

Enhancing the Safety and Participation of Students with Disabilities through Inclusive Engineering Education, Educational Cluster Technology, and Sustainable Development Goals Integration

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Abstract—The purpose of this study was to develop and evaluate a model for improving the safety and participation of students with disabilities through inclusive engineering education, educational cluster technology, psychological support, and Sustainable Development Goals (SDGs) integration. We used a mixed-methods design that combined literature analysis, observation, interviews, and a pedagogical experiment (1,238 students, with 633 in the experimental group and 605 in the control group). Social safety was assessed before and after the intervention using high, average, and low categories. Quantitative and qualitative analyses resulted in improved social safety in the experimental group, including higher proportions at high and average levels and fewer students at the low level. The term “Diffuse Inclusive” approach integrates pedagogical, psychological, socio-cultural, and family support to strengthen adaptation, participation, and psychological safety within inclusive engineering education aligned with SDG 4.

Keywords—educational cluster technology; engineering education; inclusive engineering education; psychological safety; students with disabilities; sustainable development goals.

I. INTRODUCTION

Inclusive engineering education needs more than physical access to learning environments. It also requires psychological safety, active participation, adaptive pedagogy, and coordinated support for responding to diverse learning needs. For students with special needs or disabilities, inclusive education, especially in engineering, should reduce barriers to participation while they are provided flexible instructional and social environments that support technical learning (Ainscow & Miles, 2009; Florian, 2014). Recent studies also emphasized the importance of digital accessibility, inclusive design, communication development, and community-based support as important

components of effective inclusion (Gil Jr., 2025; Faddillah et al., 2022; Musayroh et al., 2023; Adesokan & Bojuwoye, 2023; Glushchenko, 2025; Fakhridinovna, 2025).

Psychological safety is equally important in inclusive engineering education because students are more likely to participate, interact, and adapt when they experience stability, acceptance, and reduced fear of discrimination or failure. Psychological safety supports resilience, communication, and social participation and therefore represents an important condition for effective participation in engineering learning environments (Edmondson, 1999; Nazarova, 2018). At the same time, inclusive engineering pedagogy requires educators to adapt instruction, differentiate support, and respond to diverse learner characteristics (Florian & Black-Hawkins, 2011; Santos et al., 2021).

Educational cluster systems provide a potential mechanism to coordinate these demands within engineering education. Cluster-based approaches can connect educational institutions, families, educators, specialists, and support services within a structured network. Such coordination can facilitate resource sharing, differentiated instruction, psychological support, and ongoing tracking of students' development (Porter & AuCoin, 2012; Gentry & Mann, 2008). In this context, educational clustering can be conceptualized as a system-oriented technology that manages relationships between stakeholders and creates more coherent support structures for students with disabilities engaging in technical and engineering learning.

However, previous studies have generally considered inclusive pedagogy, psychological safety, educator preparedness, cluster organization, and sustainable education as separate domains. There has been little consideration given to an integrated model that simultaneously encompasses pedagogical support,

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psychological support, socio-cultural interaction, family involvement, and educational cluster technology for the improvement of safety and participation of students with disabilities in engineering education. This fragmentation calls for a coordinated framework that links pedagogical, psychological, organizational, and technical support within the same inclusive engineering learning environment.

The relevance of this study is particularly high because students with disabilities may experience multiple and interrelated barriers such as limited accessibility, psychological stress, social exclusion, lack of coordination between stakeholders, and insufficiently adaptive teaching practices. Addressing only one of these barriers may not be sufficient. A system-based approach is thus needed to coordinate pedagogical, psychological, family, institutional, and accessibility-related support while enabling ongoing adaptation to students' needs. Such coordination is particularly relevant to engineering education, where participation often depends on access to technical learning activities, structured environments, and appropriate support systems.

Technology-supported and system-oriented inclusive engineering education is also relevant to sustainable development. SDG 4 emphasizes inclusive and equitable quality education, while broader SDG-oriented educational frameworks highlight the importance of accessibility, resilience, social participation, and long-term educational inclusion (Al-Zahrani & Bello, 2026; Daud, 2026; Chano et al., 2025; Lhawon, 2025; Awalussillmi et al., 2023). Thus, a safe and coordinated engineering education system should support not only immediate learning participation but also sustainable social integration, accessibility, and well-being.

Therefore, this study aims to develop and evaluate an integrated model for enhancing the safety and participation of students with disabilities within an educational cluster system relevant to inclusive engineering education. Specifically, the study aims to: (1) identify the main technical, pedagogical, psychological, socio-cultural, and motivational components of inclusive safety; (2) implement the "Diffuse Inclusive" approach within a coordinated educational cluster; (3) compare changes in high, average, and low levels of social safety between experimental and control groups; and (4) examine the implications of the model for adaptive, inclusive, and sustainable engineering education. Unlike the approaches that treat these components separately, the novelty of this study is that it combines inclusive pedagogy, psychological and socio-cultural support, family involvement, structured educational cluster technology, and the "Diffuse Inclusive" approach in one safety-oriented framework. The proposed model emphasizes the need for coordinated interaction, continuous adaptation, and system-level support of long-term safety and participation of students with disabilities in engineering education.

II. LITERATURE REVIEW

A. Inclusive Engineering Education and Student Safety

Inclusive engineering education requires learning environments that provide not only access but also meaningful participation, equitable support, and protection from physical, psychological, and social barriers, in which inclusive engineering education systems should respond flexibly to differences in students' abilities and learning needs while ensuring that students with disabilities can participate actively in technical and engineering learning activities (Ainscow & Miles, 2009; Florian, 2014). Effective inclusion involves accessibility, appropriate learning design, communication support, and coordinated services. Community-based approaches, inclusive learning materials, and accessible learning environments can strengthen participation among students with special educational needs (Gil Jr., 2025; Faddillah et al., 2022; Musayaro et al., 2023). However, barriers related to educator preparedness, institutional capacity, and inconsistent inclusive practices continue to affect implementation (Adesokan & Bojuwoye, 2023; Fakhridinovna, 2025). Within engineering education, these challenges are particularly important because participation may also depend on access to technical activities, structured learning environments, and appropriate support systems.

B. Psychological and Social Safety

Psychological safety is an important component of inclusive engineering education because students require an environment in which they can participate, communicate, and learn without excessive fear, anxiety, discrimination, or social exclusion. Psychological safety can support emotional stability, resilience, interpersonal interaction, and willingness to participate in learning activities (Edmondson, 1999; Nazarova, 2018).

For students with disabilities, safety should therefore be considered multidimensional. It includes accessible physical conditions, emotional stability, supportive relationships, social acceptance, and opportunities for meaningful participation. In engineering education, these conditions can support students' participation in technical learning activities and collaborative problem-solving environments. Improving student safety requires coordinated pedagogical and psychological support rather than isolated interventions.

C. Educational Cluster Technology in Engineering Education

Educational cluster models provide an organizational mechanism for coordinating institutions, educators, families, specialists, and other educational stakeholders. Cluster-based structures can facilitate resource sharing, differentiated support, communication among stakeholders, and continuity between educational services (Porter & AuCoin, 2012; Gentry & Mann, 2008). Within inclusive engineering education, educational cluster technology can function as a system-oriented framework that connects

pedagogical activities with psychological, social, technical, and family support. Such coordination is particularly important for students with disabilities because their learning needs may involve multiple stakeholders and require continuous adjustment rather than a single instructional intervention. Educational clusters can therefore provide a coordinated structure for supporting access, participation, and safety in engineering learning environments.

D. Inclusive Engineering Pedagogy and Educator Preparedness

Inclusive engineering pedagogy emphasizes teaching approaches that respond to learner diversity without unnecessarily separating students according to ability or disability. Effective inclusive teaching requires flexibility, differentiated learning opportunities, and appropriate professional preparation (Florian & Black-Hawkins, 2011). Educator preparedness is therefore central to the safety and effectiveness of inclusive engineering education environments. In engineering education, it also includes providing for accessible participation in technical and problem-solving activities. Educators must be able to identify diverse learner needs, adapt learning activities, cooperate with families and specialists, and respond appropriately to psychological and social challenges. Insufficient preparation can reduce the effectiveness of otherwise well-designed inclusive systems (Santos et al., 2021).

E. Inclusive Engineering Education and Sustainable Development

Inclusive engineering education is closely related to the Sustainable Development Goals (SDGs), particularly SDG 4 on inclusive and equitable quality education. Sustainable engineering education requires long-term participation, accessibility, resilience, social integration, and opportunities for learners from diverse backgrounds. Studies have linked inclusive educational practice with educator development, resilience, multicultural participation, and sustainable community development (Al-Zahrani & Bello, 2026; Daud, 2026; Chano et al., 2025; Lhawon, 2025).

Accordingly, the safety and participation of students with disabilities should be considered important components of sustainable engineering education. A system that improves accessibility but does not provide psychological stability, social participation, and coordinated support may not achieve sustainable inclusion. Inclusive engineering

education therefore requires the integration of accessibility, adaptive pedagogy, psychological support, and institutional coordination to support long-term participation.

F. Research Gap

Previous studies have addressed inclusive pedagogy, psychological safety, educator preparedness, educational clustering, accessibility, and sustainable education from different perspectives (Ainscow & Miles, 2009; Florian, 2014; Porter & AuCoin, 2012; Edmondson, 1999; Nazarova, 2018; Florian & Black-Hawkins, 2011; Santos et al., 2021). However, these dimensions have generally been examined separately, and limited attention has been given to their integration within inclusive engineering education.

Limited attention has also been given to an integrated framework that combines pedagogical, psychological, socio-cultural, family-support, technical, and educational cluster components to improve the safety and participation of students with disabilities in engineering learning environments. In particular, the relationship between system-based educational coordination and changes in students' social safety remains insufficiently addressed. Indeed, this study adds new information regarding SDGs, as reported elsewhere (Fiandini et al., 2025).

Table I summarizes the principal areas of previous research and the specific gaps addressed in the present study. An integrated approach is needed to connect engineering pedagogy, psychological safety, socio-cultural interaction, family involvement, educational cluster technology, accessibility, and sustainability within a single framework. The present study addresses this gap through the "Diffuse Inclusive" approach as a coordinated model relevant to inclusive engineering education.

III. METHODOLOGY

A. Research Design

We employed a mixed-method design combining literature analysis, observation, interviews, and pedagogical experimentation. The mixed-method design was used to integrate qualitative information concerning pedagogical, psychological, socio-cultural, and stakeholder interactions with quantitative evidence of changes in students' social safety. This combination is appropriate for examining inclusive educational environments in which measurable outcomes and contextual educational processes must be considered together.

TABLE I
SUMMARY OF PREVIOUS RESEARCH AREAS AND IDENTIFIED RESEARCH GAPS.

Research area	Main contribution	Limitation identified	Gap addressed in this study
Inclusive engineering education	Promotes access, participation, and equitable learning	Often focuses broadly on inclusion	Integration of inclusion with an explicit student-safety framework
Psychological safety	Supports stability, participation, and interpersonal interaction	Frequently studied separately from educational organization	Connection of psychological safety with cluster-based educational support
Educational clustering	Coordinates institutions, resources, and stakeholders	Limited emphasis on safety of students with disabilities	Application of cluster technology to inclusive safety

Inclusive engineering pedagogy	Provides flexible and differentiated teaching	Depends strongly on teacher preparedness	Integration with psychological, family, and institutional support
Family and socio-cultural support	Strengthens participation and social adaptation	Often treated as supplementary support	Inclusion as a core component of the safety model
Sustainable engineering education	Promotes long-term inclusive and equitable education	Commonly discussed at policy level	Operational linkage among safety, inclusion, cluster systems, and SDGs

B. Participants and Sample Characteristics

The pedagogical experiment involved 1,238 students with disabilities. The experimental group consisted of 633 students, while the control group consisted of 605 students. The same groups were evaluated at the beginning and end of the study, allowing changes in high, average, and low levels of social safety to be compared over time. The available source manuscript reports the group sizes and the pre-post structure of the experiment but does not specify the exact participant-selection or group-allocation technique. Therefore, no unsupported sampling method, such as random, purposive, or convenience sampling, was introduced in the revised manuscript. Data were also collected from teachers and parents to provide additional information on the educational and socio-psychological conditions surrounding the students.

C. Research Components and Indicators

The evaluation framework incorporated pedagogical, psychological, socio-cultural, technical, and motivational dimensions of inclusive safety. Social safety was classified into three levels (high, average, and low), which were used as the principal quantitative outcome categories in the pedagogical experiment. Qualitative information from observations and interviews was used to examine supporting conditions such as psychological stability, social interaction, family involvement, pedagogical coordination, accessibility, and adaptive educational practices. These dimensions were interpreted together with the quantitative distribution of social-safety levels.

D. Experimental Procedure

The experimental procedure was implemented through the “Diffuse Inclusive” approach within the educational cluster system. The intervention integrated pedagogical, psychological, socio-cultural, family-support, and organizational components to establish coordinated and adaptive support for students with disabilities. This study on diffusion has a correlation with previous reports (Nandiyanto et al., 2018; Nandiyanto et al., 2022; Nandiyanto et al., 2023a; Nandiyanto et al., 2023b; Nandiyanto et al., 2025).

Figure 1 illustrates the implementation mechanism of the “Diffuse Inclusive” approach. The model emphasizes interaction among students with disabilities, other students, teachers, families, and educational stakeholders within a shared inclusive environment. As shown in Figure 1, the approach is based on continuous interaction rather than separation of students according to disability status. The educational cluster provides the organizational structure for coordinating learning activities, peer interaction, pedagogical support, and broader stakeholder involvement. The experimental and control groups were assessed at the beginning and end of the study. Changes in the distributions of high, average, and low levels of social safety were then compared to evaluate whether the cluster-based “Diffuse Inclusive” approach was associated with improved student safety and social adaptation.

E. Data Collection

Data were collected through observation, interviews, and pedagogical evaluation involving students, teachers, and parents. Student-level quantitative data focused on the distribution of social-safety levels at the beginning and end of the pedagogical experiment. Qualitative observations and interviews provided contextual information regarding adaptive learning practices, psychological conditions, family participation, teacher coordination, peer interaction, and socio-cultural support within the inclusive educational environment.

F. Data Analysis

Quantitative data were analysed using frequency and percentage distributions for students classified at high, average, and low levels of social safety. The distributions were calculated separately for the experimental and control groups at the beginning and end of the pedagogical experiment. A descriptive pre-post comparative analysis was then conducted to examine changes within each group and differences in the pattern of change between the experimental and control groups. Particular attention was given to shifts from the low category toward the average and high categories as indicators of improved social safety and adaptation.

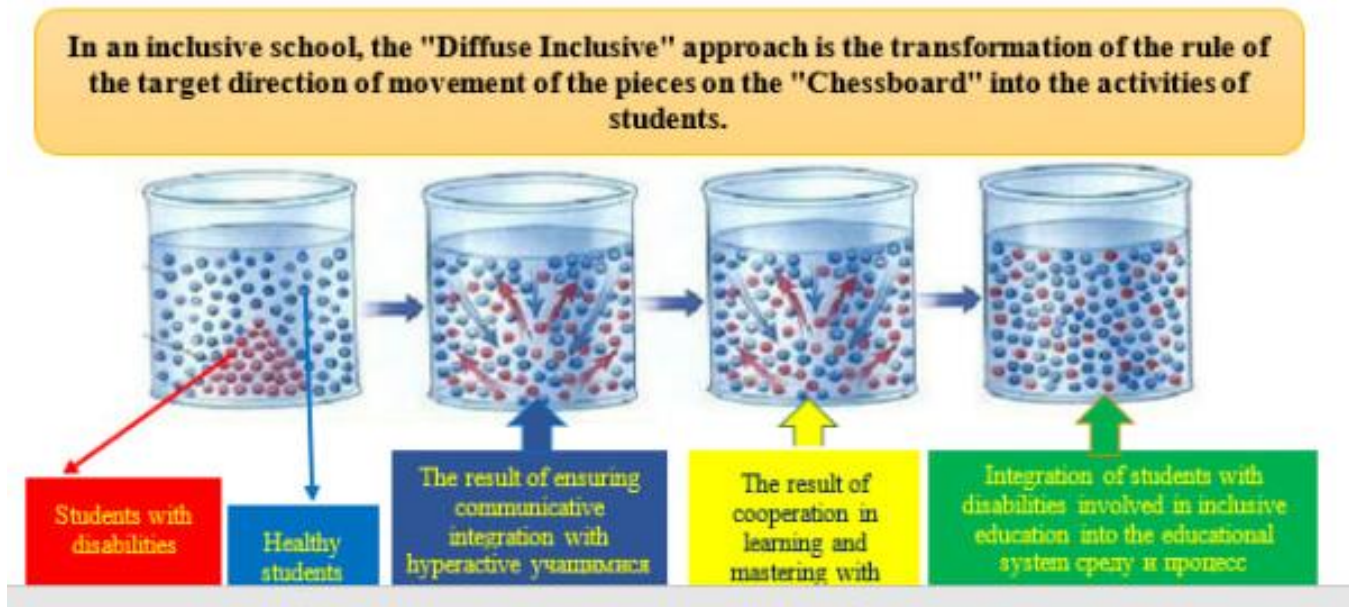


Fig. 1. Mechanism for implementing the "Diffuse Inclusive" approach for inclusive engineering education.

Qualitative information obtained through observations and interviews was used to support interpretation of the quantitative patterns, particularly with respect to pedagogical coordination, psychological stability, family involvement, adaptive support, and socio-cultural interaction within the educational cluster system. Because the source dataset does not report an inferential statistical test, the quantitative analysis was limited to frequencies, percentages, and descriptive pre-post comparisons. No unsupported statistical significance test was introduced in the revised manuscript.

IV. RESULTS AND DISCUSSION

A. Components of the Inclusive Safety Model

The proposed model integrates technical, pedagogical, psychological, socio-cultural, and motivational dimensions to support the safety of students with disabilities. These components are mutually complementary requirements, because inclusive safety cannot be achieved by only physical accessibility or instructional modification (Table II shows the components of the inclusive safety model and their respective functions). The model combines environmental, instructional, psychological and social dimensions. Technical factors provide accessible conditions, pedagogical factors address learning content and instructional processes, Psychological factors emphasize mental stability and anxiety prevention, socio-cultural factors address discrimination and

collaboration among students, teachers and families. Motivational factors complement these dimensions by encouraging responsibility and cooperative learning.

This multidimensional structure is aligned with the principle that Inclusive education is about participation and responsiveness to learner diversity and not merely placement in mainstream educational institutions (Ainscow & Miles, 2009; Florian, 2014). Psychological safety is also crucial as students need supportive environments to facilitate interaction, participation, and stability (Edmondson, 1999; Nazarova, 2018).

B. Educational Technologies Supporting Inclusive Safety

The application of the inclusive safety model implies the existence of organizational mechanisms for the coordination of its various components. Table III lists the educational technologies used to support inclusive safety within the cluster system. Cluster technology functions as an organizational system, not as an isolated teaching instrument. The structural basis for the implementation of adaptive pedagogical practices is provided through the coordination between institutions, families, teachers, and support services. This is consistent with cluster-based approaches, which stress coordination and differentiation in educational environments (Porter & AuCoin, 2012; Gentry & Mann, 2008).

TABLE II
COMPONENTS OF THE INCLUSIVE SAFETY MODEL.

Component	Description
Technical factors	Accessibility, mobility, and inclusive infrastructure
Pedagogical factors	Inclusive teaching content, safety knowledge, and interdisciplinary learning
Psychological factors	Mental stability, stress resistance, and prevention of anxiety
Socio-cultural factors	Reduction of discrimination, collaboration among teachers, parents, and students
Motivational factors	Development of curiosity, social responsibility, and cooperative learning

TABLE III
EDUCATIONAL TECHNOLOGIES SUPPORTING INCLUSIVE SAFETY IN CLUSTER SYSTEMS.

Technology Type	Function	Application in Inclusive Education
Cluster system technology	Coordination of institutions and resources	Integration of schools, families, and support services
Pedagogical technology	Adaptive teaching and learning strategies	Differentiated instruction and inclusive curriculum
Monitoring and evaluation systems	Tracking student development and safety	Continuous assessment of psychological and social conditions
Support service systems	Coordination of psychological and social support	Collaboration between teachers, parents, and specialists
Learning environment design	Structuring safe and accessible spaces	Inclusive classrooms and barrier-free infrastructure

Pedagogical technology offers differentiated teaching and learning strategies, monitoring systems provide continuous assessment of the psychological and social condition of learners, support-service systems connect teachers, parents and specialists, learning-environment design considers accessibility and barrier-free participation. These technologies form a coordinated system in which educational, psychological and social support can work simultaneously.

C. Changes in Students' Social Safety

The effectiveness of the proposed approach was descriptively evaluated by comparing the distribution of high, average, and low social-safety levels at the beginning and end of the study in the experimental and control groups. Table IV presents the complete results of this comparison, in which the experimental group showed a substantial descriptive shift toward higher levels of social safety. The proportion classified at the high level increased from 17.4% at the beginning to 28.6% at the end, representing an increase of 11.2 percentage points. The average category increased from 27.6% to 50.2%, while the low category decreased markedly from 55.0% to 21.2%.

In contrast, changes in the control group were comparatively small. The high category increased from 16.5% to 18.0%, the average category from 27.4% to 28.6%, and the low category decreased only from 56.0% to 53.4%. Thus, the descriptive pre-post pattern was substantially more pronounced in the experimental group than in the control group.

These findings should be interpreted as descriptive evidence because the available dataset does not report an inferential statistical test. Accordingly, the differences are not described as statistically significant. Rather, implementation of the cluster-based approach was associated with a more favorable pattern of change in social safety among the experimental-group students.

The observed improvement can be understood in relation to the coordinated interaction of pedagogical, psychological, and socio-cultural components within the cluster system. Structured support, adaptive learning practices, and socio-

psychological activities can provide conditions that strengthen resilience, emotional stability, and social adaptation. This interpretation is in line with previous literature emphasizing psychological safety and supportive inclusive environments (Edmondson, 1999; Nazarova, 2018).

D. Mechanism of the "Diffuse Inclusive" Approach

As previously illustrated in Figure 1, the "Diffuse Inclusive" approach emphasizes interaction among students with disabilities, other students, teachers, families, and supporting stakeholders rather than the isolation of students according to disability status. The mechanism creates a dynamic environment in which educational and social interactions are continuously reorganized according to learner needs.

The approach is particularly relevant to inclusive pedagogy because effective inclusion requires flexibility and responsiveness to learner diversity (Florian & Black-Hawkins, 2011). Teacher preparedness is also essential for coordinating adaptive instruction and support within such environments (Santos et al., 2021).

When the mechanism (see Figure 1) is considered together with the descriptive changes (see Table IV), the proposed model operates through coordinated rather than isolated support. Several factors (pedagogical adaptation, psychological support, peer interaction, family involvement, and institutional coordination) collectively provide the conditions associated with improvements in students' social-safety profiles.

E. Integration of Pedagogical, Psychological, and Socio-Cultural Support

Student safety in inclusive engineering education is multidimensional. Accessibility alone does not ensure psychological stability or social participation, while pedagogical adaptation without stakeholder coordination may provide only partial support. The proposed cluster framework therefore combines technical accessibility, pedagogical adaptation, psychological support, socio-cultural interaction, and motivation.

TABLE IV
RESULTS OF PEDAGOGICAL EXPERIMENTAL WORK.

Level of Social Safety	Experimental Group (Beginning)	Experimental Group (End)	Control Group (Beginning)	Control Group (End)
High	110 (17.4%)	181 (28.6%)	100 (16.5%)	109 (18.0%)
Average	175 (27.6%)	318 (50.2%)	166 (27.4%)	173 (28.6%)
Low	348 (55.0%)	134 (21.2%)	339 (56.0%)	323 (53.4%)
Total	633 (100%)	633 (100%)	605 (100%)	605 (100%)

Family involvement is particularly relevant because student safety extends beyond classroom interaction. Coordination between teachers, parents, specialists, and educational institutions can facilitate continuity of support and provide a more comprehensive understanding of students' needs. Similarly, peer interaction can reduce social separation and strengthen participation within inclusive environments.

The qualitative information obtained through observations and interviews was used to support interpretation of these mechanisms rather than as an independent quantitative outcome. In combination with the pre-post distributions in Table IV, these observations provide contextual support for understanding how coordinated educational practices may contribute to the observed changes in social safety.

F. Implications for Sustainable Development Goals

The proposed model is mainly linked to SDG 4 (Quality Education) since it emphasizes inclusive participation, adaptive educational support, and equitable learning opportunities for students with disabilities. Inclusive education (promotes accessibility, psychological well-being, resilience, and participation) is consistent with broader sustainable educational objectives (Al-Zahrani & Bello, 2026; Daud, 2026; Chano et al., 2025; Lhawon, 2025).

The educational cluster also offers a way of sustaining inclusive practices via institutional coordination rather than a dependency on one teacher or intervention. The framework shares accountability among schools, families, specialists, and support services; this system-oriented structure has the potential to reinforce continuity and resilience in inclusive education.

Sustainable inclusive education requires the coordinated development of accessibility, pedagogical adaptation, psychological safety, social participation, family involvement, and institutional support. The descriptive improvement observed in the experimental group provides evidence that these dimensions can be integrated within a cluster-based educational system. However, because the present analysis is descriptive, further studies using inferential statistics and clearly documented participant-selection procedures are needed to establish the magnitude and generalizability of the intervention effects.

The proposed inclusive safety framework also has broader implications for the SDGs. In particular, the integration of educational accessibility, psychological safety, adaptive pedagogy, family involvement, and institutional coordination directly supports SDG 4 (Quality Education) by promoting inclusive and equitable learning opportunities for students with disabilities. The framework also emphasizes resilience, social participation, and long-term educational inclusion, which are important dimensions of sustainable educational development (Al-Zahrani & Bello, 2026; Daud, 2026; Chano et al., 2025; Lhawon, 2025). From this perspective, the "Diffuse Inclusive" approach extends beyond improving immediate educational participation by establishing a coordinated support system in which schools, families, teachers, specialists, and students

collectively contribute to a safer and more sustainable inclusive learning environment. Thus, strengthening the safety of students with disabilities should be considered not only an inclusive education objective but also an important component of achieving sustainable and equitable education in accordance with the SDGs.

CONCLUSION

We demonstrate the potential of an integrated educational cluster system and the term "Diffuse Inclusive" approach for enhancing safety and social adaptation among students with disabilities. Descriptive pre-post analysis showed a shift in the experimental group from low toward average and high levels of social safety. At the same time, changes in the control group were comparatively limited. The results show the importance of integrating pedagogical adaptation, psychological support, socio-cultural interaction, family involvement, accessibility, and institutional coordination. The proposed framework also promotes collective participation among schools, families, teachers, specialists, and students in creating safer and more adaptive learning environments. This study supports SDGs, particularly SDG4, by improving inclusive and equitable participation in education. Further studies are recommended using inferential statistics and documented sampling procedures to confirm the observed effects and generalizability.

REFERENCES

- Adesokan, A., & Bojuwoye, O. (2023). Challenges and strategies in teaching learners with visual impairments. *ASEAN Journal of Community and Special Needs Education*, 2(2), 91–100.
- Ainscow, M., & Miles, S. (2009). Developing inclusive education systems: How can we move policies forward? *Prospects*, 38(1), 15–34.
- Al-Zahrani, A. H., & Bello, Y. A. (2026). Culturally responsive professionalism in early childhood education: Advancing sustainable development goals (SDGs) through educator development and inclusive practice. *ASEAN Journal of Community and Special Needs Education*, 5(1), 59–68.
- Chano, J., Nursalam, N., & Darmawan, D. (2025). Sustainable development goals (SDGs) and transformational leadership in higher education: A framework for resilience and inclusivity. *ASEAN Journal of Educational Research and Technology*, 4(2), 225–234.
- Daud, S. (2026). Multicultural early childhood education in global community: Integrating cultural competence, inclusive practice, and sustainable development goals (SDGs). *ASEAN Journal of Community Service and Education*, 5(1), 23–30.
- Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, 44(2), 350–383.
- Faddillah, N. A., Nandiyanto, A. B. D., & Bilad, M. R. (2022). Literacy program for elementary school students about inclusive education in recognizing

- children with special needs. *ASEAN Journal of Community and Special Needs Education*, 1(1), 1–8.
- Fakhriddinovna, M. M. (2025). Educational equality for children with special needs: Challenges and solutions. *ASEAN Journal of Community and Special Needs Education*, 4(2), 141–146.
- Fiandini, M., Mukhamedov, G. I., Khimmataliev, D. O., & Nandiyanto, A. B. D. (2025). Advancing sustainability and green engineering in mechanical engineering education: Concepts, research trends, challenges, and implementation strategies. *ASEAN Journal for Science and Engineering in Materials*, 4(2), 169–224.
- Florian, L. (2014). What counts as evidence of inclusive education? *European Journal of Special Needs Education*, 29(3), 286–294.
- Florian, L., & Black-Hawkins, K. (2011). Exploring inclusive pedagogy. *British Educational Research Journal*, 37(5), 813–828.
- Gentry, M., & Mann, R. L. (2008). Total school cluster grouping: A comprehensive, research-based plan for raising student achievement and improving teacher practices. *Gifted Child Quarterly*, 52(3), 239–253.
- Gil Jr., J. M. (2025). Communication skill intervention: Empowering elementary students with special needs. *ASEAN Journal of Community and Special Needs Education*, 4(1), 61–68.
- Glushchenko, V. V. (2025). A conceptual approach to teaching inclusive design in the interests of ensuring the sustainable development of the global socio-technological system. *ASEAN Journal of Community and Special Needs Education*, 4(2), 131–140.
- Lhawon, P. (2025). Promoting sustainable development goals (SDGs) through community engagement: Enhancing quality education through extracurricular activities. *ASEAN Journal of Community Service and Education*, 4(2), 143–150.
- Musayaroh, S., Saputra, A. A., Puspitasari, D., Sutrisno, E., Adityas, M. T., & Nandiyanto, A. B. D. (2023). Making a website-based application “Hay Special Sweet” for special needs children in the “Rumah Indira” special needs children community. *ASEAN Journal of Community and Special Needs Education*, 2(1), 1–12.
- Nandiyanto, A. B. D., Asyahidda, F. N., Danuwijaya, A. A., Abdullah, A. G., Amelia, N. I. A., Hudha, M. N., & Aziz, M. (2018). Teaching “nanotechnology” for elementary students with deaf and hard of hearing. *Journal of Engineering Science and Technology*, 13(5), 1352–1363.
- Nandiyanto, A. B. D., Che Sidik, N. A., Kurniawan, T., Bilad, M. R., Gandidi, I. M., Sukrawan, Y., & Mahmudatussa’adah, A. (2025). How to understand fluid mechanics in chemical engineering: Principles, applications, research trends, and bibliometric insights. *Journal of Advanced Research in Fluid Mechanics and Thermal Sciences*, 131(1), 96–131.
- Nandiyanto, A. B. D., Hofifah, S. N., Girsang, G. C. S., Trianadewi, D., Ainisyifa, Z. N., Siswanto, A., Putri, S. R., Anggraeni, S., Maryanti, R., & Muslimin, Z. (2022). Distance learning innovation in teaching chemistry in vocational school using the concept of isotherm adsorption of carbon microparticles. *Journal of Technical Education and Training*, 14(1), 14–26.
- Nandiyanto, A. B. D., Ragadhita, R., & Aziz, M. (2023a). Involving particle technology in computational fluid dynamics research: A bibliometric analysis. *CFD Letters*, 15(11), 92–109.
- Nandiyanto, A. B. D., Ragadhita, R., Setiyo, M., Al Obaidi, A. S. M., & Hidayat, A. (2023b). Particulate matter emission from combustion and non-combustion automotive engine process: Review and computational bibliometric analysis on its source, sizes, and health and lung impact. *Automotive Experiences*, 6(3), 599–623.
- Nazarova, N. M. (2018). Inclusive education and psychological safety of students. *Psychology in Russia: State of the Art*, 11(3), 75–87.
- Porter, G. L., & AuCoin, A. (2012). Strengthening inclusion, strengthening schools. *Exceptionality Education International*, 22(2), 2–17.
- Ragadhita, R., Nandiyanto, A. B. D., & Mudzakir, A. (2025). Particle technology in catalyst design for water treatment application: Review and bibliometric analysis. *SciEnggJ*, 18, 170–187.
- Santos, A., Mota, P., & Silva, R. (2021). Teacher preparedness for inclusive education: Challenges and perspectives. *International Journal of Inclusive Education*, 25(4), 489–506.