# A Systematic Review on Integrating Transversal Competencies in Education: Successes and Struggles

[1] Joseph Aaron V. Urlanda, [2] Rita D. Alarcon, [3] Joseph D. Modilla, [4] Mary Rose S. Modilla, [5] Dariel Palmiano

[1]PhD-DEVED Student, [2]Assistant Professor II, [3]Instructor I, [4]Teacher III, [5]Professor VI

[1]Graduate School,

[1]Central Bicol State University of Agriculture- Pili, Camarines Sur, Philippines

[1]jvurlanda@upd.edu.ph, [2]rita.alarcon@cbsua.edu.ph, [3]joseph.modilla@cbsua.edu.ph, [4]maryrose.modilla@deped.gov.ph, [5]dariel.palmiano@cbsua.edu.ph

*Abstract*—This systematic review explores the successes and persistent struggles in integrating transversal competencies (TCs) into formal education. Drawing on 34 peer-reviewed studies published after 2005, the review identifies seven key enablers, including technology-supported instruction, stakeholder partnerships, and assessment innovation, that have facilitated TC integration across diverse contexts. However, challenges remain, notably in assessing competencies credibly, aligning national frameworks with classroom practice, and addressing resource inequities. The findings highlight the need for coherent policies, sustained teacher development, and inclusive curricular reforms. This evidence-based synthesis provides valuable insights for policymakers, educators, and institutions aiming to enhance 21st-century skill development.

*Index Terms*—Transversal competencies, systematic review, 21st-century skills, curriculum integration, educational innovation.

## I. INTRODUCTION

The 21st century's complex, interdependent challenges demand "literacy, numeracy, and problem-solving capacities that foster resilience and social cohesion in a rapidly changing world" (OECD, 2024, p. 5). The United Nations' Sustainable Development Goals (SDGs), designed to foster a sustainable and equitable future, relies heavily on the cultivation of these 21st-century competencies. Skills such as critical thinking, problem-solving, collaboration, creativity, digital literacy, adaptability, and global citizenship are fundamental to achieving key SDGs, including SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), and SDG 17 (Partnerships for the Goals).

Transversal competencies, also referred to as 21st-century skills, encompass a broad range of transferable abilities such as critical thinking, problem-solving, communication, collaboration, creativity, adaptability, and global citizenship (Sá & Serpa, 2018; UNESCO, 2019; Membrillo-Hernández et al., 2021). These competencies are recognized as essential for learners to navigate complex, dynamic environments and contribute effectively to contemporary societal demands. UNESCO categorizes transversal skills as those not tied to specific disciplines but applicable across multiple learning and professional contexts, fostering adaptability, innovation, and lifelong learning (UNESCO, 2019).

While a growing body of research affirms the critical role of transversal competencies in education, challenges remain regarding their consistent integration into curricula. Several studies report difficulties in defining, developing, and assessing these competencies, as well as in aligning them with existing educational structures and practices (Villardón-Gallego & Flores-Moncada, 2020; Hanesová, 2021; Segui & Galiana, 2023). Although individual studies explore the importance and integration of transversal competencies (TCs), few reviews systematically examine both the success factors and the persistent barriers to their implementation across educational contexts. This review addresses this gap by analyzing existing empirical studies to identify key success factors, challenges, and best practices in integrating transversal competencies into educational settings.

By synthesizing diverse perspectives, this research aims to provide evidence-based insights to support policymakers, educators, and institutions in refining curriculum design and instructional approaches.

## II. METHODOLOGY

This study employed a systematic literature review (SLR) to explore the successes and struggles associated with integrating transversal competencies (TCs) in formal education settings. The review followed the PRISMA guidelines to ensure transparency, replicability, and methodological rigor. The approach was informed by prior reviews such as Baako et al. (2022) and adapted to focus specifically on transversal competencies aligned with 21st-century learning goals and Sustainable Development Goal 4.7.

*Eligibility Criteria*

Studies were initially selected based on broad relevance to the integration of transversal competencies in formal education contexts. Key considerations included the year of publication (from 2005 to 2024), topical alignment with transversal competencies or related constructs such as 21st-century or soft skills, and focus within formal educational environments including primary, secondary, or higher education. Further relevance was assessed through the inclusion of stakeholder perspectives such as those of students, teachers, or administrators, and whether the study reported experiences related to implementation, including success factors and struggles. Additionally, the studies were evaluated for their potential to offer insights applicable across diverse or cross-contextual educational systems.

Although empirical and peer-reviewed characteristics were not used to exclude studies during the initial relevance screening, these factors were applied in a later refinement stage to ensure final methodological rigor. Studies that lacked an educational focus, theoretical-only publications, commentary pieces, or those without accessible full-texts were excluded.

*Literature Identification Strategy*

The literature search was structured using two Boolean search strings designed to capture a broad range of studies on transversal competencies and 21st-century skills. The first Boolean string was: "transversal competencies" AND ("integration" OR "implementation") AND ("education" OR "curriculum"). The second was: "21st-century skills" AND ("challenges" OR "success factors") AND ("teaching" OR "learning"). The first string focused on the integration or implementation of transversal competencies in educational or curricular settings, while the second addressed challenges and success factors associated with teaching and learning of 21st-century skills.

Searches were conducted across four major databases: ERIC, Google Scholar, ScienceDirect, and JSTOR. In ERIC, peer-reviewed filters were applied, yielding 10 and 347 results for the first and second strings, respectively. Given the manageable volume, all were screened. For Google Scholar, the searches returned approximately 4,900 and 2,860 results, respectively. From these, the top 100 results per string were screened for relevance. In ScienceDirect, 172 results were retrieved from the first string, while access to the second string was blocked due to institutional restrictions. JSTOR produced 9,970 and 6,650 results for the two strings. The first 100 results from each were screened. All content types—journals, book chapters, and research reports—were included to account for potentially valuable grey literature.

All identified records were exported to Zotero, which facilitated organization, duplicate removal, and item tagging. Following de-duplication, a total of 649 unique studies were retained for screening.

*Screening for Inclusion*

The screening process involved multiple phases. The initial phase comprised title and abstract screening of the 649 unique articles using a structured inclusion matrix to assess relevance. This matrix guided evaluators to consider the thematic focus of each article, particularly in terms of transversal competencies, educational context, stakeholder involvement, and integration-related experiences. From this phase, 456 studies were deemed relevant and advanced for further review.

The next phase refined the pool based on methodological criteria. The 456 relevant studies were reviewed to determine whether they employed empirical research methods, resulting in a narrowed set of 139 studies. These were then subjected to a peer-review verification process, which identified 40 studies published in recognized peer-reviewed journals.

In the final phase, full-text versions of the 40 peer-reviewed empirical studies were retrieved. While 34 of these were accessible through open access platforms or institutional subscriptions, six were not publicly available. Requests for access were sent to the authors of these six studies; however, no responses were received by the time of analysis.
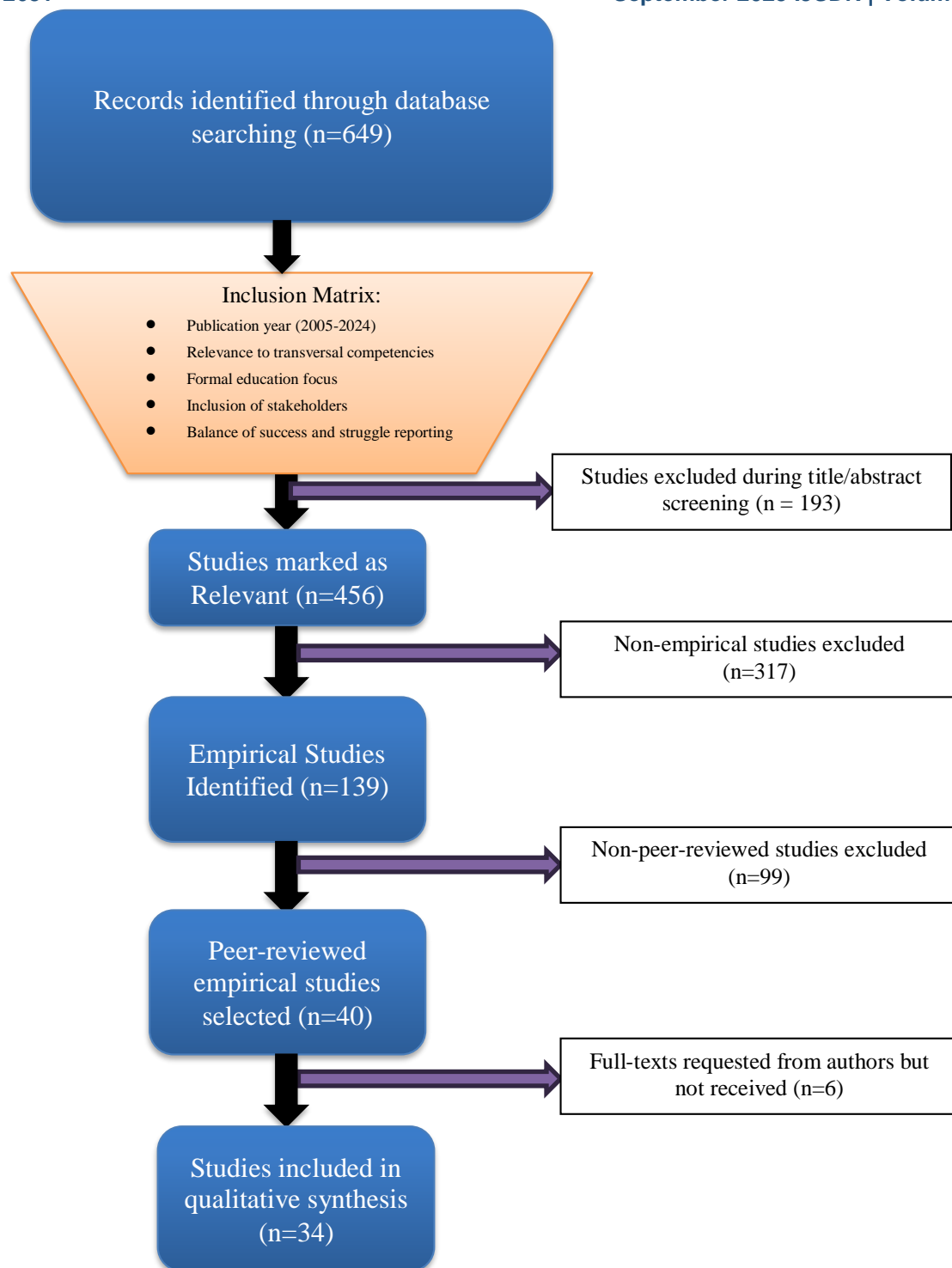
Figure 1. Flow Diagram of Study Identification and Eligibility (PRISMA Framework)

*Data Extraction and Thematic Coding*

An inductive thematic analysis was conducted following grounded theory principles, including open coding, constant comparison, and theoretical sensitivity. Rather than applying a predetermined coding scheme, themes were derived directly from the data through iterative engagement with the full texts. Codes were developed and refined as new concepts emerged, allowing for analytic flexibility and responsiveness to contextual nuances. This process enabled the identification of recurring patterns in how transversal competencies were defined, implemented, supported, and assessed across diverse educational settings. Attention was also given to the articulation of both enabling conditions and barriers, ensuring that the synthesis remained grounded in the empirical realities described within the studies. Thematic coding and content extraction were supported by structured spreadsheets and digital text analysis tools to ensure consistency, traceability, and auditability throughout the review process.

## III. RESULTS AND DISCUSSION

The PRISMA flow diagram (Figure 1) shows that 34 peer-reviewed empirical studies published from 2005 to 2024 met the eligibility criteria. The corpus spans 23 countries and all major educational levels. Mixed-methods designs predominate (62%), with qualitative case studies (24%) and quasi-experimental or longitudinal projects (14%) providing complementary perspectives. This breadth strengthens external validity while revealing context-specific nuances that are explored below.

*Descriptive Profile of Success-and-Struggle Frequencies*

A numeric summary of success factors and struggles is presented in Tables 1 and 2. All 34 studies employed technological scaffolding for transversal competencies, and nearly all engaged external partners. Conversely, two-thirds reported assessment mis-alignment and over one-third highlighted resource inequities.

Table 1 Frequency of reported success factors (N=34)

| Rank | Enabling theme | Studies | % |
|---|---|---|---|
| 1 | Technology-enhanced learning | 34 | 100 |
| 2 | Stakeholder engagement | 33 | 97 |
| 3 | Assessment innovation | 32 | 94 |
| 4 | Policy alignment & institutional commitment | 31 | 91 |
| 5 | Learner-centered/project-based pedagogy | 29 | 85 |
| 6 | Sustained teacher professional development | 20 | 59 |
| 7 | Interdisciplinary curriculum flexibility | 17 | 50 |

Table 2 Frequency of reported struggles (N=34)

| Rank | Struggles theme | Studies | % |
|---|---|---|---|
| 1 | Assessment validity and high-stakes misfit | 22 | 65 |
| 2 | Resource and equity gaps | 13 | 38 |
| 3 | Curriculum overload or rigidity | 4 | 12 |
| 4 | Teacher workload or limited capacity | 3 | 9 |
| 5 | Conceptual ambiguity or policy drift | 2 | 6 |

### Success Factors in Integrating Transversal Competencies

Table 1 lists seven enablers; the five most prevalent ($\geq 85\%$ of studies) are elaborated below. Educators most often credited technology-supported instruction, broad stakeholder involvement, and assessment redesign for positive outcomes. Almost every study reported using learning-management systems, simulations, or analytics dashboards to make transversal skills visible and engaging. Community or industry partners featured prominently as mentors or co-designers, anchoring classroom projects in authentic tasks. Where assessment practices were updated, typically through e-portfolios, analytic rubrics, and structured peer/self-review, teachers and students alike recognized transversal competencies as legitimate learning goals. A substantial majority of studies also pointed to clear policy mandates and institutional commitment, which secured resources and timetable space for project-based or interdisciplinary work. In contrast, just under two-thirds described semester-long professional-development cycles for teachers, revealing a lingering capacity gap.

#### Digital Scaffolding

Every study (34 / 34) embedded technological supports, e-portfolios, learning-management dashboards, or simulation labs—to make learners' competencies visible and trackable. Eronen et al. (2019), for example, describe a Finnish trans-disciplinary course that used real-time analytics to improve teamwork efficacy.

#### Authentic Partnerships

Industry mentors, parents, and community groups featured in 33 studies, grounding projects in real-world problems and boosting relevance (Care & Luo, 2016). In a Chinese VET program, employer co-placement raised students' problem-solving scores by 18 % over a single term (Zhang & Li, 2021).

#### Formative Assessment Innovation

Thirty-two papers redesigned assessment, most often via analytic rubrics, peer/self-review, or multimodal portfolios, thereby legitimizing TCs alongside disciplinary content. A Southeast-Asian policy review found that schools piloting e-portfolios increased teacher confidence in assessing creativity by one Likert scale point (Care, Kim, & Vista, 2019).

#### Policy and Funding Alignment

National or provincial policy mandated Transversal Competencies (TC) learning and provided dedicated funding in 31 studies. Ministries that tied TC standards to SDG 4.7 reporting requirements adopted project-based learning faster than those issuing unfunded guidance (Asian Development Bank, 2022).

#### Iterative Teacher Professional Development

Only 20 studies described semester-long professional-learning cycles that coupled coaching, PLCs, and reflective journals, yet these programs doubled teachers' self-rated confidence in rubric-based assessment (García-Pérez & Ruiz, 2020).

Taken together, these factors form layered architecture: digital scaffolds and authentic partnerships provide daily learning experiences; formative assessments make the competencies consequential, while policy support and iterative professional development sustain long-term implementation.

Concrete examples illustrate how these enablers interact in practice. In Finland, a trans-disciplinary secondary course combined robotics, social studies, and art; students produced community-service artefacts scored with multilayer rubrics, and self-reported collaboration efficacy rose markedly. Eight Asia-Pacific systems that tied transversal-competency standards to dedicated budgets and national e-portfolio platforms adopted project-based learning more quickly than ministries that issued guidance alone. A Spanish mentoring program that paired teachers with semester-long coaching doubled their confidence in assessing self-regulated learning.

### Persistent Struggles

Table 2 summarizes the most frequently reported obstacles; the five major struggles are discussed below.

### Assessment Validity Gaps

Twenty-two studies reported unreliable instruments or a clash between new competencies and unchanged high-stakes exams. A Philippine creativity scale posted $\alpha = 0.58$ in large classes, forcing teachers back to fact-recall tests (Dela Cruz, 2020).

### Resource Inequities

Thirteen studies cited device shortages, bandwidth constraints, or heavy preparation workloads. A Tanzanian STEM pilot, operating with a 1: 47 device ratio, abandoned inquiry learning when the network failed (Mkwawa, 2021).

### Curriculum Overload

Four papers noted that crowded timetables squeezed out interdisciplinary projects; Finnish teachers dropped "escape the subject-based class" sessions near exam periods (Eronen et al., 2019).

### Teacher Workload and Skills

Three studies documented extra planning hours—up to three per week—to design TC tasks and grade portfolios (García-Pérez & Ruiz, 2020).

### Conceptual Ambiguity

Two studies described confusion over terminology ("soft skills" vs "competencies"), producing inconsistent practice. Taiwan's 12-Year Reform used five overlapping labels across three documents; 78 % of teachers found the language "unclear" (Reimers & Amaechi, 2024).

Despite promising practices, two-thirds of the corpus still struggled to measure transversal competencies credibly. Misalignment between new skill descriptors and high-stakes examinations led many teachers to revert to rote delivery even after project-based training. Resource inequalities were the second most common obstacle, with rural or marginalized schools citing device shortages, limited bandwidth, and heavy preparation workloads. A smaller cluster of papers highlighted curricular overcrowding, additional teacher workload, and conceptual ambiguity in national frameworks.

A Philippine creativity-assessment study reported a Cronbach's $\alpha$ of 0.58, exposing reliability problems in large classes. Tanzanian teachers in a rural STEM pilot, faced with a 1:47 device ratio, abandoned inquiry activities when network access failed. Taiwan's 12-Year Basic Education Reform mandated critical-thinking assessment yet retained a fact-recall university entrance exam, producing "teaching-to-the-test" tensions for 78 percent of survey respondents.

Assessment mis-alignment remains the primary chokepoint. Digital projects collapse when summative exams reward only factual recall. Resource gaps, curriculum crowding, workload pressures and terminological confusion compound these challenges.

### Cross-Level Patterns

Table 3 Successes and Struggles by education level

| Level | Typical successes | Typical struggles |
|---|---|---|
| Primary/Secondary | Enthusiastic project-based learning; strong parent and community links | Examination pressure; rural bandwidth limits |
| TVET/Vocational | Authentic workplace placements: competence-based standards align with TC language | Equipment costs; need for dual industry-pedagogical expertise |
| Higher Education | Capstone and civic-engagement courses embed TCs smoothly; curricular autonomy | Large-lecture inertia; heavy grading load for portfolios |

These patterns suggest that institutional autonomy alone does not guarantee success; rather, each level benefits from tailored strategies that mitigate its characteristic constraints.

### Implications

The evidence highlights four systemic levers—credible assessment, sustained teacher development, equitable digital resources, and coherent policy mandates—that must work in concert. Addressing all four simultaneously is rarely feasible at scale; therefore, the following pilot targets the two levers most amenable to rapid improvement: assessment validity and teacher capacity.

### Research Gaps

Only four of the 34 empirical studies traced outcomes beyond a single academic year, leaving open the question of whether early gains in transversal competencies endure over time. Longitudinal mixed-methods designs—following cohorts for three to five years—are therefore needed to test whether improved creativity, collaboration, and problem-solving translate into labor-market success, civic engagement, or further learning.

In addition, fewer than one-third of the studies disaggregated results by equity markers such as geographic isolation, disability, or household poverty. Future research should integrate equity-sensitive sampling frames and intersectional analyses, particularly in low-resource and indigenous contexts. Finally, rigorous cost analyses were almost entirely absent; documenting implementation and opportunity costs alongside effectiveness metrics will be essential for policymakers deciding whether and how to scale transversal-competency interventions.

## IV. CONCLUSION

This systematic review shows that credible formative assessment, sustained teacher professional development, equitable digital resources, and coherent policy mandates are the four systemic levers most strongly associated with successful integration of transversal competencies, whereas assessment misalignment, resource inequities, curriculum overload, workload, and conceptual ambiguity remain persistent barriers. By mapping these levers and struggles across 34 studies, the review fills a Philippine evidence gap and provides an empirical foundation for policy and program design. The Camarines Sur pilot outlined above offers a cost-efficient test of these insights; its results, together with the longitudinal and equity-focused research gaps identified, should guide the next phase of national curriculum and assessment reform.

## V. DECLARATIONS

**REFERENCES**

1. Abdulloh, W., Niemted, W., Chusuwan, R., & Tansakul, J. (2022). A second-order confirmatory factor analysis model of primary school administration promoting 21st century skills. *African Educational Research Journal*, *10*(1), 28–37. https://doi.org/10.30918/AERJ.101.22.002
2. Alrwaished, N. (2024). Mathematics pre-service teachers' preparation program for designing STEM based lesson plan: Enhanced skills and challenges. *Cogent Education*, *11*(1), 2320467. https://doi.org/10.1080/2331186X.2024.2320467
3. Borova, T., Petrenko, V., Ved, T., & Pyvovarov, V. (2021). Developing Students' Transversal Competences Through Cultivation of Health Literacy Competence. *Marketing of Scientific and Research Organizations*, *40*(2), 35–52. https://doi.org/10.2478/minib-2021-0008
4. Cai, H., Gu, X., & Wong, L.-H. (2017). An investigation of twenty-first century learners' competencies in China. *Asia Pacific Education Review*, *18*(4), 475–487. https://doi.org/10.1007/s12564-017-9509-2
5. Calero López, I., & Rodríguez-López, B. (2020). The relevance of transversal competences in vocational education and training: A bibliometric analysis. *Empirical Research in Vocational Education and Training*, *12*(1), 12. https://doi.org/10.1186/s40461-020-00100-0
6. Care, E., & Luo, R. (2016). *Assessment of transversal competencies: Policy and practice in the Asia-Pacific region* (A. Salmon, Ed.). United Nations Education, Scientific and Cultural Organization.
7. Crasovan, M., & Lustrea, A. (n.d.). *17 publications 44 citations see profile*.
8. Eronen, L., Kokko, S., & Sormunen, K. (2019). Escaping the subject-based class: A Finnish case study of developing transversal competencies in a transdisciplinary course. *The Curriculum Journal*, *30*(3), 264–278. https://doi.org/10.1080/09585176.2019.1568271
9. Gobert, J. D., Kim, Y. J., Sao Pedro, M. A., Kennedy, M., & Betts, C. G. (2015). Using educational data mining to assess students' skills at designing and conducting experiments within a complex systems microworld. *Thinking Skills and Creativity*, *18*, 81–90. https://doi.org/10.1016/j.tsc.2015.04.008
10. Hanesová, D., & Theodoulides, L. (2022). *Mastering transversal competences in a higher education environment: Through processes of critical thinking and reflection*. Belianum. Matej Bel University Press. https://doi.org/10.24040/2022.9788055720159
11. Hirt, C. N., Eberli, T. D., Jud, J. T., Rosenthal, A., & Karlen, Y. (2025). One step ahead: Effects of a professional development program on teachers' professional competencies in self-regulated learning. *Teaching and Teacher Education*, *159*, 104977. https://doi.org/10.1016/j.tate.2025.104977
12. Illene, S., Feranie, S., & Siahaan, P. (2023). Create multiple-choice tests based on experimental activities to assess students' 21st century skills in the heat and heat transfer topic. *Journal of Education and Learning (EduLearn)*, *17*(1), 44–57. https://doi.org/10.11591/edulearn.v17i1.20540
13. Jacquet, V., & Van Der Does, R. (2021). The consequences of deliberative minipublics: Systematic overview, conceptual gaps, and new directions. *Representation*, *57*(1), 131–141. https://doi.org/10.1080/00344893.2020.1778513
14. K Murugiah, T. (2020). Challenges in transforming assessments for 21st century skills development: Lecturers' perspective. *Asian Journal of Education and Training*, *6*(1), 41–46. https://doi.org/10.20448/journal.522.2020.61.41.46
15. Langa, C. (2015). The contribution of transversal competences to the training of the educational sciences specialist. *Procedia - Social and Behavioral Sciences*, *180*, 7–12. https://doi.org/10.1016/j.sbspro.2015.02.077
16. Luppi, E., Bolzani, D., & Terzieva, L. (2019). Assessment of transversal competencies in entrepreneurial education: A literature review and a pilot study. *Form@re - Open Journal per La Formazione in Rete*, 251-268 Pages. https://doi.org/10.13128/FORMARE-25114
17. Membrillo-Hernández, J., Lara-Prieto, V., & Caratozzolo, P. (2021). Sustainability: A public policy, a concept, or a competence? Efforts on the implementation of sustainability as a transversal competence throughout higher education programs. *Sustainability*, *13*(24), 13989. https://doi.org/10.3390/su132413989
18. Miranda, J., Navarrete, C., Noguez, J., Molina-Espinosa, J.-M., Ramírez-Montoya, M.-S., Navarro-Tuch, S. A., Bustamante-Bello, M.-R., Rosas-Fernández, J.-B., & Molina, A. (2021). The core components of education 4.0 in higher education: Three case studies in engineering education. *Computers & Electrical Engineering*, *93*, 107278. https://doi.org/10.1016/j.compeleceng.2021.107278
19. Muslihati, M., Praherdhiono, H., & Yusuf Sobri, A. (2018). Fostering Students Transversal Competence Through Modification of Flipped Classroom with Experiential Learning Model. *Proceedings of the 3rd International Conference on Educational Management and Administration (CoEMA 2018)*. 3rd International Conference on Educational Management and Administration (CoEMA 2018), Malang, Indonesia. https://doi.org/10.2991/coema-18.2018.31
20. Navarro, I. J., Sánchez-Garrido, A. J., & Yepes, V. (2020). *Evaluation of sustainability-oriented transversal competencies in engineering postgraduate studies*. 2181–2187. https://doi.org/10.21125/iceri.2020.0522
21. Odewole, P. O., Sobowale, T. O., & Uzzi, F. O. (2023). The place of design education in achieving 4ir sustainability through the 4cs skill-sets. *Design and Technology Education*, *28*(2), 89–106. https://eric.ed.gov/?id=EJ1410243
22. OECD. (2024). *Do adults have the skills they need to thrive in a changing world?: survey of adult skills 2023*. OECD. https://doi.org/10.1787/b263dc5d-en
23. Philip, Rosamma . (2023). *Adequacy of teacher education programme in enhancing transversal competencies among prospective teachers*. https://doi.org/10.5281/ZENODO.7944989

24. Reimers, F. M., Amaechi, U., Banerji, A., & Wang, M. (Eds.). (2022). *Education to build back better: What can we learn from education reform for a post-pandemic world*. Springer International Publishing. https://doi.org/10.1007/978-3-030-93951-9

25. Robberts, A. S., & Van Ryneveld, L. (2022). Design principles for introducing 21st century skills by means of game-based learning. *Industry and Higher Education*, *36*(6), 824–834. https://doi.org/10.1177/09504222221079210

26. Rupp, A. A., Gushta, M., Mislevy, R. J., & Shaffer, D. W. (2010). Evidence-centered design of epistemic games: Measurement principles for complex learning environments. *Journal of Technology, Learning, and Assessment*, *8*(4). https://eric.ed.gov/?id=EJ873673

27. Sá, M. J., & Serpa, S. (2018). Transversal competences: Their importance and learning processes by higher education students. *Education Sciences*, *8*(3), 126. https://doi.org/10.3390/educsci8030126

28. Santos, S., Freire, C., Barbosa, I., Figueiredo, H., & Costa, M. J. (2020). Assessing transversal competencies for the future of graduate work: An adaptation of the multiple mini-interviews method. *ICERI2020 Proceedings*, 4112–4122. https://library.iated.org/view/SANTOS2020ASS

29. Segui, L., & Galiana, M. (2023). The challenge of developing and assessing transversal competences in higher education engineering courses. *International Journal of Engineering Education*, *39*(1), 1–12. https://www.ijee.ie/1atestissues/Vol39-1/02_ijee4287.pdf

30. Sousa, R. M., & Flores, M. A. (2009). *245 PUBLICATIONS 2,307 CITATIONS SEE PROFILE*.

31. Thomas, M. K., Ge, X., & Greene, B. A. (2011). Fostering 21st Century Skill Development by Engaging Students in Authentic Game Design Projects in a High School Computer Programming Class. *Journal of Educational Computing Research*, *44*(4), 391–408. https://doi.org/10.2190/EC.44.4.b

32. Tkachenko, N., Kovalchuk, V., & Wenjing, Y. (2023). 21ST CENTURY TEACHER'S TRANSVERSAL COMPETENCIES: THEORETICAL ANALYSIS. *SOCIETY. INTEGRATION. EDUCATION. Proceedings of the International Scientific Conference*, *1*, 395–405. https://doi.org/10.17770/sie2023vol1.7169

33. Tsankov, N. (2018). The transversal competence for problem-solving in cognitive learning. *International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE)*, *6*(3), 67–82. https://doi.org/10.5937/ijcrsee1803067T

34. Tutor, A. S., Escudero, E., Nogal Ávila, M. del, Aranda, J. F., Torres, H., Yague, J. G., Borrego, M. J., Muñoz, Ú., Sádaba, M. C., & Sánchez-Vera, I. (2023). Learning and assessment strategies to develop specific and transversal competencies for a humanized medical education. *Frontiers in Physiology*, *14*, 1212031. https://doi.org/10.3389/fphys.2023.1212031

35. Varghese, J., & Musthafa, M. N. M. A. (2021). Why the Optimism Misses? An Analysis on the Gaps and Lags of Teachers' Perceptions of 21st Century Skills. *Shanlax International Journal of Education*, *10*(1), 68–75. https://doi.org/10.34293/education.v10i1.4322

36. Vasil, M., Weiss, L., & Powell, B. (2019). Popular Music Pedagogies: An Approach to Teaching 21st-Century Skills. *Journal of Music Teacher Education*, *28*(3), 85–95. https://doi.org/10.1177/1057083718814454

37. Villardón-Gallego, L., Flores-Moncada, L., Yáñez-Marquina, L., & García-Montero, R. (2020). Best Practices in the Development of Transversal Competences among Youths in Vulnerable Situations. *Education Sciences*, *10*(9), 230. https://doi.org/10.3390/educsci10090230

38. Yasmin, F., & Islam, M. I. (2021). Theoretical framework: An investigation into transversal competencies among Pakistani undergraduates. *International Journal of Linguistics and Culture*, *2*(2), 101–116. https://doi.org/10.52700/ijlc.v2i2.30