprehensive description of sustainable development, as follows:

> 'Sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.' (World Commission on Environment and Development, 1987, p. 46)

Sustainability education is also referred to as Education for Sustainability (EfS), Education for Sustainable Development (ESD), and Environmental Education (EE) (Evans et al., 2017). All these synonyms refer to the skills, values, capabilities, and understanding needed to develop as citizens of the world and respond in every small way to tackle the global challenges of the 21st century.

This research uses the term sustainability education (SE), a general term to refer to the four dimensions: social, cultural, environmental, and economic. The various dimensions are interrelated; it is not merely an environmental issue that requires scientific attention; rather, it is an interdisciplinary issue that considers local and global context as well as past, present, and future events (Wolff et al., 2017).

Sustainability education is the process of educating individuals about sustainability practices. The term refers to instructional content and practice where sustainability is emphasized; it includes educating people about environmental, social, cultural, and economic sustainability and how these different areas are interconnected. Sustainability education can occur at various levels of education, from primary to secondary schools and at university degrees (Evans et al., 2017).

Figure 1 *Four dimensions of sustainability*
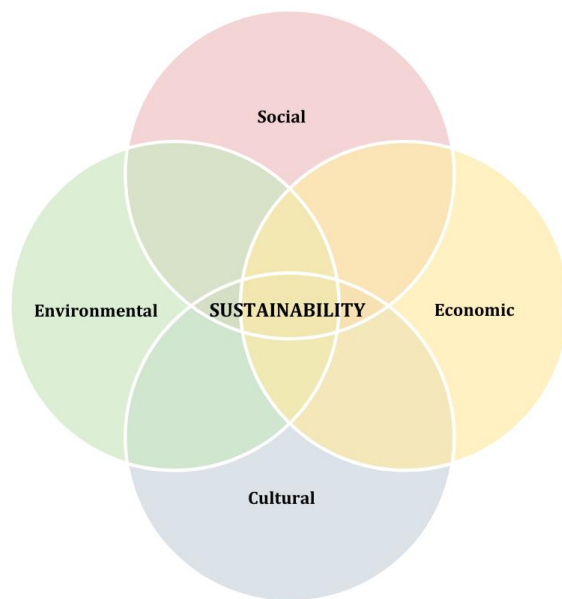
Sustainability education aims to empower individuals to make informed decisions and act upon those decisions to create a more sustainable future. Learning about SE promotes the development of knowledge, skills, and values that are necessary for leading a sustainable future that is resilient and equitable (UN, 2021). Awareness of SE encourages learners and citizens to understand the interdependence of environmental, economic, and social systems and their impact on the planet and future generations. SE is not limited to academic knowledge; it also emphasizes developing social skills such as communication and problem-solving to help us work together to be more responsible global citizens.

In brief, SE focuses on raising awareness, understanding, and commitment to issues and actions related to the environment, social justice, and

economic development. It seeks to empower individuals to become active change agents in their local context, incorporating the values of equity, justice, and respect for all.

2.2   Agenda 2030

Agenda 2030 by the United Nations undertakes to promote global sustainability in all UN member states in 2015. This is built upon the Millennium Development Goals (MDGs) adopted in 2000, which aimed to reduce extreme poverty by 2015. Adopted in 2015, the Sustainable Development Goals set out to implement global sustainability goals by 2030 (UN, 2021).

The 2030 Agenda for Sustainable Development is a global plan to end poverty, protect the planet, and ensure prosperity for all. If appropriately implemented, it has the potential to make a real impact on global sustainability. There are 17 Sustainable Development Goals (SDGs) and 169 targets underpinning the universal plan for reaffirming peace and prosperity for present and future generations and for the planet (UN, 2021). The goals are designed to be achieved by 2030. The primary focus of Agenda 2030 is to reduce poverty and inequality while promoting economic growth and environmental sustainability. This will be accomplished through a combination of policy development, public-private partnerships, and the provision of resources. The SDGs are implemented through various initiatives, including the Paris Agreement, the Sendai Framework for Disaster Risk Reduction, and the 2030 Agenda for Sustainable Development (UN, 2021).

Finland, a member of the United Nations, is enjoined to act towards a sustainable future by 2030 (Ministry for Foreign Affairs of Finland, n.d.). The different areas of sustainability are environmental, social, cultural, and economic. A concise description of each of these is provided below.

2.2.1 Environmental Sustainability

It is also referred to as the ecological dimension. This focuses on reducing the impact of human activities on the environment and using natural resources responsibly. This includes reducing air and water pollution, reducing greenhouse gas emissions, conserving biodiversity, and promoting efficient energy use (UN, 2015b). Table 1 mentions the environmental sustainability SDGs.

Table 1 *Environmental sustainability goals (UN, 2015b)*

Goal 6: Ensure the availability and sustainable management of water and sanitation for all.

Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all.

Goal 12: Ensure sustainable consumption and production patterns.

Goal 13: Take urgent action to combat climate change and its impacts.

Goal 14: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.

Goal 15: Protect, restore, and promote sustainable use of terrestrial ecosystems; sustainably manage forests; combat desertification; halt and reverse land degradation; and halt biodiversity loss.

2.2.2 Social sustainability

It focuses on improving the well-being of people and communities. This includes promoting equitable access to resources, reducing poverty and inequality, improving access to quality education and health care, and promoting the rights of marginalized communities (UN, 2015b). Table 2 mentions the SDGs that promote social sustainability.

Table 2 *Social sustainability goals (UN, 2015b)*

Goal 1: End poverty in all its forms everywhere.

Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.

Goal 3: Ensure healthy lives and promote well-being for all at all ages.

Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Goal 5: Achieve gender equality and empower all women and girls.

Goal 10: Reduce inequality within and among countries.

2.2.3   Economic sustainability

This focuses on developing resilient economic systems that can support long-term growth. This includes promoting responsible business practices, encouraging investment in renewable energy sources, and improving access to financing for small businesses (UN, 2015b). Table 3 mention the SDGs 8 and 9 focus on achieving economic sustainability.

Table 3 Economic sustainability goals (UN, 2015b)

Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.

Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.

2.2.4   Cultural sustainability

Cultural sustainability refers to the preservation of cultural elements such as language, customs, and traditions in communities around the world. It focuses on respecting diversity and the growth of new cultures while preserving cultural heritage. This aspect is connected to social sustainability because strong communities and active citizenship help shape the future of the environment and social and economic growth (UN, 2015b). Table 4 contains some of the SDGs that focus on working towards cultural sustainability.

Table 4 Cultural sustainability goals (UN, 2015b)

Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable.

Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.

Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

2.3   Teacher education

It refers to any formal, structured program that supports the academic preparation required to become a competent teacher in elementary schools,

secondary schools, and higher education. The study of becoming a teacher varies worldwide; however, teacher education programs are designed to enable students to acquire the knowledge, skills, and dispositions to work as teacher professionals (Darling-Hamond et al., 2005). Teacher education is aimed at both preservice and in-service teachers (Craig, 2016).

2.4   Pre-service teachers

Students who are preparing to become teachers are referred to as pre-service teachers. It is the time prior to a teacher's employment status at a school. Pre-service training refers to any kind of instruction a student receives in teacher education courses before they start working as teachers (Loughran & Hamilton, 2016). Pre-service teachers are also referred to as student teachers in the Finnish context. In this study, both the terms pre-service teachers and student teachers are used interchangeably.

3 THEORETICAL FRAMEWORK

3.1 Contextualizing the study

The education policies in Finland place significant emphasis on principles such as equality, democracy, human rights, and the attainment of Agenda 2030 objectives. Hence, it is intriguing to investigate the integration of sustainable education within Finnish teacher education, which is the specific topic of this study. The Finnish education system has gained global recognition, with the primary factor attributed to the exceptional standard of Finnish teacher education. Finnish teachers hold a master's level education from one of the eight Finnish universities with specific teacher education programs. (Sahlberg, 2015; Välijärvi et al., 2007). The Finnish teacher education system is characterized by its incorporation of research-based pedagogy, which integrates theoretical knowledge with practical application. Furthermore, Sahlberg (2015) asserts that it also facilitates the development of instructors' pedagogical skills and professional growth. Therefore, the focus of this study is Finland, a nation that is widely acknowledged for its exceptional education system on a global scale. It is of utmost importance to gain a comprehensive understanding of how student teachers perceive sustainability education (SE), as this can offer valuable insights for the incorporation of SE throughout teacher education programs in the nation. According to Hofman's (2012) prior research, the inclusion of sustainable education in teacher education programs is lacking in many Finnish programs. More than that, teacher educators have been seen to define SE without making any connections to the economic, ecological, or social aspects of sustainable development (Hofman, 2015). Hofman uses his research results to pose an interesting question: how could a teacher educator effectively and comprehensively teach the idea of sustainability to future student teachers if that educator lacks the ability to make connections between these dimensions or understand the multifaceted nature of SE? Hofman's quandary intrigues and

motivates this research to explore pre-service teachers' comprehension of sustainability education.

The objective of this study is to examine the comprehension of sustainability education among Finnish preservice teachers. The aim of this study is to examine the key elements pertaining to preservice teachers' comprehension of sustainability education, as well as the way the goals and substance outlined in Finland's National Education Curriculum manifest in their knowledge of sustainability education. The Finnish National Agency for Education's core curriculum for basic education in the years 2014, 2018, and 2019 highlights a recurring theme that emphasizes the need for learners to assume responsibility for the environment and direct their attention towards achieving a sustainable future (FNCBE, 2014). The emphasis is placed on the competence area of "participation, involvement, and building a sustainable future" within the framework of the seven transversal competences (FNCBE, 2014). So, the aim of this study is to find out how well preservice teachers understand and learn about sustainability in the classroom and how well the teacher education program helps them learn this.

The findings of this study would have implications for understanding the perceived perception of sustainability education among preservice teachers on a broader level. It can also be helpful to think about teaching philosophy and find new ways of looking at sustainability by reviewing educational practices like the curricula, the ways of teaching, and the training that teachers get. These processes have the potential to stimulate transformative shifts towards a more sustainable existence (Falkenberg & Babiuk, 2014). The implementation of this educational transformation initiates at the level of teacher preparation and training, as teachers play a crucial role in shaping the lives of upcoming generations (Kortetmäki et al., 2021). Educators serve as a significant asset in imparting essential skills to prospective individuals, enabling them to effectively confront the demands of the 21st century.

SE is a component of teacher education plans in several nations, yet the precise way it is included in the curriculum and subsequently implemented

within educational institutions remains ambiguous. According to Evans et al. (2017), the endeavors undertaken within institutional settings often fail to align with the necessary competencies for fostering active, global citizenship. There are instances where preservice teachers may have misconceptions regarding specific subjects within the field of sustainability education (Ratinen et al., 2013). Previously, it has been observed that student teachers possess a limited awareness of climate change, although they have some factual knowledge (Ekborg, 2006; Ratinen, 2013). Furthermore, these individuals tend to hold misconceptions and misunderstandings regarding the broader implications of climate change in relation to sustainable development. The reason for this might be that the prioritization of enhancing students' literacy and numeracy skills within educational systems has led to the marginalization of social education (Evans et al., 2012, 2017). The most common view is that sustainable development can only happen if teachers help their students learn how to be sustainable, hence fostering the development of competencies pertaining to sustainability matter.

In addition to suggestions about curriculum, there are obstacles that impede the successful implementation of SE. Hopkins and McKeown (2007) have identified four primary problems associated with the implementation of SE. These challenges include:

1. Lack of awareness and support at the teacher education institutional level
2. Lack of prioritizing sustainability in the educational community
3. Lack of incorporation of SE in the educational systems and structures
4. Lack of establishing partnerships with the local community

Hopkins and McKeown (2007) conclude that the introduction of SE in schools is expected to result in significant modifications to various aspects, including school ethos, structure, curriculum, resource management, and community engagement. However, the authors note that numerous educational institutions are hesitant to embrace this change due to concerns about potential risks to their existing systems, leading to a lack of appreciation for the value of SE.

Education is a key part of making society better, and three main parts of education—pedagogy, curriculum, and teacher education—are changed to make this happen (Falkenberg & Babiuk, 2014). One of the primary factors contributing to the lack of effectiveness of SE in previous instances is the limited inclusion of SE as a focal point in the professional development programs offered to instructors within teacher education courses (Lozano, 2010).

SE is an increasingly prominent field of study in numerous nations. Nevertheless, the process of defining SE has posed a significant challenge, resulting in a fragmented comprehension of the subject matter. The essential element of SE is to fully embrace its content and integrate it into the curriculum of higher education, hence expanding students' breadth of knowledge. According to McFarlane (2011), SE covers a wide range of topics and exhibits greater depth of analysis than environmentalism. The objective of this study is to look at how student teachers feel about sustainability to understand how the University of Jyvaskyla's teacher education curriculum implements sustainability principles.

The purpose of this study is to provide some insights into how sustainability education (SE) is conceptualized within the Finnish education system, namely at the tertiary levels. And to explore the perspectives of student teachers on sustainability to gain insight into their comprehension and retention of knowledge acquired during their teacher education program. In addition, it can provide feedback for future changes to teacher training. There is a chance that sustainability courses could be given more attention in teacher education, giving future teachers the knowledge and skills, they need to deal with this important issue in the best way possible. The intended audience for this study includes educators, curriculum designers for teacher education programs, and researchers in the field.

3.2   Global Understanding of Sustainability Education

The concept of sustainability has evolved and acquired diverse interpretations along its trajectory within the field of education. According to Bianchi (2020), the concept of "sustainability" has undergone three distinct phases. The first stage starts in the 1960s with the release of Rachel Carson's influential book Silent Spring (1962), and it ends with the Stockholm-based first global United Nations summit on environmental issues in 1972.

The commencement of the second phase occurred in 1992, coinciding with the United Nations Rio conference and the subsequent endorsement of Agenda 21. This event caused a change in the way schools work, with a focus on developing skills and knowledge related to social, environmental, and developmental justice. The paradigm holds substantial importance in the realm of sustainability education. The existing provision falls within the purview of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) (Lauries et al., 2016). The 1992 United Nations Conference on Environment and Development recognized education as a crucial component for achieving sustainable development (UN, 1992).

The concept of sustainable development has traditionally focused on the integration of social and economic aspects, with the aim of utilizing natural resources in a manner that ensures the well-being of future generations (Matero and Arffman, 2023). The concept of SE was first introduced in chapters 35 and 36 of Agenda 21, a document presented during the 1992 United Nations Conference on Environment and Development. The chapter highlights the significance of education in advancing the cause of sustainable development and presents several recommendations to support this endeavor. These suggestions include the need to realign educational systems to prioritize sustainable development, enhance public consciousness on the subject, and foster the provision of training opportunities (UN, 1992).

This action served as the foundation for the contemporary sustainable development movement, including a revitalized focus on environmental education (Aaltonen et al., 2023). Subsequently, the phenomenon of SE has

witnessed a significant surge in global recognition and acceptance (Aaltonen et al., 2023). Currently, the integration of sustainability into many facets of education is widely recognized as a fundamental element within many educational systems. To achieve this integration, it is important to focus on using sustainable principles and practices across many academic areas, such as science, technology, and social studies. Furthermore, numerous nations have implemented legislative measures to ensure the integration of SE within their respective national educational frameworks (Evans, 2020). The International Union for Conservation of Nature (IUCN) conference has consistently emphasized the integration of SE into teacher education since 1971. During this conference, it was asserted that teacher education holds significant importance and serves as a fundamental element of environmental education (IUCN, 1972, p. 25). Nevertheless, teacher education programs in numerous countries exhibit shortcomings in adequately equipping teachers to effectively fulfill their role as pivotal contributors to sustainability initiatives (Angelotti et al., 2010; Muños-Pedreros, 2014). Hence, it is necessary that SE be integrated as a fundamental component of teacher education.

The third phase refers to the World Summit on Sustainable Development, organized in Johannesburg in 2002. The occurrence in question served as a catalyst for the initiation of the Decade of Education for Sustainable Development (2005–2014), which placed a strong emphasis on the importance of lifelong learning. The United Nations Environment Programme (UNEP) launched the Global Action Programme on Education for Sustainable Development (GAP-ESD) in 2014 with the intention of advancing education on global sustainability (Bianchi, 2020). This program has played a key role in aiding nations across the globe in the implementation of sustainable education policies, programs, and resources (Aaltonen et al., 2023). In 2015, the United Nations (UN) officially embraced the Sustainable Development Goals (SDGs), with particular emphasis on the aspect of education quality (SDG 4). Now, this project is seen as an important part of UNESCO's 2030 project, which aims to promote growth and

change in individuals and societies with the end goal of achieving sustainable development around the world (Bianchi, 2020; UNESCO, 2022).

3.2.1 European Union policies

SDG 4, specifically Target 4.7, emphasizes the significance of education in promoting sustainable development. The worldwide community aims to achieve this target by the year 2030 with a range of policies and activities to provide support to nations in their pursuit of the objective (Aaltonen et al., 2023).

The European Green Deal (EGD) is a policy initiative designed to support European Union (EU) member states in tackling pressing global issues, such as climate change, while simultaneously promoting the development of sustainable economies. Avelino and Ramos (2020) say that putting this strategy into action will make sure that all schools, training centers, and universities in the European Union teach the skills that are needed to get the desired result.

The European Commission (EC) and the Organisation for Economic Cooperation and Development have established other frameworks such as EntreComp, DigComp, LifeComp, GreenComp, ProcurComp, and 21st-century skills (OECD, 2020; Avelino & Ramos, 2020). It is important to note, though, that putting these frameworks into action does not guarantee that all European Union (EU) countries will fully implement Education for Sustainable Development (ESD). This is because each country may have different plans and strategies. Regulating Education for Sustainable Development (ESD) at the national level has both advantageous outcomes and inherent difficulties. Education is considered a catalyst for substantial societal developments. Several European Union (EU) member states have implemented educational programs aimed at fostering the acquisition of sustainability capabilities among learners. Because of this, many educational policy documents and course plans have included sustainability skills in school- and university-level courses. The primary objective of these competencies is to foster environmental consciousness, promote sustainability, and facilitate future-oriented learning (Aaltonen et al., 2023).

3.3　　Sustainability and teacher education

Currently, the need for sustainability education is critical in worldwide efforts to achieve a more sustainable society and economy (Kortetmäki et al., 2021). Globally, nations seek to nurture sustainable education policies in their quest of a more sustainable future for the world, and they work tirelessly to achieve this goal (Stevenson et al., 2015). Nonetheless, there is a lack of agreement on the concept of sustainable development, sometimes known as ESD. Because these concepts are so wide and susceptible to interpretation, academics have debated how to integrate sustainability or sustainable development into education (Evans, 2020). The acronym ESD was deemed problematic because of the apparent normative overtones linked with the term "for." As a result, researchers such as Wolff (2011), Sterling (2010), Fisher and McAdams (2015) used the term "sustainability education." Ecologists use these terms to describe ecological phenomena. Environmentalists promote environmental protection, but economists highlight the need for long-term production and economic expansion. As a result, the meaning of the term varies depending on the viewpoint from which it is perceived. It is worth noting that while the terms "sustainable development" and "sustainability" are commonly used in educational policy, their precise connotations are not always clear (Bianchi, 2020). The use of a term and the implications it carries can have educational consequences. Bianchi (2020) gives a thorough examination of the UNESCO definition of sustainability, which holds that sustainability includes the overarching objective of achieving a sustainable world and sustainable development. According to the author, this idea comprises a plethora of interconnected activities that contribute to societal growth. The context in which the words are used determines their meaning (Connelly, 2007). As a result, the concept of sustainability is rather ambiguous because different groups of scholars have varied beliefs about what it entails. The lack of consensus and shared goals surrounding sustainability has resulted in a similar dilemma in the field of education. As a result, the effort to embrace it as a vital component of education has been abandoned.

Furthermore, some instructors believe that this particular issue is different and disconnected from their academic activities, which makes conducting complete research difficult (Evans, 2020). Michelsen, Holdsworth, and Thomas (2015) established three separate forms of education within the context of sustainability in the scholarly discourse. The first type of education presented is concerned with increasing awareness about sustainability while not upsetting the prevailing worldview. The second type is education for sustainable development, which uses education as a vehicle to actively pursue and achieve sustainable development goals. Sustainability education entails learning as a transforming process in which individuals and groups in society participate actively, employing a broad and all-encompassing approach. As a result, the concept of educational goals in the context of SE must be refined further.

According to Evans (2012), there are various fundamental problems connected with implementing SE in educational settings, such as grassroots barriers, administrative barriers, and conceptual barriers. Grassroots barriers refer to the difficulties that school instructors encounter daily, such as a lack of time and materials, as well as limited access to training opportunities targeted at improving their understanding of SE. Administrative constraints impede the distribution of financial resources for initiatives, causing SE implementation at educational institutions to halt. Despite being properly qualified to design and implement specialized teaching initiatives in schools, teachers encounter a lack of necessary financial support. When educational institutions obtain financial help, a large amount of the funds are frequently allocated to various projects that prioritize the improvement of students' literacy and numeracy skills. These activities, once again, have the potential to redirect attention away from the topic at issue, which is SE. When there are conceptual obstacles in an organization, it leads to larger-scale problems. SE's ideals, for example, do not align with the school's existing practices, which are founded on distinct principles.

According to Evans (2012), the implementation of SE necessitates a necessary transformation in how we see and approach the current educational system. This transition should attempt to create an educational framework that

can encompass conservation, social justice, development, and democracy goals. SE could assist profound social change in this way. A pluralistic approach to sustainability education is promoted, including educational practices aimed at empowering learners as critical and political activists. This method makes it easier to recognize, think on, and act on the models that promote harmonious coexistence on our planet (Rudsberg & Öhman, 2018; Wals, 2006).

Despite the limitations, higher education institutions have integrated sustainability-related courses to a larger extent than in the past (Lozano et al., 2015 & 2017). It is important to emphasize, however, that inclusion in curricula does not necessarily imply that students are actively committed or engaged with the subject matter. Both Karvinen et al. (2015) and Wolf et al. (2017) underline the lack of implementation of sustainable practices and the lack of emphasis on sustainability content in Nordic teacher preparation programs. According to other research findings, sustainability concepts are more prevalent around science topics rather than being incorporated as a cross-subject theme or topic (Cantell et al., 2019). According to Wolf et al. (2017), instructors lack the essential pedagogical tools to properly address sustainability subject matter, which can be ascribed to inadequate preparation throughout their teacher education programs. Several additional academics offered light on Finland's current sustainability status. More information is provided in the following paragraphs. Wolf et al. (2017) outlined five reasons why even the best educational setting cannot successfully incorporate sustainability education. These proposed explanations mirror the normal issues that teachers experience in different countries. The causes are as follows:

1. Sustainability contradicts societal trends; sustainability contradicts sociological and political inclinations. Education is regarded as a weapon for the nation's economic growth in Finland, where consumption is increasing.

2. Finnish teacher education reflects university education in general; teacher education takes place at universities; educators' and institutions' lack of

critical thinking about sustainability influences students' learning about sustainability.

3. Separate fields and curricula hamper sustainability education implementation; teacher education is based on separate academic disciplines. Universities are mostly subject-oriented, making cross-disciplinary or interdisciplinary research challenging. Furthermore, because of the complexity and interdisciplinary character of sustainability, it is more difficult to apply in higher education.

4. Sustainability is difficult; sustainability is intricate; the topic's interdisciplinary character needs a new technique. Another issue confronting universities in Finland is the restructuring of education to address the nature of the subject.

5. Sustainability is complicated due to its dependence on values; comprehending the importance, morals, and ethics surrounding sustainability necessitates critical thinking, value discussion, and action competency. This manner of thinking and doing has not yet been created at universities that specialize in teacher education.

Beyond the challenges of implementing sustainability in Finland's higher education, additional scholars highlight the perspectives and understanding of sustainability supplied by teacher professionals and preservice teachers. According to previous studies on sustainability education in Finland, sustainability is not seen as a core principle in Finnish education.

Koskela, T., and Kärkkäinen, S. (2021) conducted a qualitative case study to investigate how students evaluated the role of change agency and sustainable development. According to the findings, student teachers' ideas on sustainable development were quite limited, with most of their responses focusing on social rather than economic or environmental aspects of the topic. Similarly, a questionnaire was used to assess pre-service teachers' environmental perspectives, knowledge, and perceptions, specifically the consequences of climate change mitigation efforts and their desire to engage in these actions. This study demonstrates how preservice teachers view certain environmental

knowledge. The responses of 224 participants show that preservice teachers do not really understand the effects of different efforts to fight climate change and cannot tell the difference between low- and high-impact measures (Tolppanen et al., 2021).

Uitto and Saloranta (2017) found in their survey of 442 lower secondary subject teachers that sustainability issues are not usually stressed in their teachings. Also, compared to the four pillars of sustainability, social sustainability received greater attention in the classroom than cultural, economic, and ecological sustainability. Furthermore, biology and social science instructors were more actively interested in sustainability than other subject teachers at the school (Uitto, 2017, as reported in Wolff et al., 2017). According to Uitto and Saloranta's research, Finnish instructors have little involvement in sustainability.

All these research findings reveal a lack of conscious behavior about sustainability knowledge and a pedagogical understanding of how to teach sustainability. This can be resolved if Finnish teacher education programs equip students with the necessary knowledge and abilities to teach about sustainability and emphasize the importance of acting sustainably.

3.4   Sustainability in Finnish Education

The national curriculum of Finland serves as the guiding framework for the entirety of the country's education system. The document establishes the foundation for educational activities by outlining the principles and goals that guide the operations of all educational institutions in Finland.

SE obtains considerable normative support in policy texts such as the national curricula in Finland (FNAE, 2014). The concept of taking responsibility for the environment and emphasizing the pursuit of a sustainable future is emphasized in the Finnish National Agency for Education's core curriculum for Basic Education for 2014. Furthermore, one of the seven transversal competence areas incorporates the concepts of participation, involvement, and the development of a sustainable future. SE is consistent with the United Nations

Sustainable Development Goals (SDGs) in Finland. The Expert Panel on Sustainable Development (2016) set the goals for sustainable development in Finland. These goals include equitable opportunities for well-being, an inclusive society that encourages participation from all members, the adoption of sustainable practices in the workplace, the establishment of a sustainable and carbon-neutral society, the promotion of sustainable local communities, and the cultivation of a resource-efficient society (Kasa et al., 2022).

The 1980s saw the introduction of sustainability ideas into Finnish educational policy. In 1985, the National basic Curriculum for Basic Education made the first mention of the basic goal of 'environment and natural protection.' The phrase sustainable development' first appeared in the Finnish National Core Curriculum for Basic Education in 2004. The curriculum continually highlighted the importance of environmental stewardship, well-being, and sustainable development. Similarly, the concept of sustainable development was addressed across several grade levels in other academic fields such as environmental and natural studies, geography, biology, and ethics. Each of the subjects places a strong emphasis on individual involvement in the environment, the importance of biodiversity for the purpose of ecological sustainability, development issues, human rights, and a variety of other topics that enable students to become acquainted with and demonstrate responsible behavior toward their peers, society, the natural world, and themselves. Sustainability emerged as the key focal point following the implementation of the redesigned national curriculum in 2014. Indeed, the first paragraph of Finland's national curriculum for basic education explains why the curriculum was updated, in addition to the regular revision of the curriculum: "…to ensure that changes in the world around the school can be responded to and that the school's role in building a sustainable future can be strengthened in the organization of education" (FNAE, 2014).

In national studies on how to implement Agenda 2030, Finland has recognized education as a crucial asset in reaching sustainability goals. However, when it comes to Finnish schools, the global goals of sustainability education may not necessarily translate into actual actions. Even though it calls for the

implementation of sustainability into school culture and instruction, the 2014 Finnish national core curriculum for basic education is not explicit enough in this regard (Mykrä, 2023).

The curriculum focuses on the key ideas of sustainable development, achieving a sustainable future, and adopting a sustainable lifestyle. The foundation of basic education in Finland is built on four essential values that help to improve global citizenship and promote culturally sustainable development.

1) Respecting the uniqueness of each student and guaranteeing the right to a good education

2) Promoting each student's growth as a civilized or educated human being and as an active citizen of a democratic society

3) Valuing cultural diversity and regarding it as a source of richness,

4) Understanding the necessity of living sustainably

(National Core Curriculum for Basic Education 2014, p. 15–17).

The Finnish national core curriculum for basic education is divided into two parts: the general part and subject-specific offerings available at various levels. The general section includes beliefs, broad goals, and organizational culture. The subject section includes academic fields relevant to students in Grades 1-2, 3-6, and 7-9. Each academic discipline is defined by a set of educational objectives and core content areas. Every instructional goal is linked to the corresponding transversal competencies outlined in the curriculum's general section. The seven transversal competencies are intended to promote the development of individuals capable of actively participating in democratic society and living a sustainable lifestyle. Each of these competencies must be taken into account when developing content and objectives for subjects at various grade levels. The following competencies will be discussed: This framework includes the following areas of focus:

1) Thinking and learning to learn

2) Cultural competence, interaction, and expression

3) Taking care of oneself, managing daily life

4) Multiliteracy

5) Digital (ICT) competence

6) Working life competence, entrepreneurship

7) Participation, involvement, and building a sustainable future.

(National Core Curriculum for Basic Education 2014, 21-26)

A closer examination of the four values and the seven transversal competencies reveals that sustainability is the underlying principle at the heart of these notions. Sustainability will be stressed in all academic fields, according to the curriculum. Environmental studies are taught to students in grades 1-6, while biology and geography courses in grades 7-9 investigate the concept of sustainability through many theme topics. As a result, numerous stakeholders agree that sustainability is an essential component of Finnish education. The incorporation of sustainability in numerous learning situations across the national curriculum indicates a positive trend. Certain concerns, however, come from the curriculum. One of the key challenges is the inadequate definition of the term's "sustainability" and "sustainable development" (Bianchi, 2020). This phenomenon creates a quandary in terms of interpreting the phrase, as each reader and user of the curriculum may have a different interpretation of it. This is a difficult topic, and the methodical approach to achieving a sustainable future may not produce the intended results.

Niina Mykrä 2023 examined all of Finland's environmental and education policy documents, identifying six broad themes that were consistently present across these texts.

1) Sustainability education is significant in policy documents at all levels.

2) Education is seen as one tool for environmental policy.

3) Education policy documents do not include sustainability issues as comprehensively as the commitments of the national school administration would suggest.

4) The steering of schools towards ecological sustainability stays at an abstract level.

5) Commitments to include sustainability issues in all activity in education and comprehensive schools fade level by level until they reach the local documents.

6) Regulatory and economic policy instruments stay marginal when steering schools towards ecological sustainability.

Furthermore, the many aspects of sustainability, namely the ecological, social, cultural, and economic components, are exclusively treated within the subject of environmental studies. The concept of social values is offered in future parts without being contextualized within the framework of one of the components of sustainability. For example, the curriculum lacks thorough debates on human rights and equality issues, which differ from sustainability and are not viewed as one of its other qualities. Furthermore, the curriculum places a strong emphasis on student promotion, training, and active participation in the goal of a sustainable future. However, it fails to provide a realistic portrayal of the actions and measurements required to achieve the promotion goal. Lack of responsibility for schools in terms of sustainability makes it difficult to ensure that sustainability is applied consistently throughout all schools and by all school administrators, teachers, and other key personnel. As a result, there are worries about the effectiveness of national sustainability measures (Niemi, 2015).

Eco-social education, or eco-social *bildung*, is another concept that underpins the Finnish curriculum. This paradigm emphasizes transformation, with a special emphasis on recognizing the worth of Earth's biodiversity, the importance of ecology, and the significant consequences of climatic crises. It opposes the notion of the economy as the foundation for social and economic well-being, instead claiming that addressing and mitigating climate issues is vital to societal well-being (Finnish National Board of Education, 2014; Aaltonen et al., 2023).

3.5 Teacher Education in Finland

Since 2000, the Finnish Education brand has acquired prominence because of its outstanding performance in the Programme for International Student Assessment (PISA). Fair access, a focus on students' wellbeing, and a pool of highly qualified teachers are features that set the education system apart (Sahlberg, 2012). Teacher education has been utilized to explain PISA success and is thus seen as a relatively high-quality program (Kasa et al., 2022). These variables are crucial in creating the global impression of Finnish education.

There are eight major institutions in Finland that provide teacher education programs out of a total of sixteen universities.

1. University of Eastern Finland
2. University of Helsinki
3. University of Lapland
4. University of Jyväskylä
5. University of Oulu
6. Tampere University
7. University of Turku
8. Åbo Akademi

The teacher education curriculum consists of 300 ECTS credits and is intended to provide primary school students and teachers with a thorough understanding of education as a vital and diverse area. Individuals who complete this program will be qualified to teach students in grades 1–6. To fulfill the qualifications for becoming an upper secondary teacher, student instructors must study one or more school topics (Jónsson et al.,2021).

It is critical to integrate teaching practice with educational theory, as well as topic research and subject teaching. Teaching practice is an essential component of Finnish teacher education; nevertheless, it is crucial to stress that this feature does not naturally give instruction on sustainable pedagogy (Wolff et al., 2017). Most training practices take place in training institutions affiliated with university teacher education departments.

Teacher educators and teachers are universally acknowledged to be important catalysts for promoting societal reform. A study conducted in Finland looked at the availability of preservice teacher training among universities that cater to different types of instructors. According to the study, there is a lack of understanding of how higher education institutions can ensure that student instructors are appropriately ready to teach sustainability (Pathan et al, as cited in Wolf et al, 2017).

According to Wolff et al. (2017), despite the prominence of rigorous teaching approaches, sustainability education and training are frequently disregarded. The integration of sustainability across all areas is a prominent characteristic of both the 2004 and 2014 core curricula. The implementation of sustainable development methods in schools and teacher education continues to be a difficulty. The critical function of teachers in promoting sustainable development has gotten insufficient attention or resolution.

According to a 2010 survey by Maria Hofman, none of the Finnish universities that offer teacher education have established required sustainability courses at the fundamental levels. The findings show that the availability of sustainability courses varies throughout Finland's higher education institutions. Furthermore, a sizable proportion of teacher educators (87%) reported a lack of training or instruction on the integration of sustainability across all sectors. Furthermore, according to Wolff et al. (2017), most participants lacked awareness about whether their departments had produced a clear definition of sustainable development in their strategic plans or other policy documents. It is critical for student teachers to be aware of and engaged in SE to adequately prepare pupils for the future. This notion originates from the understanding that SE provides students with the skills needed to build a thriving future.

Hofman's major study (2012) investigated teacher educators' attitudes about the implementation of sustainable development in universities. According to the study's conclusions, the sustainability objectives in Finnish higher education have not been met, resulting in a lack of sustainability education for potential instructors.

The major goal of this study is to assess student teachers' collective understanding of SE to identify potential areas for improvement within the teacher education curriculum. The findings of this study will help to better understand preservice teachers' perceptions about sustainable education. Furthermore, a major portion of capacity-building assistance is often provided during the preservice phase. It is crucial to monitor the integration of sustainability education within preservice teacher education curricula. Also, an evaluation of this subject will provide important insights into how pre-service teachers understand and apply SE in their educational settings.

The goal of this research is to improve understanding of the numerous factors and barriers that prevent teachers from applying SE in their classrooms following the training period. This research could re-evaluate our existing teacher education curriculum. As a result, the purpose of this research is to determine the extent to which SE is integrated into the teacher education curriculum in Finland through pre-service teacher's understanding of the role of sustainability education.

3.5.1   Teacher Education at JYU

JYU's Department of Teacher Education has the distinction of being Finland's first Finnish-language institution specializing in teacher education. The program was founded in 1863 and is now linked with the Faculty of Education and Psychology, which offers a variety of undergraduate, graduate, and doctorate degree programs in education. The Department of Teacher Education's major goal is to provide comprehensive education and training to individuals interested in careers in teaching and counseling. The course includes a three-year undergraduate program and a two-year graduate program that prepares certified primary school teachers or subject instructors who have completed pedagogical topic studies to teach in Finland. The program's curriculum includes a variety of courses focused on pedagogical concepts, curriculum design, and psychological views. And through work experience and internship possibilities, students are exposed to a blend of theoretical and practical learning, which

improves their pedagogical subject knowledge, educational judgment, and issue competence.

Students must complete a certain number of courses in various academic disciplines, such as philosophy, sociology, psychology, and history. Students are required to complete a minimum set of core classes, also known as compulsory subjects, within the framework of the program to fulfill the credit requirements. There is also a range of elective classes that are optional and allow students to choose whether to include them in their program. Students who have earned a bachelor's degree will continue their studies at the master's level (University of Jyväskylä, n.d.).

4   RESEARCH TASKS AND QUESTIONS

The current study makes use of a qualitative research design based on the interpretive paradigm. This paradigm allows people to recognize and value their individual differences. The numerous traits inherent in this paradigm allow for the collection of significant data as well as the critical evaluation of current knowledge. The primary goal of this study is to investigate the underlying attitudes and notions held by educators in the field of sustainability education. The goal will be met by initiating dialogues that critically examine the underlying framework, particularly the curriculum and course options in teacher education, and their impact on individuals' understanding of sustainability education and its associated consequences. The current study was guided by the following research questions:

1. What is the understanding of sustainability education among Finnish pre-service teachers?
2. How is sustainability education embedded in the teacher education curriculum at JYU, and in what terms?

5 RESEARCH IMPLEMENTATION

5.1 Research participants

This study's participants were drawn from the Department of Teacher Education at the University of Jyväskylä. The only criterion used to identify participants was enrollment in a program for primary school teachers. This group of teachers oversees teaching children in grades 1-6 a variety of subjects. The purpose of this study is to investigate preservice teachers' and prospective primary school teachers' understanding of sustainability education, as well as their level of readiness to teach environmental studies.

Due to two primary reasons, the selection of participants was limited to those only linked to the University of Jyväskylä. It would be beneficial for a university student to create communication with other students. Furthermore, considering that JYU was the first teacher education school in Finland, I am interested in learning about the perspective and implementation of SE in teacher education courses.

Initially, the researcher planned to conduct focused-group discussions (FGD) with a diverse group of Finnish student-teachers at various levels of their studies. Participants were to be chosen at random from a group of people who had agreed to participate. Nonetheless, due to a lack of involvement from the intended participants, the data collection instrument was adjusted to include individualized interviews. Another barrier discovered was the issue of language, which limited the capacity to engage a larger and more diverse pool of people. I am not fluent in Finnish, and a significant percentage of student teachers expressed hesitation to relate their experiences in English. This constraint made it difficult to collect a larger dataset. Additional research tools, such as questionnaires, were examined for data collection since they have the potential to promote increasing levels of participation. Nonetheless, given the intrinsic qualities of qualitative research, I believe that questionnaires may not be the most

effective way to collect extensive information. As a result, the study was designed to include interviews.

A significant amount of effort was put into promoting the study to attract volunteers. Volunteer recruitment tactics include spreading information through multiple faculty channels, actively participating in events, and directly contacting Finnish lecturers to describe the study and its participation requirements. The hiring process lasted from November 2022 to February 2023. The problems found in locating Finnish student teachers substantially impeded the completion of the project. However, by the end of March 2023, a total of six individual interviews with student instructors had been successfully conducted. The study included only female participants who were enrolled in various academic years at the university and had varying levels of study experience.

5.2   Data collection

Interviews were chosen as the method of data collection for this qualitative research study in accordance with the stated research framework. Interviews provide a thorough understanding of student-teachers experiences and perspectives on sustainability education (SE). This methodology promotes the exploration of non-predetermined inquiries, allowing participants to provide detailed and intricate responses. The comments have the potential to provide substantial insights into the subjective interpretations and meanings that people ascribe to SE prior to beginning their teaching careers (Merriam, 2015).

Furthermore, using interviews as a research tool in interpretive research allows for the incorporation of several perspectives (Tracy, 2019). When compared to alternative research approaches, the incorporation of a diverse range of experiences and viewpoints in this topic research results in more thorough and meaningful data.

Initially, the research methodology incorporated the use of a focus group interview to elicit a wide range of comments from the student participants. Nonetheless, due to limited participant availability, the study chose to conduct

individual interviews instead. After finding a group of possible participants, the study's goal was explained, and they were asked to take part in a research interview, which they agreed to do voluntarily.

The research approach included guided questions to facilitate interviews, allowing the researcher to delve deeper into the participants' discussions about SE. Interviewees must grant genuine and informed consent to build a foundation of mutual trust and respect among all parties involved. At the start of the interview, it was critical that all participants felt a sense of ownership over the setting and could contribute individually to the proceedings. Another important thing was that as a researcher, I knew it was important to understand and be sensitive to the participants' sharing, their unique ways of expressing themselves, and the larger conversation about their shared experiences, which was very different from my own culture.

All interviews were held in English, with the researcher asking the guiding questions in English. Prior to the interview, the same set of questions was translated into Finnish to assist participants who had linguistic challenges. The participants used English as their primary mode of communication, with the opportunity to switch to Finnish if they had difficulty articulating their thoughts and ideas in English. All interviews were scrupulously documented to ensure the integrity of the audio recordings. Because the participants were unable to meet in person, two interviews were organized using the Zoom online platform.

The interviews were divided into three sections, each of which included questions about the student teachers' backgrounds, educational experiences, and motivations for pursuing a career in education. The third section of the interview focused on the candidates' readiness to incorporate sustainability into their primary school instructional practices. The goal of the interview was not to merely conduct a 'question and answer' session. Instead, a predefined questionnaire was used to prompt the respondent and keep the discussion focused on the study problem throughout.

Following the interview, all the interviews were transcribed, with special emphasis paid to sections that required translation from Finnish to English.

Following that, a translator was identified who assisted in interpreting these specific passages. The translator ensured the participant's identity was kept private. During the interview, the translator was given a brief description of the study's aims and their support. The audio clip was played repeatedly only after the participants confirmed their commitment to act as translators, allowing for quick translation into English.

An analysis of the curricula and values of the University of Jyväskylä's teacher training school was done to strengthen the study's robustness. The procedure involves conducting an online search to acquire relevant data from the Department of Teacher Education's webpages at the University of Jyväskylä. The study concentrated on two documents: the "Teacher Education Curriculum 2014–2017" and the "JYU Teacher Training Values OPS 2020–23." To address the issues raised by linguistic differences, these documents were translated from Finnish into English with the goal of extracting useful and significant information. The findings from the study of this document aided in the improvement of the research questions and the comprehension of the interview data provided by the participants.

5.3   Data Analysis

This study chose thematic analysis as the methodological approach for analyzing the data acquired in this investigation. Thematic analysis is distinguished by its systematic methodology, which uses transcribed interviews to build thematic networks that encompass the primary themes and distinguishing features of the dataset (Miles et al., 2014). The analysis was thought to be appropriate for answering and interpreting the research questions because it used the different themes that came up in the study's multiple interview data sets. Once these basic themes are found using this method of analysis, they can be turned into larger ideas called organizing themes. These organizing themes cover many different basic themes. Identifying organizing themes in a set of data can help create a global theme that includes how the

different parts of the data relate to each other. The technique is highly effective in the process of evaluating and arranging data to articulate both overt and covert themes or findings within the data.

The following stages were included in the data analysis technique: first, transcribing recorded interviews; second, immersing oneself in the data set; third, reviewing the transcribed interviews; fourth, developing initial codes; fifth, revising the codes to establish organizing themes; and finally, refining the themes.

Computer-Aided Qualitative Data Analysis Software (CAQDAS) was used for data analysis to simplify the process of reviewing the interview text, its contents, and incorporating the found themes to develop conclusions. Atlas.ti (version 23.2) was utilized in this work as a platform for data organization, management, coding, sorting, and reconfiguration (Braun and Clarke, 2006).

The recurring themes and unique words were carefully emphasized, marked, and documented for future study after a comprehensive review of the interviewee's repeated themes and distinctive language. Multiple readings of the transcribed interviews were used to document the emergent themes drawn from the interview material. These codes were used as the primary codes for the dataset. Specific words and sentences that directly reflected the interviewee's grasp of sustainability were found during the interview transcript analysis, considering the study questions. After that, more themes were investigated during the data analysis to get to the deeper meanings that the respondents' statements hinted at.

A total of 20 initial codes were generated, which were then sorted into nine themes, which were then structured into three overarching themes that served to meet the research inquiries provided by questions 1 and 2. An example of this process is illustrated in table 5. It is vital to remember that the specified themes are not mutually exclusive when addressing the research inquiries. The use of codes in this study enables the assessment of interview talks, allowing the investigation of both research questions. There were also discoveries that, while not directly related to the research inquiry, provided useful insights into

sustainability teaching within the context of JYU teacher education. The iterative process of analyzing, reconstructing, and improving the themes that encompassed the outcomes was repeated several times. This was done to create a consistent and accurate set of topics that successfully replicated the research findings. All patterns that were seen were written down as empirical data to answer the study question, either by supporting or contradicting the main idea. This was done by finding new themes, condensing themes, and rearranging themes in the way described above. Additional evidence and remarks acquired from interviews are presented in the next sections of this discussion to provide a complete picture of the research findings.

Table 5 Example of thematization process

Theme	Verbal description
Mainly environmental	nature pretty much, so all the forests and animals and every kind of that. But then also the weathers we have. Yeah, and the global warming we are having and also in Finland we have just started to talk about Luontokato and Sukupuuttoaalto them- extinction of species.
More than environmental	sustainability is not the same as ecology or biology…it's about actually how humans interact and how humans' patterns, human made things we have created in this world, for example like laws and the whole markets and they are all connected to environment.
Pedagogical dilemma	just to make it interesting, might be the first challenge, because it's not like a sexy topic you know in a way that some are like very fun topic like games and amusement parks.

5.4   Ethical Solutions

During the first phase of data collection, careful thought was given to the research's ethical implications. The inclusion of ethical issues is critical in all research undertakings (Tracy, 2019). To effectively address ethical difficulties, this study strictly conformed to the ethical guidelines established by the Faculty of Education and Psychology at the University of Jyväskylä.

Several essential criteria were carefully evaluated, including the maintenance of anonymity, the cost of participation, and the confidentiality of study data. The participants were advised of their ability to withdraw from the interview process at any time, emphasizing the voluntary nature of their participation. Furthermore, it was critical for the researcher to provide participants with detailed information about the research technique, ensuring their informed consent.

Ethical Principles for Research with Human Participants, published by the Finnish Board for Research Integrity, were referenced during data collection (TENK 2021). Through the distribution of research notification and privacy notice documents, all participants in the study were fully informed about the research. These materials clarify the study's aims and rationale, as well as the participants' right to withdraw from the study at any time during the interview process. Participants were free to leave the study at any time and were not required to give any rationale for their decision. Withdrawal can occur before, during, or after the process of gathering replies. As a result, only students who willingly gave a signed consent form were included in the study.

Furthermore, prior to beginning the interview, each participant provided express verbal agreement, which was documented in the audio documentation. The participants were explicitly advised that the interviews could be released in the future for educational, research, or publication purposes. The participants were assured that their interviews would be kept in a secure location. Following the completion of the transcribing process for the recorded interviews, the participants were given the opportunity to review the transcripts in order to ensure the precision of their responses and obtain approval for the written text. To protect the participants' confidentiality, their identities were anonymized, and generic phrases such as researcher and interviewee were used.

Strict adherence to data privacy standards was observed throughout my thesis work. Preventive steps will be put in place to reduce errors, such as not downloading audio files onto personal devices or distributing them to unauthorized individuals. Also, encryption will be used to ensure strict control

over folder and file access, particularly for files containing the personal data of research participants.

While acknowledging the benefits of this research, it is critical to address ethical concerns about the authenticity of information and its ability to be manipulated (TENK 2021). While conducting interviews with participants, an academic researcher must be cognizant of personal biases and avoid imposing preconceived conclusions based on literature readings. The avoidance of researcher-driven impositions is especially important in interpretative research, which seeks to capture participants' subjective experiences and opinions (Mason, 2002).

5.5　　Researchers' positionality

This research is very contextualized in Finland and Finland's educational system; it is essential to share my background and positionality as a researcher.

I am Indian by nationality. I strongly believe in education for social change because I have many years of experience as a teacher, student, and apprentice in different educational settings. And having witnessed the teacher preparatory programs at universities and teacher professional development programs in the domain of school education at the ground level in India, I was drawn to understanding the teacher education program at JYU. Given the emergent talk about sustainability across professions in public, I was curious to understand how the teacher education programs at JYU conceptualize SE.

The lack of experiential knowledge within the Finnish school education system and studying as a student allowed me to view the practices and knowledge sharing of participants during the interviews through an unbiased lens. As the participants and I did not have similar shared experiences, the discussion during the interview brought out the nuances of the student teachers' experience in a different light. During the interview, the participants shared their experience of the system and their understanding of the researcher as an outsider and, importantly, a learner. This identity allowed the researcher to not be seen as

superior or more powerful than the participants. This established relationship in the introductory conversation, sharing about myself, opened space for certain explanations to be shared in detail to make me understand the context of the learning experience. This also helped to build trust with research participants for a more open and focused dialogue. As a research tool, the interview with a set of questions led to such interaction. These details might not have been possible to get with other methods.

During the research process, while conducting interviews and reading the JYU curriculum documents, I was conscious of my identity. To achieve objectivity and express my respect for the system I am studying, I often reminded myself of my outsider identity in this research.

The learning process as a researcher was great, despite the language barrier. During the interview, a few participants expressed themselves in Finnish, as they had difficulty expressing themselves in English. Therefore, I relied on a translator to post the interview, which limited the opportunity to discuss some aspects in detail.

6   RESULTS

The analysis of the data produced findings relevant to the two study questions. Firstly, how is sustainability education understood by Finnish preservice teachers? Secondly, how is sustainability education embedded in the teacher education curriculum at JYU, and in what terms?

Nine basic themes were identified from the thematic analysis of the six interviews conducted with student teachers, as shown in Table 1. The table outlines the themes and subthemes. There were six identified basic themes focusing on their definition of sustainability education, responding to the first research question. These include SE being mainly environmental; SE being more than just environmental; definitions in the light of SDG 4; pedagogical dilemmas; social dilemmas; resource and time dilemmas; and sensitivity dilemmas.

Three themes have emerged in relation to the overall understanding of how sustainability education is incorporated into the curriculum of the teacher education program at JYU, responding to the second research question. These include SE-related courses within the JYU teacher education program; reflections of preservice teachers on sustainability education (SE) at JYU; and recommendations made by preservice teachers regarding the integration of SE into the teacher education program.

These findings are discussed under each research question separately. The first research question looks at the themes under the headings 'Binary perspective on sustainability' and 'Preservice teachers' dilemmas beyond the definition'. These categories contain insightful responses from student teachers that enhance their comprehension of participating in sustainability education as future educators. Subsequently, the second study question is introduced, focusing on the topic of 'SE and JYU teacher education programs'. This section includes the participants' accounts of their educational journey within the teacher education program. The discussion and conclusion sections conclude by summarizing the key study themes that have been uncovered in the research.

Table 6 *Thematization of Pre-service Teachers' Interview Response*

Organizing theme	Basic themes
Binary perspective on sustainability	1. SE is mainly environmental
	2. SE is more than just environmental
	3. Definitions in the light of SDG4
Preservice Teachers' dilemma beyond the definition	1. Pedagogical dilemma
	2. Resource and time dilemma
	3. Sensitivity dilemma
	- Age appropriateness
	- Contradictory values
SE and JYU teacher education program	1. SE related courses of JYU teacher education
	2. Pre-service teacher's reflection on SE in JYU
	3. Recommendations for teacher education program

6.1   Binary perspective on Sustainability

To understand how the student teachers make sense of the term sustainability education, they supported their reflection with the three following definitions:

1. "takes responsibility for the environment and focuses on a sustainable future"—quote Participation from the Finnish National Curriculum of Basic Education, 2014.

2. "participation, involvement, and building a sustainable future" - transversal competency stated in the Finnish National Curriculum of Basic Education, 2014.

3. "all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship and appreciation of cultural diversity and culture's contribution to sustainable development" (SDG, 2019) - quote from Sustainable Development Goal 4, Target 4.7.

The data analysis revealed that student teacher's definitions of SE varied; some were centered around only the environmental perspective, while others extended their definitions concerning other perspectives of SE. However, some participants mentioned that SE is a difficult topic to teach in school. Some participants did have consensus and a clear understanding of SE, while others struggled and were not aligned with their own definition when we discussed the SDG4 target.

The following sections present the themes - SE is mainly environmental; SE is more than just 'environmental'; definitions to SE in the light of SDG 4; pedagogical dilemmas; resource and time dilemmas; and sensitivity dilemmas to answer the first research question.

6.1.1   SE is mainly environmental

The initial viewpoint explored by the participants centered around the environmental aspect. This term was frequently employed to define sustainability education (SE) and was, at times, synonymous with the concept of sustainability. Out of the six participants, three of them exclusively emphasized the environmental dimension, overlooking the other facets of SE. In some instances, their responses exhibited a pronounced inclination towards environmental concerns. For instance, one participant articulated her interpretation of sustainability in the following manner:

> It is about nature pretty much, so all the forests and animals and every kind of that. But then also the weather we have. Yeah, and the global warming we are having and in Finland we have just started to talk about Luontokato and Sukupuuttoaalto them- extinction of species. (Student teacher 4).

Another participant shared her perspective, asserting that sustainability primarily pertains to the environment. She admitted her lack of awareness regarding other dimensions, acknowledging the existence of a social dimension but without a clear understanding of its dimensions. Her comment is as follows:

> I think it's about the environment and social things…I don't know what they are. (Student teacher 3)

Similarly, another participant delved into the details of the environmental dimension, reflecting various aspects within this realm. Through their choice of words, they vividly illustrated the interplay between the environment and human actions. Once again, their perspective remained centered on the natural world, with their expression exclusively focused on the environmental dimension.

> It is about the climate change, about the topics on how to sustain the nature and preserve what we have as best as we can. Making children as conscious consumers, basically we're trying to educate them to become conscious about the choices they are making about the environment and sustainability, and use the resources they could and don't just take from nature (Student teacher 1)

6.1.2   SE is more than just 'environmental'

In the analysis, student teachers were found to define the concept of sustainability in a second way, which encompassed all four dimensions of sustainability. In this perspective, sustainability was viewed as having dimensions beyond just the environmental aspect, utilizing words that described more than merely environmental concerns. While three participants' responses primarily emphasized the environmental dimension, the alternative perspective on sustainability was reflected in the responses of three other student teachers.

One of these student teachers raised concerns about the common practice of viewing sustainability solely through an environmental lens. She articulated how various facets of life are interconnected with the environment and that the overarching concept of sustainability encompasses all of these dimensions. Throughout the interview, she consistently emphasized the role of human actions in contributing to the sustainability crisis. Furthermore, she expressed frustration at the lack of awareness and engagement on this topic among people in her social circle, highlighting the concerning negligence of this critical issue. Personally, she admitted that this issue held great significance to her.

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> Eli kestävä kehitys sosiaalisesti taloudellisesti ja vielä ympäristöystävällisesti, sillee kestävästi että se palvelee tai toimii, toimii jokaisessa näistä tällasesta niinku alueesta. (So sustainable development socially, economically and environmental friendly, kind of sustainably so that it serves or functions in each of these, kind of areas…sustainability is such a big term, many times we think it is only an environmental thing, yes, but it is about politics, about how the economy works… Sustainability is not the same as ecology or biology…it's about actually how humans interact and how human patterns…sustainability is like environmental values and human rights and promoting a culture of peace and non-violence. You know this is actually not taught. I don't know if it's like taking for granted that this should be something everyone should already know…I don't find that it's working really well or that the core goal is not achieved. (Student teacher 2)

Another participant articulated that sustainability pertains to one's worldview, transcending a mere representation of scientific or environmental aspects, and instead underscores the fundamental values embraced by humanity within our world. This perspective underscores her recognition of the socio-cultural dimensions of sustainability. The term 'human values' serves as a pivotal element in her conceptualization. She articulates it as follows:

> taken out of this environmental study box and put more examples of elämänkatsomustieto, which means the way you see life…the way you see the life subject, not to see it together with only science, but to take it as we actually see the life, the value we have as human and not something the science says. (Student teacher 5)

Within the same context, another student-teacher expands upon the definition by encompassing the idea of perceiving the consequences of one's actions on the broader societal and environmental context. This expanded definition highlights the interplay between individual actions and their consequences on the surrounding environment, as well as the inherent interdependence among individuals. This perspective is condensed in the phrase, "not only contemplating one's own interests but also considering the welfare of others," emphasizing the creation of disadvantaged groups or imposing costs upon others due to the outcomes caused by one's actions. This perspective is articulated as follows:

It's like not only thinking about yourself but thinking about the other people around the world. And the environment, of course. And living in a way that your own lifestyle isn't too costly, like someone or something is always paying the price and that shouldn't be too high. (Student teacher 6)

6.1.3 Responses in the light of SDG 4

Throughout the interview process, the observations pertaining to students' reactions concerning the Sustainable Development Goal 4 (SDG4) target were particularly noteworthy. Some students clearly stated what they thought when they read the SDG4 quote: "all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship, and appreciation of cultural diversity and culture's contribution to sustainable development'' (SDG, 2019). Their responses effectively conveyed their comprehension of SDG4 and their conceptualization of sustainability. After that, their answers to SDG 4 supported this view of sustainability because it gave a broader definition of sustainability than the one in the Finnish curriculum's transversal competency.

One student indicated that she had encountered Sustainable Development Goal 4 (SDG4) on a few occasions during her study time in the teacher education program but had limited exposure to it.

I think I've heard it being mentioned, but not a lot in my study—barely nothing. (Student teacher 6)

Another student acknowledged her lack of familiarity with the various dimensions of sustainability as presented in the SDG4 quote.

The different aspects of sustainability, that's something I'm not that familiar with and I would like to know more about it for sure. (Student teacher 3)

A third student was surprised upon reading the quote, as it revealed the diverse components contained within the objective of SDG 4. The expressions of these students are as follows:

> When you showed the target to me, I was like oh!! These all are part of sustainability. Because I have only one- environmental. (Student teacher 4)

6.2   Preservice teachers' dilemmas beyond the definition

During the interview, in which the primary focus was to find out the student teachers' comprehension of the concept of sustainability education, several significant insights emerged concerning the broader subject of sustainability. While these responses did not directly capture the student teachers' definition of sustainability, they shed light on their prospective approaches to addressing this subject within future classroom contexts. These responses revealed a spectrum of emotions and exposed their apprehensions, dilemmas, and concerns regarding the pedagogical delivery of sustainability-related content to students in grades 1 through 6.

The analysis process revealed three predominant themes: the pedagogical dilemma, the resource and time dilemma, and the sensitivity dilemma. Each of these themes is described below, along with student-teacher responses. The themes explain the specific concerns met or expected by student teachers regarding engaging with the topic of sustainability in their future classrooms. The themes shed light on their apprehensions surrounding the pedagogical and other aspects of sustainability education.

6.2.1   Pedagogical dilemma

This theme focuses on the challenges and uncertainties that student teachers have faced or are likely to face when developing effective pedagogical strategies for teaching sustainability-related subjects to their future students. It summarizes the challenges they anticipate in fostering an understanding of sustainability concepts among young learners.

Several recurrent phrases employed by student teachers were indicative of their prevailing anxiety and lack of confidence when asked about their readiness to participate in SE within schools, as well as their apprehensions concerning the potential challenges entailed in such engagement. The following quote reveals some of the concerns:

> This subject has a lot of aspects too, like one of them being climate change, where some kids may have fear, you don't want to bring terror in the classroom. And to make it an interesting topic for kids. It's something they might not be passionate about, like there are like people who will feel strongly about it and they are the ones that might get like, scared, but then they're mostly their children that don't really like care about the topic and you gotta make it interesting, got to make it like important to them, make it meaningful. It's not something they really like to concern themselves with; kids don't think about sustainability. (Student teacher 5)

This student teacher articulated the nature of addressing the subject, emphasizing its significance while also acknowledging the sensitivity nature when teaching young learners. The necessity of being cautious while discussing in the classroom can be a potential challenge. Another challenge could arise in the effort to generate enthusiasm for the subject matter amongst a cohort of students who may not inherently possess an inclination towards, awareness of, or concern for the topic in question. This pedagogical task of providing meaningful learning experiences while remaining attuned to a child's cognitive and emotional capacity for comprehending such subject matter presents a challenging task for educators. The articulation of this dilemma is as follows:

> I think teachers would actually need basic knowledge to be able to tell students. Why do we have these problems? You know if we say cars pollute, OK. Well, why do you know? What's the thing that we actually pollute? Why fossil fuels are worse than renewables, is there any downsides to renewable energy sources. This is not like the information that most people are actually knowing, but actually as a teacher, I think it would be super important to explain for kids where these things actually come from and why they are problematic.(Student teacher 1)

Other participants used the term 'complicated' to articulate their dilemma over the best way to effectively introduce this subject matter to children. She says it is a "very complex and complicated subject to teach, with the integration of many subject areas.' (Student teacher 2). She further discusses the challenge of effectively teaching children about the rationale behind the importance of sustainability. Additionally, there is difficulty in selecting appropriate content to engage students in the classroom, as teachers must determine which materials will effectively convey the concept and foster a commitment to sustainable living. She articulates her thoughts with the following words:

> I really want them to understand, you know the importance and like what, why things are problematic and not just saying this is some problem. But to actually make them curious about these things. I probably would need to not just follow the book, because many times if we just follow the class book or schoolbook, go chapter by chapter, it's probably not enough, so I would probably need to modify it quite a lot. How I would teach is a big question for me. And I know it would be problematic because, at the sametime, they are supposed to know the stuff that is in the book. For example, Finnish river names or different plants, to recognize different flowers, which also I don't think is unimportant, but I hope that gender rights, justice and economics would also be given time and taken into account. (Student teacher 3)

6.2.2   Sensitivity dilemma

The sensitivity dilemma investigates the ethical and emotional challenges faced by teachers while engaging in sustainability education. Student teachers grapple with dilemmas related to the age-appropriateness of certain sustainability topics and the emotional impact such discussions may have on young students. It points out the need for a nuanced and considerate approach to teaching sustainability. Therefore, the responses under this theme are further divided into subcategories: age-appropriateness and contradictory values. And under the subtheme of contradictory values, results sharing the dispositions of teachers, schools, and families are presented.

The presence of conflicting opinions, ideologies, and values that originate from differences between familial and educational institutions stimulates a

distinct pedagogical challenge within the classroom. Similarly, the teacher's personal beliefs and values, which are rooted in their familial upbringing or their personal ideology, possess the potential to significantly influence the views held by students. As a result, the incongruities between the ethos of the home environment and that upheld by the educational establishment can invariably impact a child's learning experience on this topic.

In a classroom with a diverse group of learners, the potential for opposing ideas on any topic or subject looms large. These disparities can often give rise to substantive debates stemming from the influence of family or other sources that consciously or unconsciously influence children's views. This dynamic situation can be very challenging for a teacher to strike a balance between effectively engaging the topic of sustainability while respecting and considering the individual differences of the students. The concerns shared by the interviewee falls under two themes: experience, age-appropriateness, and contradictory values.

Age appropriateness:

The concept of age appropriateness refers to the selection of content and the challenge of effectively communicating a highly sensitive subject, such as biodiversity loss, to students in both first grade and seventh grade. One participant expressed concern from a teacher's perspective about being cautious when teaching the subject.

> But you also have to be very cautious about how you talk about it. A topic such as biodiversity loss or climate change might frighten a lot of people if it is talked about without the sensitivity it should have.(Student teacher 4)

The participant went into more detail about her problem by showing how different students' backgrounds can have a big effect on a teacher's ability to lead relevant discussions about sustainability. As educators, we recognize the significance of the subject matter, although it is equally crucial for us to

comprehend how to avoid students being overwhelmed when teaching this issue.

> The most difficult part is that the students have so different backgrounds (their age, experience, and home culture) about what their families have told about the subjects, so there might be some students who know that we are having this and this crisis and they might be even more anxious about the themes. And then there might be some students whose parents are like, Oh, there is no such thing, and the attitudes from the families are very different. In some of the themes, of course, there is cultural diversity, we are having in Finland more and more now. I think it is wonderful, but it also brings out the different cultural expectations or social norms in the school world. But what I think will be the most challenging part is to bring the theme to the kids so that it doesn't become overwhelming or that they can understand it but not get anxious and panicking about the theme. (Student teacher 6)

Contradictory values:

The values and belief system of an educational institution may diverge significantly from those upheld within the domestic sphere. This disparity may give rise to a dispute or pose a challenge in engaging a child with an objective, which can then contribute to their engagement in fostering a sustainable lifestyle. One student expressed her difficulty in the following manner:

> I think it can be challenging if they have very different views about the things we talk about in the school. If they think differently in their homes. Then it would be challenging.(Student teacher 2)

Another participant provides further insight into this difficulty by suggesting that the achievement of a sustainable society cannot be solely dependent on teachers. However, if all stakeholders, including parents, teachers, and students, are aligned in their efforts, the potential for impactful change is considerable. This comment is articulated as follows:

> Children's ideas on cultural diversity and gender equality I think it's about the attitude from the homes that affect children. So much so or if it's only on the teachers shoulders to

do that work, then it won't happen if their homes are giving different attitudes. So we need to have the homes and teachers doing it together. (Student teacher 5)

6.2.3   Resource and time dilemma

Within this theme, student teachers express their concerns regarding the availability and allocation of resources and time necessary for the comprehensive and meaningful integration of sustainability education into the teaching time. This theme highlights the practical constraints they predict and observe in addressing sustainability topics.

One participant expressed the lack of pedagogical aid received in the integration of sustainability as an integrated topic across many subjects taught in the grade 1 to 6 curriculum. The individual expresses frustration and says that it is unreasonable to place the expectation on instructors to instruct on the subject matter without providing them with the necessary training to include sustainability across other disciplines.

> Teachers are not supported enough to handle that integration. The best way to teach sustainability could be taken as part of each subject a bit, but then I know it would be very difficult for teachers because now it's kind of supposed to teach it in all subjects, but they're actually not taking or giving any specific resources or what you are supposed to teach there. But often we are told to teach sustainability and everything. And teachers don't know about it and don't understand it. So it is like you tell them to do something, but it's like they are not given any resources to do it. What about how to teach this topic and how to engage it? (Student teacher 5)

In addition to the challenges posed by limited resources and inadequate training, time emerges as a critical concern. During a typical school day, children are involved in various activities and educational experiences. Consequently, it might be challenging for a teacher who is interested in regularly addressing the topic of sustainability at school to allocate sufficient time and commitment to this goal. Ultimately, educators find themselves faced with the issue of which subjects they should prioritize, considering the diverse aims they want to achieve. She personally expressed this in her words as:

Time, I would say, is another problem. In a school day or in school week, there are too many things that kids are supposed to learn, and if this is not given any time, it's hard to actually, even if the teachers would like to, where to actually take it…So what to actually emphasize at the school? (Student teacher 1)

6.3   SE and JYU teacher education program

To comprehend the experiences of student teachers within the teacher education program, this study aims to investigate the specific way they acquired knowledge and comprehension of sustainability through their academic curriculum. During the interview, a limited number of questions were posed to gather information on the recognition of sustainability education within JYU's teacher education program. The probe was aimed at finding out the way in which the value articulated in the national curriculum is imparted within the university setting. Specifically, respondents were requested to identify the courses in which this value is taught. Additionally, participants were encouraged to provide insights on any meaningful experience related to sustainability education. As the individuals in question are prospective educators, our conversation revolved around their level of preparedness to effectively incorporate sustainability into their pedagogical approach within the school setting. There are three main themes that run through the answers to these questions: SE-related courses in the JYU teacher education program; preservice teachers' reflection on SE in the TE program; suggestions for the TE program; and the results of document analysis.

6.3.1   SE-related courses for JYU teacher education program

In the interview with the research participants, a specific question was asked to understand the courses offered in the program that reflect sustainability education.

All six participants mentioned—KTKP020, Kasvatus, yhteiskunta ja muutos (education, society, and change)—shared that they remembered discussions and learned about sustainability as part of this course. Other courses that the participants suggested include POMM 1093, ympäristö-ja tiedekasvatus

(environment and science education), and POMMI 1043, Käsityökasvatus (handicraft and science). These three courses seem to have largely focused on sustainability themes in classroom engagement. Following completion of these study modules, students should possess the competencies listed in the table below.

Table 7 *The objective of the SE-related course at JYU teacher education program (Teacher Education Curriculum 2014–17)*

Study module	After completing the course, the student
KTKP 020 - Kasvatus, yhteiskunta ja muutos (education, society and change)	1. understand how education appears on the one hand as part of social structures and practices and, on the otherhand, as a force to change them
	2. can examine the phenomena of education and training from a social and cultural perspective, utilizing the concepts of the sociology of education
	3. can distinguish the connections between educational practices and cultural changes that occurred in childhood, adolescence and adulthood
POMM 1093 - ympäristö- ja tiedekasvatus (environment and science education)	1.able to plan, guide and evaluate the learning of physics, chemistry, biology and geography in accordance with the national basic education curriculum
	2.can set competence goals for environmental studies, choose suitable working methods to achieve them and evaluate the achievement of the goals
	3.knows and wants to encourage learners to observe the world around them, interpret their observations and communicate them
	with natural scientific reasons in different ways
	4.knows how to use and teach interdisciplinary principles
	5.understand the nature of scientific knowledge
	6.knows how to plan natural science learning situations in which everyday situations and problems are investigated
	7.able to guide learners to examine the connections of natural science to society and its changes in accordance with the goals of sustainable development

Study module	After completing the course, the student
POMM1043: Käsityökasvatus (handicraft and science/craft education)	1.has experienced successes and the development of professional activity
	2. Understand the processual nature of handicraft
	3. Understand the educational role of making with hands
	4. knows how to implement and develop handicraft teaching based on a valid curriculum
	5. own capabilities to analytically look at human activity as a shaper of its environment

6.3.2 Preservice teachers' reflection on SE in JYU

The student teacher's response sheds light on the students' real-world experiences and firsthand memories by offering a reflective account of their time spent learning at JYU. The cohort of interview participants consisted of students from various academic years at JYU, resulting in a diverse range of experiences. The act of sharing this experience is valuable data for the study.

Most students have identified the same courses previously mentioned as being relevant to their study of sustainability within the course of their studies. In reaction to the learning of sustainability in the academic program, students expressed their thoughts as follows: All the participants acknowledged the talk of sustainability' in discussions, although it does not address SDG 4. Additionally, one participant stated that sustainability was not a mandatory subject in their undergraduate or graduate studies. The insights from the participants below show that the discourse surrounding sustainability has primarily centered on environmental concerns.

We talked about it. But the other dimensions of SE, barely any. (Student teacher 3)

I feel like it has been largely like focusing on the environment mainly…we may have talked about those topics as well, but it's not the first thing that comes to mind when talking about sustainability. (Student teacher 4)

> SE is not really taught. A few times it's like mentioned maybe in the background, but it's not what we study…there is no course specified on those subjects. I'd say it's none in the bachelors and in the masters. There was not any compulsory subject which discussed sustainability in a very intense way.(Student teacher 6)

One person expressed their experience while contemplating the practical application of this subject. Throughout her academic career, she has come to recognize the significance of sustainability; nevertheless, she has yet to acquire practical knowledge regarding the implementation of sustainable practices inside her classroom as an educator. The individual expresses their viewpoint in the following manner:

> Sustainability education is like a word you always hear, and it's like, Oh, this is important, but there is nothing concrete. It's missing the practice; how to make it in practice? What should a teacher do to make this happen? It's hard to get on if there are no steps or keys.(Student teacher 5)

Another student expresses similar feelings regarding her anticipation of teaching days. She acknowledges feeling inadequately prepared to instruct about sustainability. However, she asserts her confidence in her ability to acquire new skills, despite not having received direct instruction in this area during her studies at JYU.

> Not ready. Not ready, that's for sure. It's a topic I need to search more…It's a topic I'm not that familiar with. (Student teacher 1)

During this dialogue concerning the exchange of learning experiences, the participants also provided several ideas or proposals aimed at enhancing the TE program, particularly from a sustainability standpoint. The reflections offered by students who have directly participated in the program serve as a highly significant resource for the future of the TE program at JYU. These are presented in the following section.

6.3.3 Recommendation for TE

The participants' recommendation highlighted the necessity of incorporating additional content related to sustainability within the study program. The individual conveyed their limited understanding of these domains and showed a desire to acquire further information on these subjects. Some individuals have proposed that it be mandated as a required course in the curriculum. One student expressed that their study plan includes enough courses on education and suggested that this aspect should also be taken into consideration. Another student proposed the inclusion of a course that offers a comprehensive overview of the different perspectives on sustainability. The following are her exact words:

> There could be more about this topic, for sure, and about the different aspects you mentioned — the other aspects of sustainability. That's something I'm not that familiar with, and I would like to know more about it for sure.(Student teacher 4)

> I think it could be taught more so everyone knows what it means and all the areas that are in it. I think it is mostly about the environment, but we do not think about the social or economical things, and I think those are very important as well. (Student teacher 2)

Another speaker expressed the intention to implement compulsory sustainability education for students across all academic fields. This implies that sustainability is not solely a significant subject for prospective educators but rather a topic that all students should be knowledgeable to become responsible citizens. The individual expressed her opinions in a clear and coherent manner.

> A course about sustainability is needed. I actually think it should be not only for teachers but compulsory sustainability and human rights for all university students, no matter what they study. And then after that, there would be a specific sustainability course within each study. For example, sustainability and education, sustainability and economics It should be part of the basic studies for the student teachers. I kind of hope that, in the future, it will become compulsory for everyone. But also, I think the teacher education program at the universities should focus a lot more and involve sustainability in all the subjects so they would actually have some sort of knowledge. At the moment, it's like nowhere, so it's better to have it at least somewhere, but ideally it should be everywhere. (Student teacher 6)

In contrast to the thoughts, ideas, and reflections shared by current JYU Teacher Education program student teachers, two document analyses were carried out to make sure the information from the interviews was accurate. The section that comes next provides a concise overview of the findings obtained from the study of the documents.

6.3.4   Overview of document analysis

The analysis focused on two specific documents, specifically the "Teacher Education Curriculum 2014–2017" and the "JYU Teacher Training Values OPS 2020–23." The search tool was utilized to examine both texts for the presence of phrases related to sustainability.

University of Jyväskylä Department of Teacher Education Curriculum Plans 2014-2017

This is a comprehensive 28-page document that discusses the fundamental concepts, objectives, organizational framework, and prerequisites of the joint bachelor's and master's program for class teachers at the University of Jyväskylä (University of Jyväskylä, n.d.). The term "sustainable" was referenced twice throughout the entirety of the paper. The statement, 'The task of the Finnish school system is to educate citizens who will take responsibility for building a more just world based on sustainable development, The second instance of the statement is, 'During their studies, students will be supported in the development and growth of their self-knowledge towards ethically sustainable educational agency.'

Nevertheless, a limited number of occurrences of language and themes related to the principles and ideas of sustainability were observed. As an example, the subsection dealing with the Bachelor of Education degree: Study modules and credits: the course Education, Society and Change mentions that on completion of this study module, students will be able to

recognise how education manifests itself, on the one hand, as a component of social structures and practices and, on the other, as a force changing these structures and practices

examine the cultural, economic, political and social phenomena associated with the socialization process, as well as educational and training institutions, by making use of concepts and theories in educational sociology

The following passage is derived from the description of the study block titled 'Education, Society, and Change', which asserts that

'Education and schooling practices are also bound up with the prevailing socio-historical situation, culture, politics, ideologies, and power structures. These determine the social and structural parameters of education. In addition to these questions, this phenomenon block will also consider questions of social justice, inclusion, equality, diversity, otherness and increasing inequity.'

Even though sustainability is not directly mentioned in the study block description, the use of words like "otherness," "power structures," "social justice," and "equality" makes it sound like sustainability-related topics might be included. And again, within the framework of the 'Multidisciplinary school subject studies and cross-curricular theme modules (POM studies),' it is mentioned

'understand the opportunities and challenges that inclusive education and multiculturalism bring to learning and teaching'.

The provided statement lacks explicit mention of sustainability, yet the inclusion of terms like inclusive education and multiculturalism suggests a potential connection to the concept of sustainability.

University of Jyväskylä Teacher Training Values 2020–2023
This document encompasses a total of four pages and offers a comprehensive examination of the fundamental elements, goals, and operational principles related to the teacher training program at the University of Jyväskylä. More

precisely, it applies to the temporal span from 2020 to 2023. Additionally, the document outlines the crucial domains of knowledge and abilities that the University of Jyväskylä (2022) anticipates students enrolled in the teacher training course at JYU to develop. Through a comprehensive search, it was determined that both the terms "sustainable" and "sustainability" were utilized only once in the given work.

The first paragraph states "Today, our education and operating culture emphasize… expertise related to diversity". Then it continues to state:

'We think that the mission of a Finnish school is to raise citizens who take responsibility for building a world that is more just and based on sustainable development.' This is of paramount importance in light of future developments, which include the ecological sustainability crisis, the tensions of international politics and the challenges of democracy, as well as the rapid development of technology combined with changes in working life.'

And finally, under the section Interaction competence and competence related to diversity, it is shared that

'The student wants and is able to work cooperatively and constructively in various interaction situations, relationships and groups…He has the awareness and sensitivity to interact in culturally diverse contexts and appreciates and understands the special features of, for example, ethnicity, language, age, religion, gender, sexuality and social class.'

While the explicit term "sustainable" or "sustainability" may not be used, the topic of discussion contains essential vocabulary that effectively conveys the equivalent essence as articulated in Sustainable Development Goal 4.

7   DISCUSSION

This study aimed to comprehend how preservice teachers interpreted the idea of sustainability education. This objective was investigated through interview responses and a review of the curriculum document for teacher education at the University of Jyväskylä.

The first research question focused on how Finnish preservice teachers understand the definition of sustainability education. From the interview responses, it was found that the participants had varying perspectives on the concept of sustainability education, with some focusing solely on environmental aspects and others on other dimensions—social and cultural. None of the participants agreed on a definition of sustainability that included all perspectives—economic, environmental, social, and cultural—coherently. For the student teachers, defining SE is difficult, especially considering all four aspects.

The study's small sample size makes it difficult to make a definitive claim that most participants exclusively identified one dimension above others. Nonetheless, the participants' definitions of SE showed that they did not know much about the different parts of SE, which is similar to what Hofman (2015) and Ratinen et al. (2013) found. Furthermore, the participants were not very familiar with Sustainable Development Goal 4 (SDG4); a few recalled hearing about them at seminars but were not clear about the goals and aims of SDG4. The UN sustainable development goals are supposed to guide teaching in higher education, but these student teachers were not very familiar with them.

In the definitions of SE, three participants stressed environmental problems such as global warming, climate change, wildlife extinction, waste segregation, and recycling. The other three participants contributed additional viewpoints on the concept of sustainability that went beyond its environmental dimension but did not cover all the dimensions of sustainability. This result is consistent with the findings of Hofman's research, which found that only 10% of teacher educators discussed all four characteristics of sustainability, while the

rest talked about only one (Hofman, 2012, as cited in Wolff et al., 2017). Consistent with the findings of Karvinen et al. (2015) and Wolff et al. (2017), the results show that future teachers are not fully knowledgeable about sustainability education. This is because it is a complicated subject that needs to be broken down into its many parts. However, all participants agreed that studying sustainability is essential for all learners and that education is the best tool for promoting sustainability in society.

Concerning the second research issue addressed in this study: how is sustainability education embedded in the teacher education curriculum at JYU? The participants identified three courses in their curriculum that addressed sustainability: KTKP020, Kasvatus, yhteiskunta ja muutos (education, society, and change); POMM 1093, ympäristö-ja tiedekasvatus (environmental and science education); and POMMI 1043, Käsityökasvatus (handicraft and science). These classes taught ideas like the sociology of education, the changing relationships between nature and society in line with the goals of sustainable development, and how people's actions affect the environment. This is why student teachers thought of these classes as having something to do with sustainability.

The document analysis conducted did not provide a comprehensive discussion on sustainability (University of Jyväskylä, n.d.; University of Jyväskylä, 2022). However, the documents referenced concepts like power structures, social justice, equality, diversity, multiculturalism, and otherness, which inherently embody the core principles outlined in Sustainable Development Goal 4. Despite this, the current teacher education curriculum falls short of actively and deliberately integrating the objectives of Sustainable Development Goal 4. The various dimensions of the SDGs are also not mentioned; the social and cultural dimensions of sustainability are discussed in the Education, Society, and Change course, but without using the term sustainability in a sociology context. Both documents make no mention of the SDGs or sustainability dimensions. This also explains why student instructors are unaware of or have difficulties naming the four elements of sustainability, as

they are not even stated in their course objectives. This gap points out the need to align the curriculum with its long-term objective of providing future educators with the competencies and knowledge they need to effectively teach about sustainability.

Based on the findings derived from the interviews and document analysis, it is evident that courses about sustainability are few and are not discussed in depth within the curriculum of teacher education. It is important to acknowledge that the curriculum does not currently include any specific courses dedicated solely to the discussion of sustainability and related topics. Additionally, there are no compulsory courses for student teachers as part of their academic program. Overall, it is evident that the implementation of the curriculum does not consistently align with the overarching values it purports to uphold. While reviewing the program documents, it was observed that both documents contained language indicating a commitment to sustainability goals. The teacher education program's goals include that teachers will build a variety of competencies, including ethical competence, intellectual competence, cultural, community, and social competence. These objectives give the impression of being associated with sustainability goals; however, they make no direct mention of SDG 4. Based on the interview results, it is evident that preservice teachers were not provided enough learning opportunities for sustainability education-related themes, or at least students did not link them to sustainable development. This finding aligns with and confirms Hofman's (2012) prior research on the lack of sustainable education in Finnish teacher education programs.

Additional research findings that go beyond the definition of sustainability education shed light on the dilemmas and issues that educators encounter. These findings provide useful knowledge of student teachers' level of preparedness to interact with the topic of sustainability. Pedagogical and resource dilemmas may be overcome through the teacher education program if it also helps pre-service teachers gain both theoretical and practical expertise for effective classroom instruction. One participant shared a pedagogical dilemma, grappling with the most effective approach to teaching the interdisciplinary

nature of sustainability. Another concern one participant mentioned highlighted the way in which different teachers engage with children. During teaching, teachers are also expressing their own individual beliefs. Yet, another concern arose about how to effectively cultivate a sense of accountability among students with diverse backgrounds without imposing a set of behavioral expectations while their individual differences exist due to their home background and parents' values. According to Uitto and Saloranta (2017), teachers are likely not to use SE in their classrooms because of these difficulties. While these are issues that teachers may confront in the field, teacher education can support teachers to integrate SE better in practice and to handle these concerns. The various challenges and projected issues highlighted by student teachers indicate some level of involvement already with the subject of sustainability. The students' teaching period can be highly productive if teacher education provides enough help to deal with these concerns. If sustainability education is not made explicitly available across the teacher education programs, both in policy and practice, it will be hard for future teachers to implement it in the schools. It is also of utmost importance to conduct studies on how teachers see their role in fighting the climate crisis and other types of emergencies, both locally and globally. Another problem is that time management remains a limiting factor within the structure of a conventional school day. According to Evans et al. (2020), acting effectively toward sustainability goals needs a collaborative effort among teachers within a school as well as organizational reforms.

Earlier studies show that a comprehensive understanding of the importance of sustainability education (SE) and its diverse aspects is imperative for effective communication. The time has come to shift our focus towards contemplation and goal setting within the realm of SE, rather than continuing the discourse on its content. According to Kortetmäki et al. (2021), it is crucial to understand how the various SE dimensions interact with one another because this awareness can lead to significant transformative actions.

Considering this research, JYU's teacher education program should begin to offer more courses dedicated to the topic of sustainability, possibly even

making them mandatory. Such initiatives will aid in the engagement of sustainability subjects, laying the groundwork for future initiatives beyond classrooms at the university. The learning space that allows students to develop action competence for change in their teaching practice is very much needed. Even though few students have mentioned the courses that offer sustainability-related topics, all the respondents indicated a lack of knowledge about practicing this subject in their classrooms.

Based on the findings of this study, it is suggested that, in the future, teacher education programs include clear references to sustainability principles in their program values and curriculum documentation. They should also investigate the best ways to put sustainability principles into practice. The implementation of a deliberate focus would ensure that all student teachers enrolled in the program learn about sustainability—environmental, economic, social, and cultural. This is recommended not only to gain more knowledge about sustainability but also to educate teachers to be more committed to engaging with sustainability. And instilling values in learners, cultivating curiosity, and making this subject relevant to all future learners. Working towards sustainability is not an option or a choice; we are in a moment of crisis, and one of the finest ways to deal with young learners is through education (Rieckmann, 2012).

7.1 Evaluation of the study

Data reliability and validity:

The process of demonstrating a true picture of the phenomenon being studied is referred to as credibility. To ensure credibility in qualitative research, researchers should adhere to the following guidelines during data collection and report writing (Hayashi et al., 2019).

Providing sufficient background information about the participants, context, and each process considered to state the qualitative study's larger conclusions Researchers should also spend time at the study site, participating and persistently observing, to understand the context at a much deeper level than

just on the surface. This interaction with participants will aid in eliciting the social group's interpretation and beliefs about specific values, systems, and activities. Another way to increase the credibility of qualitative research is to acknowledge participants' subjectivity in the field and understand how this affects the results.

The results of this study are based on interviews. All the research participants in this study were student teachers from the pre-service program at the University of Jyväskylä. Due to the difficulties in finding the research participants, there was no limit to how long the students had been studying in the program. This naturally affects their depth of experience with SE in the program, but at the same time, student teachers' personal interests towards the topic might also play a role in terms of defining and understanding SE. The interviews were considered primary data sources due to the participants experience in the JYU teacher education program. Interviews reflected their experience with sustainability, which they gained by participating in the JYU teacher education program. This enhances the validity and dependability of the data. The interviewees' replies were substantiated through a more comprehensive analysis of the JYU teacher education program. Overall, the findings of this study add to prior research findings on sustainability education and teacher education conducted in Finland, thereby supplementing the existing body of knowledge.

Researchers should employ the method of triangulation, which involves the systematic collection of diverse data sources to obtain varied viewpoints on a given topic. While this methodology may assist in highlighting discrepancies in results, it also highlights the complexities of the contextual factors involved, increasing the overall credibility of the research (Tracy, 2019). In this research, along with the interview responses, two curriculum documents of teacher education programs at the University of Jyväskylä were examined to better understand the university's sustainability education scenario.

To make sure that the results of this study were valid and trustworthy, other steps were considered, such as eliminating researcher bias. The data analysis was shared and discussed with other members of the study group and supervisors

throughout the data processing process. This process of continually reviewing and debating the analysis process aided in gaining clarity on the interpretation of the themes developed during the analysis. As a researcher, I am very interested in this research issue, and this should not cause me to prejudice or overread the interview responses, affecting the results and knowledge of the research.

The usage of the Atlas.ti data analysis tool aided in maintaining the transparency of the data analysis process, and the marking of interviewee quotes as evidence contributed to making the overall research more robust. All the processes in the research process, from data collection to data analysis to result presentation, reflect the validity of the problem being examined.

Implications of the study:

The implications of the study's findings are relevant to educational policy, the curriculum of teacher education programs, and future research endeavors. The study undertaken in the education field is expected to benefit a wide range of individuals active in the field of education. The primary recipients of this research are educators, curriculum developers in teacher training programs, and other scholars in the field.

The findings of this study would enhance the comprehension of the broader perception of sustainability education among preservice teachers. Furthermore, it is crucial to do an introspective analysis of our pedagogical principles and draw inspiration from diverse viewpoints to enhance our knowledge of sustainability.

Furthermore, this research endeavor aims to evaluate the integration of sustainability into educational curricula at a macro and micro level. Numerous policy documents on a global scale have emphasized the significance of teachers as a pivotal component of an educational plan aimed at attaining sustainable development.

Teachers play a crucial role in advocating for and fostering sustainable lifestyles. By prioritizing the education and professional development of teachers, we may effectively promote the acquisition of essential skills among

future learners, thus fostering the construction of a sustainable future. Therefore, it is crucial to analyze the manner in which universities that offer teacher education integrate sustainability. This kind of research at the University of Jyväskylä supports identifying the gaps, or how well the educational programs and courses designed for teacher education are put into practice in teacher education to meet the goals set out in SDG 4.

Limitations of the study:

One of the drawbacks inherent in this study pertains to the small number of participants. The representation of students from various academic years was not sufficiently diversified due to the limited sample size, which consisted of only six participants. If the same study were to be conducted with a larger sample size, it would yield an expanded perspective on their comprehension of sustainability. This, in turn, would improve the generalizability of the study outcomes.

Another constraint is the language used during the research process. While all participants experienced their study in Finnish, they may have felt obliged to communicate their opinions only in English. This linguistic shift may have restricted the extent to which the subject matter could be thoroughly explored and examined. Despite the fact that all of the study participants were proficient in both the Finnish and English languages, at times they encountered difficulties in effectively expressing their thoughts and opinions on sustainability in English. In such instances, they were offered the option to communicate in Finnish to ensure the accurate expression of their intended message. But unfortunately, the veracity of the opinion is still questionable. These challenges restrict the extent to which the interview conversation occurred about sustainability.

Given the limitations, using both interviews and a closer look at the teacher curriculum document has made the data much more reliable and supports understanding the integration of sustainability in the teacher education program at the University of Jyvaskyla's sustainability situation.

7.2 Future research

The subject area of sustainability holds significant worldwide importance, making it a critical issue for investigation. As educators hold a crucial position in the education of future citizens of society, research regarding teachers and how they prepare to teach sustainability prior to entering the profession remains a significant and relevant field of study. To address the limitations associated with this study, future research projects may benefit from expanding the scope by including many teacher education universities. Additionally, a more diverse group of students from different cohorts of teacher education programs would also be helpful because they would bring a wider range of perspectives and deeper understandings to the topic of sustainability. A diverse group of participants can assist in determining when a learner's knowledge of sustainability improves during their teacher education program and what courses have enhanced their understanding. Along with diversity of perspective, it is also important to acknowledge and incorporate indigenous knowledge on the topic of sustainability into the curriculum. Having a diverse group of participants and resources ensures that the curriculum is relatable and contextualized.

To get a more accurate picture of how well the teacher education program is helping students understand sustainability, it would be helpful to do a longitudinal study that follows the same group of people over time. During this part of the study, they will be tested on what they know about sustainability and its different aspects, as well as what they know about how sustainability works in their own lives right now. This is done to see if they have knowledge and awareness that goes beyond what they learn in school. Participants in such a study can also be evaluated through practicums and classroom involvement to evaluate their learning vs practice in terms of how much they put into practice from their studies regarding sustainability through teacher education programs. A component of the research can also assess how useful a developed course that teaches about sustainability with a practical component has contributed to the understanding of sustainability among student teachers. This research has the

potential to shed light on the essential elements of teacher education that contribute to the development of learners into responsible citizens.

7.3 Conclusion

The 2030 Agenda for Sustainable Development is a worldwide plan that focuses on the planet's environmental, economic, cultural, and social goals to create a more sustainable future. Education is viewed as a method to this end. As a result, educators and teacher education universities bear a greater responsibility in this regard. It is critical to understand how universities adopt sustainability. It is recommended that all teaching students, irrespective of their discipline or specialization, be required to participate in sustainability-focused study programs. This measure aims to enhance the understanding and awareness of sustainability among preservice teachers, thereby contributing to the development of more proficient educators in the future. Drawing from the insights of student teachers, it appears that integrating a comprehensive theoretical foundation for comprehending sustainability alongside a pedagogical strategy within teacher training programs will equip prospective educators with the necessary skills to proficiently implement sustainability pedagogy in their classrooms. Moreover, this integration will boost their confidence in making informed decisions during teaching practice.

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APPENDICES

Appendix 1. Research Notification

JYVÄSKYLÄN YLIOPISTO

Research Notification

"Understanding Finnish Pre-Service Teacher's Perception of Sustainability Education'' and invitation to participate in research. Master's degree research thesis.

We ask you to participate in qualitative research study, which aims to investigate the understanding of Finnish Pre-Service Teacher's Perception of Sustainability Education. The purpose is to research the critical aspects of how preservice teachers understand Sustainability Education and how the objectives and content stated in the National Education Curricula of Finland, emerge in their understanding of Sustainability Education.

You are invited to the study because you are suitable for the research person, i.e. Finnish Student teacher, who will be active in the teaching practices post your pre-service training in your respective universities.

The study will involve a group of 5–6 participants, who are pre-service teachers. The participants are located in Finland university. However, as this study aims to understand teacher's perception of Sustainability Education, locations of the research participants are not important.

 This is a single study, and you will not be contacted again later.

2. Voluntariness

Participation in this study is voluntary. You can refuse to participate in the study, stop participating or cancel your previously given consent, without stating any reason for this and at any time during the study. This will have no negative consequences to you.

If you stop participating in the study or if you cancel your consent, the personal data, samples and other information collected on your university and your interview answers will not be used as part of the research material.

3. Progress of the study

As mentioned earlier, this study aims at understanding the pre-service teacher's perception of Sustainability Education in Finland context. In the core curriculum for Basic education of the Finnish National Agency for Education 2014, 2018, and 2019, one of the value states that "takes responsibility for the environment and focuses on a sustainable future". And among the seven transversal competence areas, "participation, involvement, and building a sustainable future" is one of them. Hence, author of this research works aims at finding out how pre-service teachers understand and have gained knowledge about sustainable education and how do they think to execute values of sustainable education in their classroom teaching.

Estimated duration of the study is expected to be a year, participant's part in the study. This time period includes building theoretical framework and data gathering, analysis and review. Data gathering will be done by conducting focus group interviews, which will take approximately one hour.

4. Possible benefits from the study

As current research work is done within the education field, intended audience to whom results of this work may benefit is expected to be all the members of education field. On the small scale intended audience consists of teachers, curriculum designers of teacher education program and fellow researchers. On the larger scale the results of the study would help to identify the conceived perception of sustainable education among preservice teachers. And also, to reflect on our own teaching philosophy and to get new ideas about sustainability from others.

5. Possible risks, harm, and inconvenience caused by the study as well as preparing for these

No possible risks or harm are going to be caused by the participation in the study. Inconvenience in regard to the time of the interview may be present, however attempted to be avoided by the meeting arrangements beforehand.

6. Study-related costs and compensations to the subject as well as research funding

No rewards will be paid for participation in the study.

7. Informing about research results and research outcomes

The study will yield master's theses and published accordingly on the Universities official portal. Research results of the study in general will be accessible within thesis work itself.

Contact person for further information

Abitha Chakrapani

Master's Degree Student in Educational Sciences

Faculty of Education and Psychology, University of Jyväskylä, Finland

Email: abchakra@student.jyu.fi

Role in the research project: research conductor/author

Name: Heidi Layne and Anna Leena Kähkönen

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Role in the research project: supervising teacher

Faculty of Education and Psychology, University of Jyväskylä, Finland

JYVÄSKYLÄN YLIOPISTO

Privacy notice

You are participating in a scientific research. This privacy notice informs you about the processing of personal data as part of the research. You have a legal right to receive this information in accordance with the European Union and Finnish legislation.

Data Controller(s)

The Data Controller is responsible for lawful processing of personal data in this research.

The Data Controller of this research is: Abitha Chakrapani

Responsible leader or team of the research

Name: Abitha Chakrapani

Phone number: +358417191208

Email: abchakra@student.jyu.fi

Role in the research project: researcher of Master's Degree in Educational Sciences department,

Faculty of Education and Psychology, University of Jyväskylä, Finland

Name: Heidi Layne and Anna Leena Kähkönen

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Role in the research project: supervising teacher

Faculty of Education and Psychology, University of Jyväskylä, Finland

Processor(s) of personal data

Processor of personal data refers to somebody processing personal data on behalf of the Data Controller and according to the Data Controller's instructions. A Data Processing Agreement must be signed with the processor of personal data.

During research, the Data Controller can also use other processors of personal data who cannot be named beforehand. Necessary agreements are always signed with the processors and their eligibility for the processing of personal data in terms of information security is assessed before signing the agreement. The data subject will be informed separately about the use of another processor if the change is significant from the data subject's point of view.

To ensure the accuracy of research data, the Data Controller may submit data for processing (primarily without direct identification data) to a so-called research reviewer or verifier for a defined period when necessary. These reviewers or verifiers work under the supervision of research staff, and data processing agreements are signed with them.

Other disclosure of personal data during research

Your personal data will be handled confidentially and without disclosing them to any outsiders.

Personal data to be processed in "Understanding Finnish Pre-Service Teacher's Perception of Sustainability Education" research study.

Your personal data will be processed for the research purpose described in the information letter.

In this research, we will collect the following personal data on you [e.g. name, email address, survey responses, audio records, interview notes]. Data collection is based on the research plan.

This research does not involve processing of personal data of special categories.

This privacy notice has been delivered to the data subjects via email. All data subjects are adults.

The lawful basis for processing personal data in scientific research

☒Data subject's consent (GDPR, Article 6.1a, special personal data categories 9.2a)

Transfer of personal data outside the EU/EEA area

In this research, your personal data will not be transferred outside the EU/EEA area.

Protection for personal data

Processing of personal data in this research is based on an appropriate research plan and the study has a designated person in charge. The personal data collected and saved for this research will include only such data that is necessary for the research purpose.

Preventing identification

☒As a protective measure, any direct identification data are removed upon the compilation of the data set (pseudonymised data allowing restored identification by means of codes or equivalent information, and also new data connected to the data set).

The personal data processed in this research will be protected by means of:

 ☒by other means, how: all data obtained during the interview will be processed confidentially and anonymously. I am the only one who will listen to the recording. The content of our interview may be disclosed to the supervising teacher of the data controller/researcher for study purposes only.

PROCESSING OF PERSONAL DATA AFTER *THE RESEARCH HAS ENDED*

☒ The research register will be deleted after the research has ended, approximately by 09/2023

Rights of the data subject

You have the right to cancel your consent if the processing of personal data is based on consent. Such a cancellation has no impact on the lawfulness of consent-based processing conducted before the cancellation of consent.

Right to access your personal data (GDPR, Article 15)

You have the right to get to know whether and which personal data of yours are processed. If you wish, you can also request a copy of your personal data to be processed.

Right to rectification (GDPR, Article 16)

If there are any inaccuracies or errors in your personal data to be processed, you are entitled to request that these be rectified or supplemented.

Right to erasure (GDPR, Article 17)

You have the right to demand in some cases that your personal data be erased. However, the right of erasure is not applicable if the erasure would prevent or greatly hinder reaching the goal of processing in a scientific research.

Right to restriction of processing (GDPR, Article 18)

You have the right to restrict the processing of your personal data in some cases, like when you challenge the correctness of your personal data.

Right to data portability (GDPR, Article 20)

You have the right to receive your submitted personal data in an organised, generally used and machine-readable format, and also the right to transfer the data to another Data Controller if possible and processing takes place automatically.

Deviating from the rights

In some individual cases, it is possible to deviate from the described rights on the grounds stipulated in the GDPR and the Data Protection Act insofar as the rights would prevent or greatly hinder reaching the goals of scientific or historical research or statistical purposes. The need for deviating from the rights is always assessed case-specifically. It is also possible to deviate from the rights if the data subject cannot, or cannot any longer, be identified.

Profiling and automatised decision-making

In this research, your personal data will not be used for any automatic decision-making. In this research, the purpose of the processing of personal data is not to assess your personal qualities, i.e. profiling, but personal data and qualities are considered from the perspective of broader scientific research.

Implementing the data subject rights

If you have any questions about your data subject rights, you can contact the University's Data Protection Officer. All requests concerning the implementation of data subject rights are submitted to the JYU Registry Office. Registry Office and Archives, P.O. Box 35 (C), 40014 University of Jyväskylä, tel. 040 805 3472,

email: kirjaamo@jyu.fi. Visiting address: Seminaarinkatu 15, Building C (University Main Building, 1st floor), Room C 140.

Reporting an actual or suspected information security breach to JYU

https://www.jyu.fi/fi/yliopisto/tietosuojailmoitus/ilmoita-tietoturvaloukkauksesta

You have to lodge a complaint with a supervisory authority especially with a locally relevant one in terms of your permanent place of residence or work if you regard that the processing of personal data violates the EU General Data Protection Regulation (EU) 2016/679. In Finland, the supervisory authority is the Data Protection Ombudsman.

Updated contact information of the Office of Data Protection Ombudsman: https://tietosuoja.fi/etusivu

Appendix 3. Consent Form

JYVÄSKYLÄN YLIOPISTO

CONSENT TO PARTICIPATE IN SCIENTIFIC RESEARCH

I have been asked to take part in a study named Understanding Finnish Pre-Service teacher's perception of Sustainability Education.

I understand that participation in the study is voluntary and that I can stop participating at any time, without giving a reason. There will be no negative consequences for me if I withdraw. The data collected about me up to the point of withdrawal may still be used in the study.

I have been adequately informed about the study and the processing of my personal data. I have received the information sheet about the study, as well as the privacy notice. I have also had the opportunity to ask the researchers further questions.

I confirm that I will not participate in interview data collection if I have flu symptoms, fever, am recovering from illness, or am feeling otherwise unwell.

Yes ☐No ☐

I understand the information that I have received and agree to participate in this study.

Yes ☐No ☐

I give my consent to the sections specified above by ticking the "yes" boxes.
If I do not wish to participate in a particular section, I have the right to refuse by ticking the "no" box.
However, I still agree to participate in the study otherwise.

Confirmation

By signing this consent form, I accept that my data will be used in the study described in the research notification.

Signature _____

Date _____

Name in print _____

Email _____

Consent received

Signature of the recipient_____

Name in print_____

Contact details:

Abitha Chakrapani

Master's Degree Student in Educational Sciences

Faculty of Education and Psychology, University of Jyväskylä, Finland

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Email: abchara@student.jyu.fi

Role in the research project: research conductor/author

Heidi Layne and Anna Leena Kähkönen

Email: heidi.j.layne@jyu.fi and anna-leena.m.kahkonen@jyu.fi

Role in the research project: supervising teacher
Faculty of Education and Psychology, University of Jyväskylä, Finland

If this document is signed, it should be placed in the PI's archive. Informed consent documents will be stored in a secure location for as long as the data are in an identifiable form. If the data are anonymised or deleted, informed consent documents do not need to be preserved.

Appendix 4. Interview Questions

1. Can you please introduce yourself and share your background shortly? (Native city, year of education and reason to become a teacher)
2. Quote from the National Curriculum and SDG4 was shared –

   In the core curriculum for Basic education of the Finnish National Agency for Education 2014, 2018, and 2019, one of the values states that "takes responsibility for the environment and focuses on a sustainable future". And among the seven transversal competence areas, "participation, involvement, and building a sustainable future" is one of them.

   Sustainable Development Goal 4, Target 4.7 (United Nations, 2016). SDG Target 4.7. states that "all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship and appreciation of cultural diversity and culture's contribution to sustainable development" (SDG, 2019)

3. Can you describe what you understand about this value stated in the curricula?
4. How has this value been taught in the university? Can you name the course/subject?
5. Could you share any meaningful method or learning experience related to sustainability education, and then ask about what course was it part of
6. How well are you prepared to engage with this value in your school practice?
7. What are the ways in which you think is the best way to engage in teaching this value/SE?
8. What difficulties do you encounter while engaging with SE.?
9. Is there something about SE that doesn't feel right/good to you as a teacher?
10. What support do you require to overcome the current difficulty?

Appendix 5. Codes and thematization process

Challenge-emotional conflict while teaching SE	Course in TE focusing on SE	dilemma on how to teach SE
Example of an experience related to SE in TE program study	Experience of SE in TE study program	importance of SE and school- the linkage
Interviewee's approach to SE in their classroom	Issue of education in the society	learnt more from a seminar on campus about SE than TE class
Learnt transversal competency through classes at JYU	Meaning given to Sustainability	Other potential conflicts while teaching SE in classroom
Preparedness to teaching SE	Reaction to SDG4	Reason to become a teacher
Suggestions to improve SE in TE program	Understanding of the transversal competency	Was aware of transversal competency but not SDG4

These codes were grouped to form themes such as SE is mainly environmental, SE is more than just environmental, definitions in the light of SDG4, pedagogical dilemma, sensitivity dilemma, resource and time dilemma, SE related courses at JYU, reflection of TE program, recommendations for TE program.