

Integration of Sustainable Development Competency Points into the Telecommunication System Subjects at Vocational High School

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Abstract

Education for Sustainable Development (ESD) plays a crucial role as an instrumental approach that must be widely promoted to ensure a more advanced and sustainable future. This study aims to comprehensively analyse the successful implementation of ESD in Vocational High Schools (VHS) with a specialisation in the Telecommunication System Subject. To achieve this objective, a research methodology combining document analysis, and interviews was employed. Through document analysis and semi-structured interviews with three subject matter experts among school personnel, pertinent data was gathered. The data encompassed the examination of the syllabus and lesson plans, which were subsequently subjected to meticulous scrutiny using the powerful Maxqda Software. The research findings demonstrate that the existing grading systems and qualification criteria for VHS students align significantly with the core competencies of ESD. However, it is noteworthy that the syllabus and Lesson Plans Study (RPP) themselves lack explicit integration of ESD principles. The effective implementation of Education for Sustainable Development (ESD) heavily relies on the proactive efforts of teachers. Additionally, it is crucial that both the curriculum and lesson plans (RPP) are meticulously revised to integrate key ESD competencies. This approach will help cultivate a generation that is more sustainable, environmentally aware, and socially responsible.

1. Introduction

Human life in the 21st century undergoes a significant change different from the previous period, marked by globalisation. Globalisation is a process that includes the causes, directions, and consequences of transnational and transcultural integration of human and non-human activities (Dinara Abdunayimova, 2020). In this century, it is required to have the ability to compile and synthesise various pieces of information into a knowledge proposition that becomes a framework for solving various problems of individuals and societies.

Globalisation in the 21st century has significantly impacted the development of science, technology, and art, including Technical and Vocational Education and Training (TVET). The development of science and technology has a positive and negative impact on human life. The positive effects of science and technology include providing convenience, increasing the effectiveness and efficiency of social interaction in society, accelerating and simplifying the information process, and distributing various fields. On the other hand, there are negative impacts, including the risk of globalisation in terms of its intensity, the number of interdependent events that influence each other, risks originating from the created environment, and environmental development by maximising existing exploitation of the present without thinking about the future (Widuto & Spinaci, 2023).

Concerns about various human actions today that threaten the lives of future generations are the responsibility and attention of various parties. In dealing with this concern, it is necessary to develop and implement the Education for Sustainable Development (ESD) method, in which education is the primary basis for sustainable development. In 1987, the United Nations began reviewing sustainable development through the World Commission on Environment and Development (WCED). They produced a report entitled *Our Common Future*, which defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their needs alone (Emina, 2021).

On September 25, 2015, the United Nations held a general assembly in New York, United States, which officially set the Sustainable Development Agenda or SDGs (The Sustainable Development Goals) with the theme "Changing Our World: The 2030 Agenda for Sustainable Development", which contains 17 goals and 169 target plans for global action for 15 years (valid 2016–2030). One of the goals of the SDGs is quality education, which will ensure adequate and inclusive quality education and promote lifelong learning opportunities for all. The Goal of Quality Education in the SDGs is a follow-up to the ESD program (Emina, 2021).

As a subsystem of national TVET, vocational high schools should prioritise students' readiness in choosing a career, entering the labour force, competing, developing careers, and being agents of change in the workplace or their personal lives. A program that supports everything from the curriculum to the lesson plan is needed to get all that. ESD is a solution the United Nations offers to overcome all of this.

In the trawl of literature, there have been several studies from various countries regarding the implementation of ESD in the vocational education curriculum, including "Monitoring Progress of Change: Implementation of Education for Sustainable Development within the Document of the German Education System" by Jorrit Holst et al. in 2020, which showed the results that the ESD program in vocational training education had not been appropriately implemented. Of the 19 new relevant vocational education particular resolution documents for 2017–2019 analysed, whereby only two refer to ESD, and the 14 training regulatory documents only refer to sustainability programs, not to ESD specifically (Holst et al., 2020).

Furthermore, in 2020, a study by Holst J et al. from Leipzig University titled "Monitoring Progress of Change: Implementation of ESD within Documents of the German Education System". This study's results indicate that the ESD program has been implemented in several important documents and declarations that have been ratified. Still, the sustainability of its implementation at the institutional and practical level cannot be ensured. There are still obstacles to implementing participatory methods and the ability of teachers to implement an ESD-based curriculum (Holst et al., 2020; Kamilah et al., 2020).

In this study, the focus is to examine the implementation of ESD in telecommunication system subjects in telecommunication vocational schools to determine the level of ESD implementation and the relevance of ESD implementation to the Indonesian National Qualifications Framework (KKNI).

Education for Sustainable Development (ESD), or continuing education, is a lifelong learning process that aims to provide information and engage creative people who have problem-solving, scientific, and social literacy skills who then commit to being bound by individual and group responsibilities (Achuk Eba, 2020). The proper implementation of ESD can greatly impact society in the long term. The points contained in the ESD that must be mastered are the competencies of systems thinking, anticipatory, normative, strategy, collaboration, critical thinking, self-awareness, and integrated problem-solving.

As for the syllabus, according to Regulation of Minister of Education and Culture Number 22 of 2016, the syllabus is a reference for preparing the learning framework for each subject study material. The syllabus contains at least subject identity, school identity, core competencies, basic competencies, themes, subject matter, learning, assessment, time allocation, and learning resources. The syllabus is one of the important instruments in education; thus, it needs to be designed as well as possible.

Also, referring to previous regulations, the Lesson Plan (RPP) is a face-to-face learning activity plan for one or more meetings. The RPP was developed from the syllabus to direct student learning activities to achieve Basic Competence (KD). Every academic purpose needs to be adjusted to the Indonesian National Qualifications Framework (KKNI). KKNI is a framework for ranking the qualifications of Indonesian human resources that juxtaposes, equalizes, and integrates the education sector with the training and work experience sectors in a work ability recognition scheme that is adapted to the structure of various employment sectors (kkni.ristekdikti.go.id).

2. Research Method

This study uses a qualitative approach using document analysis and supported by an interview. Document analysis is a systematic procedure for reviewing and/or evaluating documents in both printed and electronic form (Morgan, 2022). This method is suitable for analysing subject content in printed and electronic documents. This study analyses the Telecommunication System subject documents in the form of syllabus and lesson plans at SMK UT PGII Bandung, SMK Telkom Bandung, SMKN 1 Cimahi, and SMK TI Garuda Nusantara Cimahi. To strengthen the document analysis results, the second phase involved an interview with three experts in the subject matter, including a teacher and/or deputy head of curriculum, regarding the implementation of ESD in the subject of Telecommunication Systems.

2.1 Data Collection Method and Analysis

The research began by conducting a traditional literacy study to prepare the materials needed for the interview. A matrix table and checklist were used to record the findings, mostly to get the general figure of the EDS competency points embedded in the current curriculum. Documents include but are not limited to syllabus and lesson plan (RPP) for the telecommunication system subjects.

The findings from document analysis were used to draft a protocol interview to get the ideas regarding the ESD competency points. Then, an interview appointment was set with three experts in the subject matter who have more than ten years of experience: an ESD Expert, curriculum expert and a telecommunication system subject at VHS (Vocational High School). A consent letter was given to them physically at their school office before the semi-structured interview began. The MP3 recorder and field notes were used to support the data recording in the fieldwork.

A semi-structured interview was emphasized to support the data needed in research lesson plans and syllabus document analysis. Start by explaining the purpose of the interview, confidentiality, and how the data will be used. The interview questions grouped under ESD Competency points that are; System Thinking Competencies, Anticipatory Competencies Normative Competencies Strategy Competencies Collaboration Competencies Critical Thinking Competencies Self-Awareness Competencies Integrated Problem-Solving Competencies.

Data from the interview was transcribed into text and thematically analysed using software. Further analysis was executed to explore the involvement of ESD in the academic aspect and the common points. All the data obtained were processed using MAXQDA and then compiled to get a conclusion.

3. Result and Discussion

By analysing the main points of ESD in the syllabus using the MAXQDA 2020 application, the extent of the implementation of ESD in the learning design documents can be seen in the form of a syllabus and lesson plans. The implementation of ESD on the components of the Telecommunication System Syllabus is shown in Table 1. the syllabus document used by SMK UT PGII refers to 7 of the 8 ESD competency points.

Table 1 Implementation of ESD points in the syllabus

No.	ESD Points	Analysis Results
1	System Thinking Competencies	There are 13 sentences in the syllabus that refer to thinking competence
2	Anticipatory Competencies	There are 11 sentences in the syllabus that refer to anticipatory competence
3	Normative Competencies	There is no discussion in the syllabus that refers to normative competence
4	Strategy Competencies	There are 14 sentences in the syllabus that refer to strategic competencies
5	Collaboration Competencies	There is 1 sentence in the syllabus that refers to collaboration competence
6	Critical Thinking Competencies	There are 12 sentences in the syllabus that refer to critical thinking competence
7	Self-Awareness Competencies	There is 1 sentence in the syllabus which refers to self-awareness competence
8	Integrated Problem-Solving Competencies	There are 13 sentences in the syllabus that refer to integrated problem-solving competencies

The implementation of the main points of ESD is found in the elaboration of KI-3 (knowledge), the elaboration of KI-4 (skills), and the description of learning activities in each basic competency.

Based on the description, KI-3 refers more to the ESD points of system thinking competence, which can be seen by the inclusion of the sentence "understand, apply, analyse, and evaluate factual, conceptual, advanced operational, and metacognitive knowledge in multidisciplinary according to the field and scope of work." In short, ESD puts forward a continuity approach related to academics combined with systematic thinking (González-salamanca et al., 2020).

The elaboration of KI-4 explains the main competencies of skills that students must learn. In the description of KI-4, there are already several points of ESD competencies it, namely critical thinking competence, integrated problem solving, strategy, collaboration, self-awareness, and anticipatory. The argument that students must accomplish certain tasks using resources, knowledge, and standard operating procedures demonstrates critical thinking competency (Vázquez-Parra et al., 2022). As seen from the description of students, integrated problem-solving competence must solve complex problems according to the field and scope of work. Strategic competence, seen from the description of students, must display independent performance with measurable quality and quality. Collaborative competence, seen from the description of students, must demonstrate collaborative and communicative skills related to the development learned in school. Furthermore, self-awareness and anticipatory competencies seen from the description of students must show skills in perceiving, readiness, imitation, getting used to proficient movements, and original actions in the concrete realm related to the development learned in school.

The ESD competency points in the form of system thinking competence, strategy, critical thinking, integrated problem solving, and anticipatory are used to describe learning activities to relate to each fundamental competency (Saragih et al., 2021). Students must observe to identify and formulate the problems to be discussed; students must collect data on the material to be discussed; students must process data from their findings; and students must communicate the findings that have been processed on the material being discussed. ESD was implemented in the lesson plans, as indicated in Table 2.

Table 2 RPP analysis results

No.	ESD Points	Analysis Results
1	System Thinking Competencies	There are 2 descriptions in the lesson plans which refer to the competence of thinking systems
2	Anticipatory Competencies	There is no explanation that refers to anticipatory competence
3	Normative Competencies	There is no explanation that refers to normative competence
4	Strategy Competencies	There are 2 elaborations in the RPP which refer to strategic competencies
5	Collaboration Competencies	There is 1 elaboration in the RPP which refers to collaboration competencies
6	Critical Thinking Competencies	There are 2 descriptions in the lesson plans which refer to critical thinking competence
7	Self-Awareness Competencies	There is no description that refers to the competence of self-awareness
8	Integrated Problem-Solving Competencies	There is 1 elaboration in the RPP which refers to integrated problem-solving competencies

Table 2 indicates that the RPP document includes competence, including systems thinking, strategy, collaboration, critical thinking, and integrated problem-solving. The objectives and learning activities, such as the requirement that students understand the existing problems, the expectation that students locate their material and summarise it to respond to existing problems either on their own or in groups with teachers, and the assignment of more challenging problems, all show how the ESD points are being implemented (Kioupi & Voulvoulis, 2019).

Implementing ESD competency points in lesson plans can overlap with the syllabus due to several factors. For example, in the syllabus are core and basic competencies formulated directly by the central government, which is already more familiar with the sustainable education system. Lack of elaboration in the RPP that refers to ESD can occur due to educators' lack of mastery of the concept of continuing education, the central government's lack of socialisation of the concept of continuing education, and the change in the format of the RPP into a single sheet, which requires teachers to make a simple RPP without ignoring the essence of the RPP alone.

The concept of quality education, a global goal in sustainable development, has become a particular concern for Indonesia. This can be seen from the Indonesian National Qualifications Framework (KKNI), which manifests

quality related to the national education system, job training system, and the national learning achievement assessment system to produce quality and productive national human resources.

Aspects that graduates must possess by the KKNI are knowledge, practical knowledge, skills, affection, and competencies according to their fields. Following the ideology and culture of Indonesia, the implementation of the national education system and job training system carried out in Indonesia at each qualification level includes a process that fosters the following affections: having faith in God Almighty, having good morals, ethics, and personality in the workplace; completing their duties as citizens who are proud of and love their homeland and support world peace; being able to work together and have high social sensitivity and concern for society and the environment; respecting cultural diversity, views, beliefs, and religions as well as original opinions and findings; upholding law enforcement; and having the spirit to put the interests of the nation and the wider community first.

The KKNI level that graduates of SMK students can achieve is level II, where the qualifications are as follows: able to carry out a specific task using tools and information on work procedures that are commonly carried out and demonstrate performance with measurable quality under the direct supervision of his superiors; have basic operational knowledge and factual knowledge of specific work fields to be able to choose available solutions to problems that commonly arise; are responsible for their work, and can be given the responsibility of guiding others.

Based on the description of the grades and qualifications that SMK students must possess, this is already relevant to the ESD competency points. KKNI can be achieved by students who study with curriculum concepts that have implemented ESD because the qualifications that students must master in level II KKNI are conceptually and objectively the same as the nature of ESD itself.

4. Conclusion

Generally, the ESD competency points in the syllabus and lesson plans still need to be fully implemented. However, the implementation of ESD in the lesson plans is lower than in the syllabus, as seen from the document's content, which refers to the concept of ESD. In the future, revising academic components in the syllabus and lesson plan is necessary to ensure the available ESD competency points. Yet the authorities still have ample time and space to achieve the 2030 educational mission, especially to optimise the implementation of ESD in the education system in Indonesia. The practical implication: the authority is suggested to re-align the goal of ESD and KKNI, which is to produce superior human resources for the present and subsequent generations.

5. Limitations

The limitations of the problems in this study are:

- This study analyses the components of the syllabus and the components of the lesson plans for the Telecommunication System subject at the Vocational High School of Telecommunication Engineering Expertise Program;
- This study analyses the implementation of the main points of ESD, namely the competence of systems thinking, anticipatory, normative, strategy, collaboration, critical thinking, self-awareness, and integrated problem-solving;
- The analysis of the relevance of the implementation of ESD to the making of skills certification refers to the KKNI level II; and
- This research was conducted on implementing ESD in the components of the syllabus and lesson plans at various vocational high schools in Bandung.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the paper's publication.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Agus Heri Setya Budi, Enjang A. Juanda; **data collection:** Dandy Indrawan; **analysis and interpretation of results:** H Henny, Enjang A. Juanda; **draft manuscript preparation:** Alias Masek. All authors reviewed the results and approved the final version of the manuscript.*

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