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TEACHER COMPETENCY DEVELOPMENT WITH CSCT MODEL AND PISA FRAMEWORK INTEGRATION

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ABSTRAK
Program Guru Mulia meningkatkan kompetensi guru di Indonesia melalui Model CSCT dan Kerangka Kerja PISA. Program ini mengatasi kesenjangan pelatihan dengan menciptakan kerangka kerja berkelanjutan yang selaras dengan standar global. Program ini dimulai dengan Diskusi Kelompok Terarah (FGD) yang melibatkan 20 pakar pendidikan untuk mengidentifikasi kebutuhan dan merancang model pelatihan. Selanjutnya, 50 guru sekolah menengah di Surabaya berpartisipasi dalam lokakarya dan pendampingan untuk meningkatkan keterampilan pedagogis, pemikiran kritis, kompetensi sosial-emosional, dan integrasi teknologi. Evaluasi menunjukkan peningkatan yang signifikan dalam keterampilan guru. Penilaian formatif mengidentifikasi kekuatan program dan area peningkatan, sementara perbandingan pre-test dan post-test mengonfirmasi peningkatan kompetensi pedagogis dan teknologi, yang berdampak positif pada praktik kelas. Studi ini menyimpulkan bahwa Program Guru Mulia secara efektif memanfaatkan keterlibatan masyarakat untuk meningkatkan kualitas pendidikan, menyelaraskan kompetensi guru dengan tolok ukur global. Program ini menyediakan model yang dapat direplikasi untuk mengintegrasikan keberlanjutan dan standar global ke dalam inisiatif pelatihan guru.

Kata kunci: *pengembangan kompetensi guru; model CSCT; kerangka kerja PISA; keterlibatan masyarakat; pendidikan berkelanjutan*

ABSTRACT
The Noble Teacher Program enhances teacher competency in Indonesia through the CSCT Model and PISA Framework. It addresses training gaps by creating a sustainable framework aligned with global standards. The program began with Focus Group Discussions (FGDs) involving 20 education experts to identify needs and design a training model. Subsequently, 50 high school teachers in Surabaya participated in workshops and mentoring to improve pedagogical skills, critical thinking, social-emotional competencies, and technology integration. Evaluations showed significant improvements in teacher skills. Formative assessments identified program strengths and improvement areas, while pre-test and post-test comparisons confirmed gains in pedagogical and technological competencies, positively impacting classroom practices. The study concludes that the Noble Teacher Program effectively leverages community engagement to enhance education quality, aligning teacher competencies with global benchmarks. It provides a replicable model for integrating sustainability and global standards into teacher training initiatives.

Keywords: *teacher competency development; CSCT model; PISA framework; community engagement; sustainable education*

INTRODUCTION

High-quality human resources (HR) are essential to addressing global challenges and achieving the vision of Golden Indonesia 2045. Teachers play a critical role in fostering 21st-century competencies in students, including critical thinking, collaboration, digital literacy, and social-emotional skills. According to (Dang et al., 2023), student, family, and school

characteristics account for only 30% of educational success, emphasizing the significant influence of teachers on learning outcomes.

Despite this, teacher competencies in Indonesia remain insufficient, particularly in addressing the complexities of sustainability-based education (Education for Sustainable Development - ESD). Existing teacher training programs often fail to produce optimal results due to a lack of sustainability, integration, and focus on specific needs. The Curriculum, Sustainable Development, Competences, Teacher Training (CSCT) Framework, developed by (Sleurs, 2008), offers a solution by providing a sustainability-based curriculum model for teacher education. This framework integrates three dimensions of ESD competencies—teaching/communicating, reflection/vision, and networking—and five key domains: knowledge, systemic thinking, emotions, ethics and values, and action. By combining these elements, the CSCT Framework supports teachers as agents of change while embedding sustainability principles in education.

The CSCT Framework has inspired additional competency models, such as KOM-BiNE (Rauch & Steiner, 2013) and the complexity theory-based model proposed by (Garcia, 2017), showcasing its flexibility across various educational contexts. These adaptations position the CSCT Framework as a critical reference for developing teacher training curricula that emphasize sustainability, relevance, and effectiveness.

These theoretical foundations are built, and this study focuses on developing and implementing a CSCT Framework-based training model to improve teacher competency in ESD. The model incorporates intensive training, interactive workshops, and data-driven strategies to ensure relevance and sustainability. It addresses two key research questions: (1) How can the CSCT Framework be effectively applied in developing teacher competencies in Indonesia? (2) How can integrating sustainability, social-emotional competencies, and innovative pedagogy enhance education quality?

Guru Mulia Program exemplifies this approach by combining community engagement with global frameworks such as the CSCT and PISA Frameworks. By involving stakeholders in identifying teacher competency needs and designing targeted interventions, the program ensures contextualized and relevant training. Previous research, such as (Darling-Hammond et al., 2017), underscores the importance of integrating sustainability principles into teacher training, though it often lacks practical applications in diverse settings. This study bridges the gap between theory and practice by fostering collaborative efforts among educators, stakeholders, and communities. Ultimately, it aims to drive educational reform, improve teacher performance, and contribute to sustainable education development in Indonesia.

THE CSCT COMPETENCE MODEL

Curriculum, Sustainable Development, Competences, Teacher Training (CSCT) is a model designed to develop relevant educational offerings for all school levels by integrating all competencies needed by teachers in the context of sustainable development. Developed by the international organization Environment and School Initiatives (ENSI) as part of the Comenius-2 project, this model involves collaboration from 15 universities in Europe (Sleurs, 2008). CSCT plays an important role in building a teacher competency framework that is not only based on professionalism, but also includes aspects of teacher personality and social responsibility in supporting educational sustainability. The CSCT approach places teachers in three main roles: as individuals, agents of educational institutions, and members of society. The competencies designed aim to promote sustainable development through personal, social, and professional dimensions. This includes teachers' personal behavior that is aligned with sustainability values, making teacher personality a key element in the holistic approach of this

model (Sleurs, 2008). In addition, this model encompasses the whole personality of teachers, not just their professional aspects, in supporting sustainable development (Cebrián & Junyent, 2015). In addition to knowledge transfer, ESD competencies also include the development of teachers' critical and reflective capacities in evaluating individual lifestyles against sustainability claims (Elmose & Roth, 2005; Klafki, 1998).

CSCT emphasizes the educational objectives formulated by (Klafki, 1998) in the concept of Allgemeinbildung, namely the ability to understand and change one's own life conditions, participate in collective decision-making, and show solidarity with individuals who do not have control over their life conditions. This approach does not simply add "adjectival education" such as environmental education or peace education, but offers a more comprehensive and holistic educational approach that is adapted to the complexity of sustainability (Wals, 2012).

The CSCT framework divides competencies into three main dimensions: teaching/communicating, reflection/vision, and networking, which encompass five domains: knowledge, systemic thinking, emotions, values and ethics, and action (Sleurs, 2008). Although these domains are designed to interact with each other, there are challenges in implementation, such as the teaching of the "emotion" domain which is contextual and difficult to measure formally (Bertschy et al., 2013). This complexity adds to the challenge of implementing these competencies into everyday teaching practice.

This model also views teachers as individuals with social responsibilities who serve as role models in society. However, the formation of personal behavior and public commitment related to sustainability cannot be fully part of the teacher professionalization process. Therefore, this responsibility cannot be fully assigned to teacher education institutions (Baumert & Kunter, 2013; NBPTS, 2017). In practice, CSCT recognizes that the designed competencies are unlikely to be fully realized in one individual, but must be understood as a collective result in the educational environment .

Although CSCT offers a comprehensive framework, there is still a need to clarify the core competencies that must be emphasized in teacher training, especially for planning and implementing concrete learning in the context of ESD. This clarity is important to ensure that teacher education and continuing professional development are designed consistently to build individual competencies that are in line with sustainability needs.

One of the main weaknesses of this model lies in the lack of clear operationalization of the emotional domain, which acts as a companion to all other domains (Bertschy et al., 2013). In addition, the process of teacher professionalization in the context of sustainability has not been fully integrated, requiring more attention in the design of more focused and applicable training (Corres et al., 2020).

== Insert Figure 1==

Teaching Dimensions

This study focuses on teachers, emphasizing mastery of competencies in teaching strategies as an important factor in improving learning effectiveness. Teacher competency is influenced by their beliefs, values, and mastery of pedagogy. For example, a teacher who believes that project-based learning is irrelevant to the curriculum may be reluctant to encourage students to participate in interactive activities that enrich the learning experience. Therefore, mastery of teaching strategies becomes an urgent need because it impacts student learning outcomes and the overall quality of teaching (Clark & Mayer, 2016; Mayer, 1989).

The importance of teaching competency is also supported by the results of a study by (Safran & Nasir, 2014), which showed that although the level of knowledge and readiness of Design and Technology teachers in Johor was at a high level, with an average score of more than 3.67 in design subjects, their teaching skills were at a low level, with an average score of less than 2.33. This finding highlights the need to develop teaching skills through more intensive and focused pedagogical training.

Teaching skills can be strengthened through various professional development programs, such as workshops, seminars, and the latest training. This training should include innovative teaching strategies, research-based pedagogy, and the use of educational technology. With this approach, teachers can be more inspired to create active and interactive learning experiences to motivate students and prepare them to face the challenges of the industrial era 4.0.

By building strong teaching strategy competencies, teachers increase teaching effectiveness and contribute to the formation of a generation of students who are adaptive and innovative in facing global changes. Focusing on teacher professional development is key to supporting relevant and sustainable education.

Networking Dimensions

According to (Ronchi, 2018), building networks with other partners inside and outside the school is an important element in creating a sustainable learning environment. This network supports learning through a spiral approach involving four main steps: vision, planning, action, and reflection. In the context of Education for Sustainable Development (ESD), which focuses on real-life issues, community involvement in the learning process is a primary need. This context opens up opportunities to create learning experiences that are contextual and relevant to local needs.

Effective networking also improves teachers' application competencies, especially in integrating sustainability-based learning into teaching practices. Therefore, developing networking competencies is essential. These competencies include cognitive abilities to understand and analyze issues, technological skills to support cross-institutional collaboration, emotional intelligence to establish constructive relationships, and concrete actions that translate learning outcomes into sustainability solutions.

By strengthening these competencies, teachers can facilitate more dynamic and interactive learning and create a broader social impact through collaboration with various stakeholders. This step supports teachers' professional development while strengthening their role as agents of change in sustainability-based education.

Reflecting Dimensions

(Cebrián & Junyent, 2015) explain in the CSCT Model that reflection on teacher actions, conscious direction of their own professional development, reflection on work attitudes, and reflection on educational concepts are characteristics of teacher professionalism. Teachers must be able to imagine alternative futures and create creative solutions, act as "agents of change," understand the practices and principles of sustainable development (SD), and know that SD requires critical thinking, reflection, and individual and social responsibility. In addition, teachers must be able to critically reflect on their own lifestyles and choices, explain their positions with civic courage, work in problem-based projects, face uncertainty, and be persistent in the face of counterarguments. Teachers must also be able to network to build teams and partnerships, share responsibility for the learning process with students, and think systemically.

In educational institutions, teachers are required to view action as an educational value, not just a way to solve problems. Teachers must be able to find opportunities for real-world-based learning processes, especially those relevant to actions towards sustainability. Teachers need to define topics that are relevant to students, society, and the curriculum, and break them down into concrete steps for action. In addition, they must also be able to describe conditions in society that can be the reason for action, as well as organize and facilitate actions both locally and globally, both as individuals, in small groups, and communities.

Teachers must also manage and accompany the participatory learning process, creating settings that allow students to explore different perspectives on SD, find diverse solutions, and identify the direct and indirect consequences of their decisions and actions. In addition, teachers need to create learning experiences that allow students to experience success and increase self-efficacy. They are also tasked with organizing comprehensive reflections by students on various possibilities for action and the process (meta-knowledge and meta-reflection), and facilitating a shared vision process as a basis for action towards sustainability, by encouraging critical thinking (Murga-Menoyo, 2014). Thus, teachers need to apply competencies in the cognitive, technological, emotional intelligence, and action domains to support the development of relevant teacher skills in the industrial era 4.0.

PROGRAM FOR INTERNATIONAL STUDENT ASSESSMENT (PISA)

The Program for International Student Assessment (PISA) is an international assessment study conducted by the OECD to evaluate education systems worldwide by measuring the academic performance of 15-year-old school students in mathematics, science, and reading literacy (OECD, 2024). PISA was first implemented in 2000 and is held every three years. The aim is to provide comparable data so that countries can improve their education policies and quality. This assessment program measures cognitive and problem-solving abilities (Berger, 2009).

PISA is within the framework of the international school study tradition, which has been carried out since the late 1950s by the International Association for the Evaluation of Educational Achievement (IEA). Most of the PISA methodology follows the Trends in International Mathematics and Science Study (TIMSS), which began in 1995 and was later heavily influenced by the United States' National Assessment of Educational Progress (NAEP). Progress inspires the PISA reading component in the International Reading Literacy Study (PIRLS). PISA aims to test students' literacy competencies in three areas: reading, mathematics, and science, on a defined scale (Hefling, 2013). PISA also assesses students in the area of innovation. In 2012 and 2015, students were tested in collaborative problem-solving in addition to reading, mathematics, and science. In 2018, the additional area of innovation was global competence.

DEVELOPMENT OF CSCT COMPETENCE MODEL IN INDONESIA

Increasing the competitiveness of national education is an important foundation in creating superior human resources (HR) (Sukoco, 2024). In this context, global education competitiveness, as measured by the Programme for International Student Assessment (PISA), depends on the ability of teachers to support the development of literacy, numeracy, and context-based problem-solving competencies. To achieve this goal, the application of the Curriculum, SD, Competences, Teacher Training (CSCT) Model is very relevant. This model offers a multidimensional framework that supports strengthening the role of teachers as individuals, institutional agents, and community members in sustainability-based education (CSCT Handbook, 2008).

The first dimension, teachers as individuals, focuses on developing self-reflection to understand personal strengths and weaknesses. This approach aims to build critical thinking, innovation, and decision-making competencies that support a more adaptive and effective learning process. The second dimension, teachers in institutions, strengthens team collaboration and sustainability-based curriculum development. In this case, teachers are encouraged to create a learning environment that is relevant to global challenges, such as the need for digital literacy and the integration of sustainability concepts in learning. The final dimension, teachers in society, emphasizes the importance of teacher engagement with the community to create meaningful contextual learning that is relevant to local needs and global challenges.

PISA measures students' abilities in reading, mathematics, and science with a context-based approach (OECD, 2021). The implementation of the CSCT Model supports the development of these competencies through a multidimensional approach that includes knowledge, systems thinking, values and ethics, and actions. Knowledge competencies enable teachers to understand and integrate sustainability concepts into the curriculum, so that students can understand the relationships between disciplines, as expected in the PISA assessment format. Systemic thinking skills help students see connections between concepts, while values and ethics shape social and environmental responsibility in the context of global learning. This approach enables students not only to master academic skills but also to understand the implications of sustainability in real life (Sukoco, 2024).

However, the implementation of the CSCT Model in Indonesia faces significant challenges. The disparity in educational resources between regions and the lack of ongoing training for teachers are major obstacles. Therefore, national programs such as Merdeka Belajar and the use of digital technology can be strategic solutions to expand access to training, increase collaboration between teachers, and accelerate the adoption of sustainability-based approaches throughout Indonesia (Kemendikbudristek, 2022).

Overall, the CSCT Model offers a strategic approach to improving the quality of teachers and students. By supporting teachers through personal reflection, collaboration within institutions, and community engagement, this model can strengthen the foundation of sustainability education in Indonesia. If implemented effectively, this model will not only improve Indonesia's position in PISA but also create superior human resources who are able to compete globally. Figure 2 below is a development model of the CSCT model for improving teacher competence in Indonesia.

== Insert Figure 2==

TEACHER TRAINING BASED ON INTEGRATION OF THE CSCT MODEL AND PISA FRAMEWORK

Teacher training based on the integration of the CSCT Model and PISA Framework is designed to provide specific skills that support teaching effectiveness, adaptability, and teachers' ability to facilitate student growth. In terms of pedagogy, this approach allows teachers to teach contextually, connecting academic content to real-world issues such as climate change, social justice, or environmental sustainability. With this support, teachers are able to develop competency-based lessons that are in line with global standards, such as literacy, numeracy, and science, which are the main focus of PISA.

Through the integration of the CSCT Model, this training strengthens teachers' reflective and adaptive skills. They are taught to self-reflect, evaluate teaching practices, and identify areas for improvement. Adaptation skills are also enhanced, for example, by adjusting

teaching strategies based on the diverse needs of students, including applying visual methods through direct experiments. An evidence-based approach supports teachers in solving classroom problems in a measurable way, such as designing learning solutions for students with academic disabilities.

From a collaboration and leadership perspective, this training equips teachers to work synergistically in designing curriculum, sharing best practices, and establishing partnerships with local stakeholders. For example, teachers are encouraged to involve the community in learning projects, such as school-based waste management initiatives. In addition, the training builds teachers' capacity as leaders of sustainable education, enabling them to lead programs such as recycling or resource conservation in school settings.

Cognitive and critical thinking skills are also a major focus. With the systemic approach of the CSCT Model, teachers are trained to understand the relationship between global and local phenomena, such as the impact of urbanization on ecosystems. Teachers then transfer these skills to their students, helping them evaluate evidence, construct logical arguments, and improve data literacy through graphic interpretation and trend analysis, as relevant in the PISA context-based assessment.

In addition, the training develops teachers' social-emotional skills, including empathy, conflict resolution, and cultural competence. These skills enable teachers to create inclusive learning spaces and support students' well-being, such as helping them manage academic stress or build resilience when facing challenges. With strong social-emotional skills, teachers can strengthen the connection between students and education, creating a generation that is more globally competitive and empowered to face the world's challenges.

The integration of the CSCT Model and PISA Framework in teacher training is not only relevant for improving the quality of teaching, but also makes a major contribution to building a sustainable and competency-based education system. Through this approach, teachers not only become learning facilitators, but also agents of change who encourage educational transformation in accordance with the needs of the global era. Table 1 below describes the competencies expected from a training design based on the integration of CSCT and PISA Models.

== Insert Table 1==

IMPLEMENTATION OF TRAINING DESIGN IN THE NOBLE TEACHER PROGRAM

The initial stage in implementing the Noble Teacher program is identifying specific teacher competency needs. This step is carried out based on the CSCT Model, and PISA Framework approaches to understand the main competencies that need to be developed. The CSCT Model emphasizes the importance of integrating sustainability in teaching, which includes knowledge, systemic thinking, values, and action competencies (CSCT Handbook, 2008). Meanwhile, the PISA Framework focuses on developing literacy, numeracy, and critical thinking skills in a global context (OECD, 2021). Identification was carried out through Focus Group Discussions (FGD) involving 20 educator competency development experts. This approach is in line with research showing that FGD is an effective method for gaining in-depth perspectives from experts (Krueger & Casey, 2015). This discussion resulted in formulating an integrated model for teacher competency development and training design that includes a training framework for training output targets (see Figure 2 and Table 1).

Once specific needs were identified, the program continued with an implementation phase, including workshops and mentoring sessions. The workshops were designed to improve teacher competency in pedagogical skills, social-emotional skills, critical thinking skills, and the use of

technology in learning. Research by (Darling-Hammond et al., 2017) showed that workshop-based training that focused on practice positively improved teacher skills. In addition, mentoring sessions supported the practical application of these skills in everyday teaching, ensuring successful knowledge transfer. Mentoring is effective in building teacher confidence and supporting the implementation of new teaching strategies (Hobson et al., 2009). At this stage, 50 high school teachers from various public and private schools in Surabaya participated in the training, reflecting a collaborative approach between institutions.

The next stage is evaluating and measuring the success of the program. Formative evaluation is conducted during the program implementation to identify strengths and weaknesses, while summative evaluation is conducted after the program is completed. Formative evaluation helps directly improve the program's implementation (Black & Wiliam, 2009). The summative evaluation assesses the impact of training on improving teacher competency using quantitative approaches such as analyzing student test scores, academic achievement, or other performance indicators (Guskey, 2002). Pre-test and post-test analyses compare data before and after training, effectively evaluating teacher training (Kirkpatrick & Kirkpatrick, 2016).

To ensure the sustainability of the program, a follow-up plan is prepared as an integral part of the implementation. This plan includes further training, ongoing mentoring programs, and the development of innovative learning resources to support future teaching. With these steps, it is hoped that the Guru Mulia program will be able to have a significant impact on improving the quality of education in Indonesia, so that teachers can be better prepared to develop students' potential optimally.

A follow-up plan is prepared for the program's sustainability as an integral part of the implementation. This plan includes further training, ongoing mentoring programs, and the development of innovative learning resources to support future teaching. A study by (Fullan, 2007) emphasized the importance of sustainability in educational initiatives to ensure long-term impact. In addition, the development of technology-based learning resources can provide additional support for teachers in facing the ever-evolving challenges of teaching (Mishra & Koehler, 2006). With these steps, the Guru Mulia program is expected to significantly improve the quality of education in Indonesia so that teachers can be better prepared to develop students' potential optimally.

== Insert Figure 3==

CONCLUSION

The Noble Teacher Program offers an innovative approach to improving teacher competency by integrating the CSCT Model and the PISA Framework. This combination emphasizes sustainability and global education standards, which are relevant to facing the challenges of 21st-century education. The uniqueness of this program lies in the multidimensional training model that highlights personal reflection, institutional collaboration, and community engagement as key strategies to develop teachers' pedagogical, reflective, social-emotional, and technological competencies.

This approach demonstrates its effectiveness through intensive community engagement. In its implementation, the program involved 20 experts in Focus Group Discussions (FGDs) and invited 50 high school teachers to participate in collaborative workshops and mentoring sessions. Direct participation from educators and stakeholders ensures that the training design is contextually relevant and responsive to local needs. Thus, the program creates a sustainable learning environment aligned with local challenges and global aspirations.

For the community, this program significantly improves the quality of education in Indonesia. By strengthening teachers' skills in pedagogy, critical thinking, and technology

integration, the program prepares them to build essential student competencies in facing the challenges of the 21st century. In addition, the focus on sustainability in this program also supports broader social goals, such as increasing environmental awareness and social responsibility among students. Theoretically, this study contributes to developing existing literature by refining the CSCT Model to be more applicable in the Indonesian context. By integrating global assessment standards such as PISA, this study enriches the theoretical discussion on how sustainability principles can be linked to competency-based education. This locally relevant framework can be replicated in other regions, offering practical guidance for teacher training in various educational contexts.

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