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Embedding Sustainability in Teacher Education: A case study from the Maldives

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ABSTRACT *This article explores the integration of Education for Sustainability (EfS) within teacher education at the Maldives National University (MNU). Using a qualitative case-study design, the research investigates the perspectives and experiences of academics and students of the Faculty of Education (FE) regarding the integration of EfS into teacher education programmes. Findings reveal that while sustainability-related content is embedded across the curriculum, traditional pedagogies limit opportunities for students to develop sustainability competencies. The study highlights the need for a more holistic approach to EfS, that emphasises the interconnectedness of environmental, social, and economic issues and promotes the consistent use of participatory pedagogies. Institutional support, continuous professional development for teacher educators, and a focus on real-world, praxis-oriented pedagogies are identified as essential for preparing pre-service teachers to become agents of change for a sustainable future. This research highlights the importance of investigating the long-term effects of EfS programs on teachers' practices and students' learning, as well as developing effective strategies to address barriers to EfS implementation within the Maldivian context. This study contributes to understanding the complexities of integrating EfS in teacher education and provides recommendations for enhancing teacher education for a sustainable future.*

Keywords: Education for Sustainability (EfS), Teacher Education, Sustainability Competencies, Transformative learning, Pedagogical Approach

Introduction

Education for Sustainability (EfS) is an interdisciplinary educational approach that fosters a holistic and transformative learning experience, equipping learners to make informed decisions and take responsible actions for environmental integrity, economic viability, and a just society, both for present and future generations, while valuing cultural diversity (UNESCO, 2018). EfS encompasses three interconnected dimensions: environmental, social and economic sustainability. EfS has a strong emphasis on human rights, poverty alleviation, sustainable livelihoods, peace, environmental protection, democracy, health, biological and geographic diversity, climate change, gender equality, and the preservation of indigenous cultures (UNESCO, 2005). A defining characteristic of EfS is its interdisciplinary nature, that requires the integration of diverse subjects to address complex sustainability challenges (UNESCO, 2012). To this end, educators should possess a broad knowledge base and understand the interconnectedness of various disciplines (Mossman, 2018).

Higher education plays an important role in promoting EfS, particularly in teacher education programmes (UNESCO, 2018). This involves addressing socio-environmental issues, valuing different forms of knowledge, and applying

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sustainability science learning techniques, that shows significant potential for innovation in teacher education (Fischer et al., 2022). Developing teachers' sustainability competencies is fundamental for promoting sustainable practices within schools and empowering future generations to build a sustainable future. Research reveals that teacher education programmes often lack an integrated approach to EfS where sustainability principles and competencies are embedded across all subjects, teaching practices, and professional standards.

As a result, there have been minimal structural changes to incorporate EfS across subjects and competencies (Evans, 2020; Rieckmann, 2018). Studies also indicate that perceptions of teachers significantly influence the implementation of sustainability, with many associating it with environmental protection, while overlooking the social and economic dimensions (Jetly & Singh, 2019). Research indicates a significant gap between pre-service teachers' willingness and their perceived abilities to engage with sustainability (Besong & Holland, 2015). This highlights the importance of teacher education programmes that move beyond theoretical understanding and focus on practical application. Given the unique context of the Maldives, which faces significant environmental and socio-economic challenges, the role of the faculty in preparing teachers capable of promoting sustainability is crucial.

Literature Review

This literature review examines the current state of research on teacher education for sustainability, exploring various aspects, including competency development, teacher educators' perceptions, pedagogical approaches, challenges, and opportunities.

Sustainability Competencies in Teacher Education

Sustainability competencies are crucial for equipping educators with the knowledge, skills and values necessary to address global challenges and promote sustainable development in educational settings (UNESCO 2018). For example, systems thinking competency enables student-teachers to analyse interconnected social, ecological, and economic systems. Similarly, anticipatory competency empowers teachers to guide students to envision a sustainable future, assess risks, and make decisions that consider long-term consequences. A key framework for understanding sustainability competencies is the Dispositions, Abilities, and Behaviours (DAB) framework (Besong & Holland, 2015). This framework details how learners address sustainability across three domains: their willingness and motivation to engage with sustainability (dispositions), their skills and knowledge for sustainable action (abilities), and the actions taken to promote sustainability (behaviours).

In their study, Besong and Holland (2015) observed that student-teachers in Ireland demonstrated a strong willingness to engage with sustainability, but a lower perception of their own abilities, which highlights the need to develop these skills. Manasia et al. (2020) developed a teaching readiness model that highlights professional knowledge, engagement, and self-management as key dimensions of preparing pre-service teachers for EfS. This model reinforces the importance of a well-rounded approach to competency development. Building on this, Christoforatou (2021) proposed a theory that ensures consistency across

the three phases of teacher education which consists of university-based initial teacher education, practical training at teacher education institutes, and in-service professional development that integrates theory with EfS. According to Karvonen et al. (2023), developing sustainability competencies within teacher education programmes require systematic attention to self-efficacy beliefs. This dual focus is important because teachers with higher self-efficacy are more likely to implement EfS in their classrooms (Karvonen et al., 2023).

Perceptions and Pedagogical Approaches of Teacher Educators

Research indicates that teacher educators' perceptions of EfS significantly influence its implementation. Jetly and Singh (2019) found that many teacher educators in India associate EfS with environmental sustainability, with less emphasis on the social, economic, and cultural dimensions. Furthermore, their study revealed that teacher educators were more familiar with knowledge and values of EfS than with the skills needed for its practical application. This is supported by Parry and Metzger (2023), who observed that teachers often feel more confident teaching cognitive aspects of sustainability than the social and emotional dimensions. This aligns with observations in the Maldives, which indicated that teacher education is focused on rote learning rather than developing critical thinking which is essential for building sustainability competencies (Adam, 2015).

Research conducted in other contexts reveals similar challenges. For example, Wolff et al. (2017) found that in Finnish primary teacher education, social science educators emphasise social sustainability and science educators focus on ecological aspects, which suggests a need for interdisciplinary education. Meanwhile in Germany, chemistry teacher trainees demonstrated positive sustainability attitudes, yet their understanding mainly focused on environmental issues (Burmeister & Eilks, 2013). Furthermore, student-teachers' understanding of sustainability was often limited to environmental aspects, with a lack of consideration for social, economic, and political factors (Zong, 2021). Similarly, pre-service early childhood teachers in Greece also exhibited knowledge of environmental dimensions but demonstrated limited understanding of societal and economic aspects of EfS (Maidou, et al., 2019).

Key Drivers for Embedding EfS within Teacher Education

A number of studies have explored the factors that contribute to the successful integration of EfS into teacher education. These include a constructivist learning environment, inquiry, and experiential learning projects, skills of curriculum integration, working with experienced teachers in EfS, and opportunities for reflection (Kennelly et al., 2012). Research suggests that a stand-alone EfS subject with praxis-oriented pedagogies can improve pre-service teachers' self-efficacy and develop their interest in sustainability issues (Tomas et al., 2017). Meanwhile, Hogan and O'Flaherty (2021) highlight the importance of developing critical scientific literacy within science education to effectively engage with sustainability issues. Studies have shown that hybrid learning approaches also promotes sustainability education. Merritt et al. (2019) found that hybrid courses using online digital stories, reflections, and in-class activities improved pre-service teachers' values and practises related to sustainability. Similarly, Chin et al. (2019) provides case studies that shows the effectiveness of blended learning and digital tools in promoting

EfS. They offer examples of pre-service and in-service teachers engaging in critical thinking and practical sustainability projects through platforms like Facebook and digital mathematical tools. Literature highlights the effectiveness of project-based learning in transforming pre-service technology teachers' perceptions and behaviours related to sustainability (Singh-Pillay, 2020). Additionally, reflective practices within EfS courses have shown to create a sustainable mindset, as demonstrated by content analysis of teacher learning journals (Fox et al., 2019).

According to Jegstad et al. (2018), successful integration of EfS into science teacher education requires the use of sociocultural and experiential learning approaches along with explicit instruction on EfS concepts. Meanwhile, Lysgaard and Simovska (2015) maintain that the idea of participation is central to EfS, promoting both active engagement and critical thinking among learners. Furthermore, curriculum changes must be designed to reflect the cultural, environmental, and economic context (Clark, 2022). Similarly, enhancing the skills of social science teacher trainees necessitates curriculum improvement, creative teaching methods, the use of technology, and collaboration with relevant parties (Hermanto et al., 2019).

Andersson (2017) investigated the effects of EfS on pre-service teachers' perceptions of teaching sustainable development. The findings of that research showed a short-term impact on encouraging pupils to discuss environmental issues, but no significant impact on their opinions. This suggests that EfS programmes need to go beyond raising awareness and focus on developing critical thinking and empowering students to form their own informed perspectives. In this regard, Brandt et al. (2019) emphasise that competence development in EfS is a continuous learning process that needs to be supported throughout the entire teacher education program. They highlight the importance of authentic, real-world experiences, problem-oriented tasks, and collaboration with partners in practice. Meanwhile, Evans and Ferreira (2020) suggest a range of effective sustainability pedagogies, drawn from a comprehensive literature review. These methods include videos, group activities, hands-on and place-based activities, storytelling, journaling, and future visioning. These strategies contribute to student teachers' enhanced knowledge, understanding, critical thinking, and motivation regarding sustainability. In a similar study, Fahey et al. (2016) highlight the success of a project focused on fostering sustainable development and climate change adaptation expertise through a stakeholder-designed curriculum and train-the-trainer initiatives.

Challenges in Embedding Sustainability

Research reveals that teacher education programmes often lack an integrated approach to EfS, with minimal structural changes to incorporate it across subjects and competencies (Evans, 2020; Rieckmann, 2018). Successful EfS programmes requires coherent, cross-disciplinary integration rather than treating sustainability as an add-on to individual subjects (Holst, 2023). Sureda-Negre et al. (2014) found that while sustainability concepts are present in curricula, they are often addressed superficially, with environmental sustainability receiving less attention than other areas. While pre-service mathematics teachers can recognise the links between mathematical concepts and sustainability, the practical application of this knowledge in classrooms remains uncertain (Karaarslan Semiz & İşler Baykal,

2020).

Similarly, early-career teacher educators in Turkey, expressed concerns about sustainability, yet showed limited awareness and responsibility towards EfS. This has the potential to hinder their active participation (Öztürk & Pizmony-Levy, 2021). According to Kalsoom et al. (2019) teacher educators in Pakistan face significant obstacles which hinder their ability to implement EfS. These obstacles include time constraints, insufficient administrative support, knowledge gaps, and an overloaded curriculum (Mirza & Tajuddin, 2020). Evans et al. (2021) found inconsistencies in the integration of EfS into initial teacher education across several countries including Sweden, Scotland, Canada, and Australia. These inconsistencies create reluctance among educators to integrate sustainability topics, emphasising the need for institutional support and capacity building. Obstacles to integrating EfS into teacher education include insufficient leadership, negative faculty perceptions, and departmental isolation (Falkenberg & Babiuk, 2014). The authors call for EfS to be established as a foundational principle for educational goals and foster collaborative leadership across all levels of an institution (Falkenberg & Babiuk, 2014). Meanwhile, Bourn, Hunt, and Bamber (2017) emphasise that teacher educators need to develop expertise in EfS and advocate for a values-based approach in EfS.

Methodology

Research Design

A qualitative case-study methodology was selected to explore the multifaceted nature of EfS as a socially constructed and context-specific concept. This case-study centred on the Faculty of Education as a bounded system, offering insights into the challenges and opportunities for embedding EfS in teacher education.

Population and Sampling

Purposive sampling was used to select participants from two main groups: academic staff and final-year pre-service teachers at the faculty. A total of four academic staff members participated in the study, who represent different disciplinary backgrounds including social science, science education, language teaching, and economics education. Final-year students were chosen to ensure they had sufficient exposure to the curricula and could reflect on their educational experiences comprehensively.

Data Collection and Analysis

A qualitative content analysis was conducted on institutional documents, including the MNU Strategic Plan (2020–2025), Bachelor of Education programme structures, and course outlines. Documents were analysed to identify sustainability-related content and explicit and implicit references to sustainability principles, and competencies. Further to this, in-depth interviews were conducted to explore participants' understanding of EfS, their experiences in sustainability education, and perceived challenges and opportunities. Interviews lasted approximately 45-60 minutes each and were audio-recorded with participants' consent. Additionally, four teaching sessions were observed, including two pedagogy lessons and two content lessons, to gain insights into how academics translated their understanding of sustainability into pedagogy. Observations focused on sustainability content,

concepts, and pedagogical approaches for fostering sustainability competencies. Detailed field notes were used to capture the physical settings, classroom arrangements, discussions, and interactions between lecturers and students. Data were analysed using the constant comparative method (Glaser & Strauss, 1967). Interview transcripts, observational notes, and documents were iteratively coded to identify emergent themes, such as divergent EfS conceptualisations, pedagogical approaches, and implementation challenges at faculty.

Ethical Considerations

This research was conducted following approval from the University of Canterbury's Educational Research Human Ethics Committee (2018/54/ERHEC) and the MNU Research Ethics Committee. All participants provided informed consent before participating in interviews and classroom observations. Confidentiality and anonymity were maintained throughout the study, with participants identified only by codes (A1-A4 for academics, S1-S5 for students).

Findings

This section begins with an examination of sustainability inclusion in the national curriculum and subsequently explores its implementation within the faculty's programmes. Specific attention is given to the integration of sustainability content and pedagogies within Social Science, Science, Mathematics, Economics and Business Education, revealing the diverse approaches and challenges encountered across these disciplines. The findings directly address the three research questions concerning (1)conceptualisation and integration of EfS, (2) implementation challenges and enablers, and (3) strategies for enhancement of EfS integration at the faculty.

Sustainability in the National Curriculum

The National Curriculum identifies, *'Using sustainable practices'* as one of the key competencies. The objective of this key competency is stated in the curriculum document as follows:

> *To help students understand the key elements of sustainable development and give them an opportunity to explore a range of social, economic, and environmental issues in their community. It is aimed to equip students with the knowledge, skills, and values that empower them to take responsibility for creating a sustainable future.* (National Institute of Education, 2015).

This objective aligns with the broader goal of preparing informed, ethical and engaged citizens who can contribute meaningfully to sustainable development. The curriculum is based on eight *key learning areas* which contribute towards achieving the key competencies. Science education provides students with an understanding of ecosystems, natural cycles, and the interconnectedness of living things. This knowledge is crucial for recognising the impact of human activities on the environment. For example, learning about marine ecosystems helps students understand the vulnerability of coral reefs and the importance of conservation. Social Studies emphasises the importance of civic engagement and responsible citizenship. It encourages students to participate in community initiatives aimed at promoting sustainability. Another key learning area that contributes to developing sustainability competency is *'Islam and spirituality'*. This learning area emphasises

the importance of saving and economising resources, reflecting the Islamic concept of moderation and avoiding wastefulness. This encourages responsible consumption of natural resources, which are central to sustainable development.

Integrating Sustainability in the Faculty Curriculum

The faculty's organisational structure comprises three specialised departments: Business, Mathematics, and Science Education; Humanities Education; and Educational Studies. These departments collectively contribute to the faculty's primary mission: to educate professional teachers and conduct research in teaching and learning. The faculty's teaching programmes are designed to cultivate the knowledge, skills, and values essential for teachers to effectively implement the National School Curriculum, developed by the Ministry of Education. This curriculum emphasises the development of informed, ethical, and engaged citizens capable of contributing meaningfully to sustainable development. A total of 260 subjects were identified across all the undergraduate programmes the faculty is currently conducting. There is no standalone subject on sustainability or EfS. An analysis of subject descriptions, rationale, learning outcomes, topics, and teaching and assessment strategies revealed that sustainability related content, concepts and pedagogies are integrated across FE's undergraduate curriculum. Examples of modules with a sustainability focus include, 'Social Science', 'Conservation Biology', 'Climate Change and Society' and 'Development Economics'. There is explicit reference to skill development in the subject outlines. Analysis of course descriptions revealed multiple sustainability competencies embedded across the curriculum. These competencies include critical thinking and create problem-solving, collaboration and teamwork skills, communication and presentation abilities research and inquiry skills, and practical application of knowledge to real-world problems.

Sustainability in Social Science Education

Focusing on implementation challenges and enablers, Social science 1 is one of the subjects designed to develop students' knowledge, skills and values regarding the environment, economy and society, which are the three pillars of sustainable development. The five strands in Social Science, namely people, places and environments, culture and identity, economic world, time continuity and change and citizenship provides a framework for integrating sustainability into teacher education. For example, the strand 'people, places and environment focus on the relationship between humans and their physical and social environments. It provides an opportunity to embed sustainability by exploring how human activities impact ecosystems, natural resources and climate. Pre-service teachers' knowledge and understanding of sustainability is further enhanced in 'Social Science 2' where they learn contemporary global environmental, economic and cultural issues. Examples of sustainability-related topics include 'environment and world affairs', in which students learn about the environment and politics and the influence of multinational corporations. In 'Gender, Human Rights, and World Affairs,' students explore the gender awakening of the 20th century and other issues related to inequality and human rights in both global and local contexts.

The module 'Teaching and Learning Social Science' is integral to sustainability education as it provides pre-service teachers with the pedagogical content

knowledge required to integrate sustainability concepts into social studies instruction. By focusing on critical thinking and inquiry-based teaching strategies, the module prepares teachers to engage students in exploring social, economic, and environmental issues that are central to sustainable development. One academic from social science background believed that she could contribute towards promoting the social dimension of sustainability:

> *I guess probably my strength would be developing skills like critical thinking, the ability to see from diverse perspectives and also instil values like tolerance and respect for different people (A4).*

Lecturers are expected to use a variety of praxis-oriented pedagogies. These strategies include debates, role plays, simulations, experiential learning, inquiry-based learning approach, local area investigations and fieldtrips. In one observed lesson, students in a social science class discussed sustainability issues in their local communities in a simulated panel discussion. They debated on the topic of re-settling inhabitants of an island in Maldives that is vulnerable to the effects of climate change. This classroom activity employed a mix of pedagogical approaches to create a dynamic and engaging learning experience. By investigating a complex real-world issue, students are encouraged to think beyond textbook knowledge and develop a deeper understanding of the sustainability challenges faced by communities.

The pedagogical strategies used in this observation align well with promoting active learning, student engagement, and the development of higher-order thinking skills. The social studies curriculum emphasises inquiry-based learning as a key pedagogical approach for developing students' sustainability skills. Field trips offer pre-service teachers hands-on experience in applying this method. One such opportunity involves studying the mangrove ecosystem on Huraa, an inhabited island in Malé Atoll. One student described her learning experience:

> *We worked in groups to identify the plant species found in and around the mangrove and drew a vegetation map of the mangrove, how species are distributed. Others measured temperature, depth and salinity of the water body (S2).*

During these trips, students observe human impacts, perceived cultural importance and economic benefits of the mangrove ecosystem. Active participation in field trips helps develop pre-service teachers' knowledge and skills in planning, organising and conducting field trips. Inquiry-based approaches also enable students to investigate real-world sustainability challenges, such as the impact of tourism on the Maldives' fragile ecosystems or the role of traditional practices in promoting environmental stewardship. Addressing research question two, regarding implementation challenges, some academics voiced concern over students not having sustainability competencies such as critical thinking, problem solving and communication skills when they join the university. Academics believe that changing students' mindsets is a challenge, as many students entering university are accustomed to a spoon-fed approach through their earlier schooling up to A-level. One academic specialising in language education explained:

> *When students come to the university, we find that they often struggle to critically examine issues and engage in classroom discussions and reach a common ground*

(A2).

An academic who specialises in the social sciences remarked that the environmental dimension is emphasised within the curriculum:

> *Sustainability like traditionally connected to environmental issues so that's like a big topic we discuss (A4)*.

However, she thought that sustainability is embedded in our academic programmes in a superficial manner. She acknowledged that there is space for embedding sustainability in the curriculum, but it is dependent on the teachers, the pedagogies they use and the resources that are available:

> *So, there is space for embedding sustainability, but I don't know whether it's actually being practised. (A4)*.

In the context of teacher education, this lack of independent thought and critical engagement is concerning, as it suggests that students may struggle to navigate the complex challenges of sustainability, which require multidimensional thinking and interdisciplinary solutions. She thought sustainability is when people have ownership of their own lives and can 'flourish at their best'. To implement the social dimension of sustainability, she believes the learning environment has to be democratic. What she aspires to is a democratic and emancipatory environment where students can discuss various social issues and express diverse perspectives.

Another academic acknowledged that although the subjects they teach are related to sustainability, the contents are not specific to Maldives. Rather, the curriculum is intended to explain issues from a global perspective:

> *Thinking about what we have in the content, I see very little relevance to major issues in the country (A2)*.

Sustainability in Science and Mathematics Education

The Bachelor of Education (B. Ed) programme includes four compulsory science subjects which provide ideal space for integrating sustainability education. Key sustainability-related topics covered in these subjects include pollution, coral reefs, ecology, and conservation. When asked if sustainability competencies are focused in faculty's teaching programs, one academic from a science background provided the following perspective:

> *Education for Sustainable Development (ESD) competencies explicitly, I don't think there has been much done that I am aware of … in the science curriculum there is focus on again not sustainability as such but more towards you know environmental stewardship and those things (A3)*.

Environmental stewardship focuses on conserving and protecting natural resources, encouraging individuals to act responsibly towards the environment. Sustainability Competencies extend beyond environmental concerns. They include understanding the interconnectedness of environmental, social, and economic issues as well as developing long-term solutions for sustainable living. 'Teaching and Leaning of Science' helps preservice teachers develop student-centred, active learning strategies. These include inquiry-based learning, co-operative learning, role-play and games in science teaching. 'Issues and Challenges in Science and

Science Teaching' is offered as an elective subject in the final year of the B.Ed. programme. The subject aims to develop in pre-service teachers the expertise to construct, disseminate, and apply knowledge in addressing key environmental and social issues. Students are expected to conduct discussions and carry out activities related to pollution, conservation, and energy. Mathematics, like science and social studies, can also serve as a medium for integrating sustainability concepts into teaching. One student applied sustainability competency of 'using sustainable practices' into a math lesson. While teaching subtraction, she related it to minimising waste:

> *Subtraction is the concept but it's not taking away only. Minimizing could be related to that, so I applied it to reducing waste (S1).*

She believed that any approach that involves children and promotes student centred learning would enhance their sustainability knowledge, skills and values. When asked if such strategies were used by lecturers, she said:

> *No. we faced very boring sessions but when it comes to 'teaching and learning' it was quite ok. (S1)*

This implies that there is a mismatch between the pedagogical approaches taught in 'teaching and learning' modules and the approaches used by lecturers when teaching the content units. The student's response suggests a need to expand student centred teaching across all courses, not just those related to teaching and learning. One science academic believes she is able to make an impact in terms of teacher education, curriculum development, research and publications:

> *I don't think I can say much about abilities, but I can say I'm in a place where I can do something about it, I can advocate for it. (A3)*

Sustainability in Economics and Business Education

The FE's Bachelor of Teaching economics, and business programs provide space for exploring the economic dimensions of sustainability:

> *We learn sustainability in principles of economics, micro and macroeconomics as well. (S3)*

In principles of macroeconomics, students are required to examine the conflicts between economic, political and social objectives of development and challenges of simultaneously achieving these three objectives. Meanwhile, in microeconomics they address issues of inequality and explores the redistributive effects of taxes and welfare programmes. Additionally, the subject focusses on environmental sustainability. For instance, how emission charges, marketable permits, and taxes can be used to achieve efficiency in the presence of environmental problems are discussed. When asked if there is an economic solution for environmental issues, one student said that government can impose taxes on companies who create pollution and allow pollution permits up to a certain amount:

> *The government can give companies permits to pollute up to a certain level. If a company wants to pollute more than that, it has to buy extra permits from another company (S4).*

The subject 'Development Economics' focuses on issues such as poverty and

inequality, the importance of health and education for economic development and matters relating to the environment and development. Students are expected to demonstrate an understanding of how poverty and inequality are measured, and to discuss policy options for eradicating poverty. Students are also expected to analyse the importance of waste management and the methods of dealing with waste. In Business Studies, students explore the costs and benefits of business activity, the importance of controlling environmental costs and the measures that can be taken for conservation. Students also engage in discussion on ethics in the business context, the importance of equal opportunities in recruitment and selection, equal pay and the role of women in the workplace.

When asked whether social sustainability issues such as inequality are discussed in the classroom, one student specialising in economics teaching said:

We never related inequality to sustainability (S3).

The fact that the student does not see inequality as part of sustainability indicates that social sustainability is not sufficiently integrated into the curriculum. However, she believed that regional inequality has caused people from all islands of the Maldives to migrate to the capital city Male', which in turn has led to overcrowding and pollution. This demonstrates an awareness of how economic and social disparities contribute to unsustainable living conditions in the capital. When asked about practical application of sustainability competencies such as critical thinking and problem solving, two student teachers related problem solving to managing children's behavioural issues in the classroom:

We sometimes create classroom scenarios and discuss how to deal with them. We deal with classroom problems, but it has never been applied to a social issue. (S3)

The Maldives faces significant challenges related to environmental sustainability, such as pollution and coastal erosion caused by climate change. Each year, the Maldives generates over 350,000 tonnes of solid waste (World Bank, 2017). Meanwhile, marine plastic pollution in Maldives has been found to be amongst the highest in the world (UNICEF, 2020). However, the student's inability to identify these challenges may indicate a limited awareness of sustainability issues within their local context. One economics student believed that there is an opportunity cost associated with sustainable development. She stated that environmental protection measures would harm the economy and employment. The student's comment indicates a somewhat limited understanding of sustainability, focusing on the immediate costs of environmental sustainability and not fully considering the long-term benefits of sustainable practices.

I'm not saying sustainable development is not possible… but if we try to impose environmental sustainability, what about the opportunity cost of not having these industries and people not performing their activities? (S5).

Discussion

The findings of this study reveal both opportunities and challenges in integrating EfS into teacher education programs at FE. This discussion analyses these findings with existing literature and explores implications for future practice.

Sustainability Integration Across Disciplines

The findings from this research suggest that sustainability-related content is integrated across the faculty's undergraduate curriculum rather than offered as a standalone subject. This approach supports a comprehensive understanding of sustainability that encompasses environmental, economic, and social dimensions (Burmeister & Eilks, 2013; Wolff et al., 2017). Although sustainability content is integrated into the curriculum, the findings suggest a lack of opportunities for deeper engagement with sustainability concepts and principles (Sureda-Negre et al., 2014). Holst (2023) emphasises the need for a coherent, interdisciplinary integration of EfS rather than approaches that add sustainability knowledge to individual subjects. This perspective aligns with the trends observed in this study. Notably, academics from social science backgrounds emphasised the social dimensions of sustainability, focusing on critical thinking and diverse perspectives, while academics in sciences highlighted environmental stewardship. This disciplinary focus reflects trends observed in previous research on Finnish teacher education (Wolff et al., 2017). This compartmentalisation may limit students' understanding of the interconnected nature of sustainability challenges, which require integrated approaches across environmental, social, and economic domains (Jetly & Singh, 2019). Karvonen et al. (2023) suggest that disciplinary silos are a significant barrier to sustainability education in teacher education programmes where the development of sustainability competency requires integration across all disciplines.

The lessons and activities suggested in the science and social studies curricula in the faculty are based on the inquiry method, which requires pre-service teachers to investigate sustainability issues and are valuable (Kennelly et al., 2012). This research suggests that although pre-service teachers have opportunities to learn about inquiry-based learning and apply that knowledge in lesson planning, they get few opportunities to practise inquiry in real-life situations. Meanwhile, economics and business education programmes offer valuable opportunities for students to explore the economic aspects of sustainability, specifically in subjects such as Development Economics and Principles of Macroeconomics. However, feedback from students shows a disconnect between theoretical knowledge and their conceptual understanding of how social factors, such as inequality, relate to sustainability issues.

Pedagogical Approaches and Sustainability Competencies

The findings highlight several pedagogical approaches that align with best practices in EfS. In social studies, for example, students participate in debates, role-plays, simulations, and field trips that connect theory to practice. The panel discussion on relocating inhabitants of a climate-vulnerable island exemplifies real-world, problem-based learning advocated by Singh-Pillay (2020). Similarly, the field trip to study mangrove ecosystems provides experiential learning that is essential for successful integration of sustainability pedagogy (Jegstad et al., 2018). However, the findings also suggest inconsistencies in pedagogical approaches across programmes. Students reported passive learning in content-focused courses compared to teaching methodology courses, indicating a disconnect between the pedagogical approaches taught to pre-service teachers and those used by their

lecturers. This aligns with previous research in the Maldives, which indicated that teacher education emphasises rote memorisation rather than developing critical thinking through learner-centred approaches (Adam, 2015). Critical thinking, which is a key competency in the national curriculum, was identified as a common sustainability competency in the faculty's subject outlines. This emphasis on critical thinking is necessary to develop critical scientific literacy to successfully engage with sustainability issues (Hogan & O'Flaherty, 2021). However, academics in this study expressed concern about the limited critical thinking abilities of students upon entering the university, suggesting that the development of this competency remains challenging.

Gaps in Understanding and Implementation of EfS

The findings of this study revealed several gaps in the understanding and implementation of EfS. Comments from both academics and students suggest limited awareness of sustainability competencies beyond environmental preservation. This aligns with Jetly and Singh's (2019) finding that teacher educators often have a limited understanding of the skills needed for the practical application of EfS principles. For instance, the student's belief that environmental sustainability could negatively impact the economy and employment demonstrates a limited understanding of sustainability, that overlooks the potential benefits of environmental protection for economic development. This finding is consistent with Burmeister and Eilks (2013) who highlighted the challenge of assisting student-teachers understand the relationship between environmental, economic, and social dimensions of sustainability. Furthermore, the finding that student teachers mainly associate problem-solving with classroom management issues rather than broader societal challenges suggests a limited application of sustainability competencies. This finding aligns with Besong and Holland (2015) who observed a disconnect between student-teachers' willingness to engage with sustainability and their perceived ability to apply sustainability principles in practice.

University Support and Infrastructure: Addressing Implementation Challenges

Findings of this research reveal institutional factors that influence the implementation of EfS at the faculty, suggesting that its implementation may be inconsistent and dependent on individual lecturers rather than being systematically embedded throughout the curricula. This consistent with inconsistencies in EfS integration within teacher education programmes across various countries, despite the presence of relevant policies (Evans et al., 2021). The results also suggest that curricular frameworks may restrict opportunities for developing sustainability competencies. Previous studies indicate that an independent sustainability subject, incorporating praxis-oriented pedagogies can enhance pre-service teachers' self-efficacy, knowledge, and interest in sustainability knowledge (Tomas et al., 2017). Without a standalone subject focused on sustainability, the faculty needs to strengthen its interdisciplinary approach through careful coordination to ensure comprehensive coverage of sustainability dimensions. This challenge is similar to what Falkenberg and Babiuk (2014) identified as "silo-ing within faculties" (p.420), where disciplinary boundaries can impede integrated approaches to EfS.

Contextual Relevance

The faculty's emphasis on preparing teachers to implement the National School Curriculum provides a strong foundation for contextualising education for sustainability in the Maldives. For example, the integration of sustainability within Islamic values, as evidenced in the national curriculum framework, demonstrates the potential for culturally relevant approaches to sustainability education. This is in line with the idea that curricular reforms should reflect cultural, environmental, and socio-economic characteristics (Clark, 2022). The panel discussion on climate vulnerability and resettlement, showed how sustainability principles can be used to address challenges faced by Maldivian communities in real life situations. Meanwhile, the economics student's inability to identify local sustainability challenges in their local context suggests that more explicit connections between theoretical knowledge and local realities may be needed. This finding aligns with Brandt et al. (2019) who asserted the importance of authentic, real-world experiences in developing sustainability competencies.

Conclusion

This study investigated how Education for Sustainability (EfS) is conceptualised and incorporated within teacher education programmes at the Faculty of Education, MNU. This research utilised document analysis, interviews, and classroom observations, to demonstrate that despite progress in integrating sustainability content into teacher education, considerable challenges remain. The inter-disciplinary approach to sustainability education allows students to engage with various aspects of sustainability, although they often do so from distinct disciplinary perspectives that limit comprehensive understanding. The research revealed that social science educators emphasised diverse perspectives, and academics from science backgrounds focused on environmental conservation, while economics educators addressed theories of development. This study acknowledged pedagogical approaches such as problem-based learning, experiential learning, and simulations that align with the best practices of EfS. However, these approaches are not consistently implemented across programmes, with many courses relying on traditional teaching methods. Implementation of EfS at the faculty is challenged by factors such as limited institutional support, varying levels of faculty awareness regarding sustainability competencies, and students' difficulty connecting theoretical knowledge to local sustainability issues.

Recommendations

The research proposes six strategic recommendations to address these challenges:

1. ***Development of institutional framework:*** formulate comprehensive Education for Sustainability policies, create interdisciplinary committees, define common sustainability competencies, and assign specific resources for curriculum development.
2. ***Professional development programs:*** Implement mandatory training on participatory pedagogies, create faculty learning communities, establish mentoring systems, and offer continuous professional support.
3. ***Curricular integration:*** Introduce mandatory foundational sustainability courses, develop interdisciplinary modules, create capstone projects addressing

real-world challenges, and integrate sustainability competencies across all programmes.

4. ***Community partnerships:*** establish collaborations with local educational institutions, government agencies, and NGOs to implement demonstration projects and community-led learning initiatives addressing local sustainability issues.
5. ***Authentic assessment systems:*** Implement performance-based assessments, facilitate pee-evaluations, develop competency portfolios, and conduct ongoing programme evaluations with the involvement of various stakeholders.
6. ***Technology integration:*** establish digital resource platforms, design virtual learning experiences, implement online collaboration tools, and create multimedia resources that highlight local sustainability solutions.

Declaration

This research was conducted in partial fulfilment of the requirements for the Degree of Doctor of Philosophy in Education at the University of Canterbury, New Zealand. Data collection was conducted following approval from the University of Canterbury's Educational Research Human Ethics Committee and the MNU Research Ethics Committee (2018/54/ERHEC).

Conflict of Interest Statement

The author declares that there is no conflict of interest regarding the publication of this article.

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