JSER **Journal of Science and Education Research**
Vol. 4, No. 1, Januari 2025
e-ISSN 2828-2361
https://jurnal.insanmulia.or.id/index.php/jser/

A Profile of Digital Literacy, Problem-Solving Skills, and Socio-Cultural Awareness Among Pre-Service Biology Teacher in Bali

I Gede Sudirgayasa[1,2*], Sulisetijono[1], Susriyati Mahanal[1], Abdul Gofur[1], Ni Putu Sri Ratna Dewi[3], Dewa Ayu Sri Ratnani[4], I Gusti Ayu Rai[5], I Made Sudiana[2]

[1] Department of Biology, Universitas Negeri Malang, Indonesia
[2] Department of Biology Education, IKIP Saraswati, Indonesia
[3] Department of Biology Education, Universitas Pendidikan Ganesha, Indonesia
[4] Department of Biology Education, Universitas Mahasaraswati Denpasar, Indonesia
[5] Department of Biology Education, Universitas PGRI Mahadewa Indonesia, Indonesia

Email: [1] igedesudirgayasa@gmail.com, [2] sulisetijono.fmipa@um.ac.id, [3] susriyati.mahanal.fmipa@um.ac.id, [4]abdul.gofur.fmipa@um.ac.id, [5]ratna.dewi@undiksha.ac.id, [6]sri.ratnani@unmas.ac.id, [7]gustiayurai64@gmail.com, [8]made.sudiana404@gmail.com
(*Corresponding Author)

Abstract: This study aims to identify the levels of digital literacy, problem-solving skills, and socio-cultural awareness among prospective biology teachers. A cross-sectional survey method was employed. Data were collected through the distribution of a closed-ended questionnaire on February 10, 2023. The questionnaire used a Likert scale, with each item scored on a range from 1 to 5. The digital literacy questionnaire consisted of 20 items, the problem-solving skills questionnaire comprised 24 items, and the socio-cultural awareness questionnaire included 15 items. The questionnaires were distributed to biology education students from four universities in Bali: Universitas Pendidikan Ganesha, Universitas Mahasaraswati Denpasar, Universitas PGRI Mahadewa Indonesia, and IKIP Saraswati. Respondents were selected using purposive sampling, based on specific criteria relevant to the research objectives. The research instruments were developed based on the aspects and indicators of 21st-century skills proposed by Greenstein. The collected data were then analyzed descriptively to address the research questions. The findings of the study are as follows: students' digital literacy falls within the intermediate category; their problem-solving skills are at the basic level; and their socio-cultural awareness is also categorized as intermediate. It is necessary to develop alternative learning programs that enhance students' digital literacy, problem-solving abilities, and socio-cultural awareness. One potential approach is project-based learning that directly integrates technology use and addresses real-life issues at both local and global levels.

Keywords: profile, digital literacy, problem-solving skills, socio-cultural awareness, pre-service teachers, biology

Citation:
Sudirgayasa, I. G., Sulisetijono, Mahanal, S., Gofur, A., Dewi, N. P. S. R., Ratnani, D. A. S., Rai, I. G. A., & Sudiana, I. M. (2025). A Profile of Digital Literacy, Problem-Solving Skills, and Socio-Cultural Awareness Among Pre-Service Biology Teacher in Bali. *Journal of Science and Education Research*, *4*(1), 95–102. https://doi.org/10.62759/jser.v4i1.206

Introduction

21st-century skills are essential for prospective biology teachers as they prepare to navigate the dynamic and demanding landscape of modern education (Valtonen et al., 2021). These skills—including critical thinking, creativity, collaboration, communication, digital literacy, and problem-solving—support future educators in implementing student-centered learning and integrating contemporary scientific issues into instructional practices (Tican & Deniz, 2019). In the context of biology education, the ability to analyze complex biological systems, utilize technology in experiments, and promote inquiry-based learning is crucial. Moreover, mastering these skills enables prospective teachers to adapt to the rapid advancement of science and education, adopt interdisciplinary approaches, and inspire students to become active and knowledgeable individuals capable of addressing real-world challenges (Annan-Brew et al., 2024). Three particularly important 21st-century skills are digital literacy, problem-solving skills, and socio-cultural awareness. Digital literacy plays a vital role in today's rapidly evolving technological landscape, encompassing the ability to effectively and responsibly use digital devices, platforms, and information resources (Makdee et al., 2023). In the 21st century, digital literacy extends beyond basic computer skills to include safe internet navigation, critical evaluation of online content, digital communication across various media, and ethical content creation (Odede & Jiyane, 2019). For students, professionals, and educators, digital literacy facilitates broader access to information, supports lifelong learning, and enhances participation in the digital society. In educational settings, digital literacy empowers both educators and learners to engage in interactive and collaborative learning environments, adapt to remote or hybrid learning models, and

Article Info
Received: 14 Oktober 2024
Accepted: 15 Januari 2025
ISSN 2828-2361

leverage data and technology to improve teaching practices (Kasemsap, 2017). Furthermore, with the rise of misinformation and digital threats, fostering digital literacy is essential for cultivating critical thinking, encouraging responsible online behavior, and preparing individuals to actively participate in a technology-driven world (Berganio et al., 2024). Problem-solving skills are equally vital in both academic and real-world contexts, as they enable individuals to identify challenges, critically analyze situations, and develop effective strategies for finding solutions (Karatas & Baki, 2013). These skills involve logical reasoning, creativity, decision-making, and adaptability—all of which are essential in navigating complex and unpredictable environments (Sharif et al., 2021). In the field of education, particularly for prospective teachers, problem-solving competence supports classroom management, instructional design, and responsiveness to diverse student needs. Beyond the classroom, these skills also foster innovation and personal resilience, allowing individuals to effectively face personal and professional challenges (Aadzaar & Widjajanti, 2019). Given the rapid changes across various aspects of life, developing problem-solving skills is fundamental to preparing individuals to contribute meaningfully to society and confidently address global issues (Aliu & Aigbavboa, n.d.).

Socio-cultural awareness is a critical competency in an increasingly interconnected and diverse world, as it fosters understanding, empathy, and appreciation of different backgrounds, beliefs, and values (Bunch-Crump & Hitt, 2025). This skill enables individuals to interact effectively and harmoniously within multicultural environments at both local and global levels (Kim et al., 2015). In education, especially for future teachers, socio-cultural awareness supports the creation of inclusive classrooms where all students feel valued, supported, and acknowledged (Kuo, 2024). Additionally, it enhances communication skills, reduces prejudice, and promotes critical reflection on social issues and cultural dynamics (Shemshadsara, 2012). Beyond education, this awareness contributes to global citizenship and cross-cultural collaboration, which are essential in various social contexts (Chapman et al., 2014). As societies become more pluralistic, developing socio-cultural awareness is key to fostering mutual respect, preventing conflict, and strengthening social cohesion (Kuntjara, 2019).

However, it remains to be seen whether these expectations align with the actual conditions in the field? Therefore, this study was conducted to address that question. Specifically, the study aims to identify the levels of digital literacy, problem-solving skills, and socio-cultural awareness among prospective biology teachers. The findings are expected to serve as a basis for evaluating and developing alternative educational programs designed to enhance students' 21st-century skills.

Method

This study employed a survey method with a cross-sectional approach. This approach was selected because it allows for the simultaneous depiction of respondents' conditions, perceptions, or characteristics without intervention (Cohen et al., 2018; Leedy & Ormrod, 2021). Data were collected through the distribution of a closed-ended questionnaire on February 10, 2023. The questionnaire used a Likert scale, with each item scored on a scale from 1 to 5. The digital literacy questionnaire consisted of 20 items, the problem-solving skills questionnaire included 24 items, and the socio-cultural awareness questionnaire comprised 15 items. The questionnaire was administered to a sample of biology education students from four universities in Bali: Universitas Pendidikan Ganesha, Universitas Mahasaraswati Denpasar, Universitas PGRI Mahadewa Indonesia, and IKIP Saraswati. Respondents were selected using purposive sampling, based on specific criteria relevant to the objectives of the study. The research instruments were developed based on the aspects and indicators of 21st-century skills as proposed by (Greenstein, 2012). The collected data were then analyzed descriptively to address the research questions.

Results and Discussion

Based on the distributed questionnaires, a total of 61 biology education students responded to the survey. Of these respondents, 77% were female and 23% were male. In terms of institutional affiliation, 59% of respondents were from IKIP Saraswati, 14.8% from Universitas Mahasaraswati Denpasar, and 13.1% each from Universitas Pendidikan Ganesha and Universitas PGRI Mahadewa Indonesia.The profiles of digital literacy, problem-solving skills, and socio-cultural awareness among prospective biology teachers are described as follows.

Student Digital Literacy Profile

The six aspects of digital literacy measured in this study include: finding, using many sources, choosing, evaluating, considering sources, message effects, and using to generate original work (Greenstein, 2012). The indicators for each of these aspects are presented in Table 1. Based on the survey results, students' digital literacy received an average total score of 78.91, which falls into the intermediate category.

Table 1. Aspects and Indicators of Digital Literacy

No	Aspect	Indicator
1	Finding	Able to sort through options and independently find information relevant to the problem
2	Using many sources	"Skilled in almost all forms of text, video, music, simulations, and more"
3	Choosing	Exceptional ability to understand source bias and carefully make relevant choices from a variety of options
4	Evaluating	Proficient in verifying authors and sources and recognizing bias in information
5	Considering sources, message effects	Sensitive to the persuasive nature of electronic sources and can explain each methodology
6	Using to Generate Original Work	Uses strong analytical and evaluative skills in using digital information to create original products

The average total score for each aspect of digital literacy is presented in Figure 1. Based on the figure, the highest average total score was obtained in the aspect of "considering sources, message effects," with a score of 83.39. This was followed by the "choosing" aspect with a score of 80.22. The third-highest score was in the "evaluating" aspect, which received a score of 78.91.

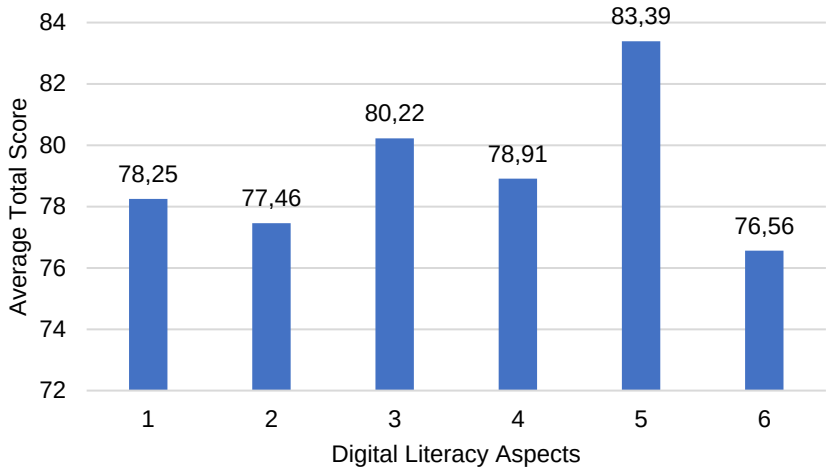

Figure 1. Average Total Score of Students' Digital Literacy Aspects

Student Problem-Solving Skills Profile

The eight aspects of problem-solving skills measured in this study include: identifying problems, applying problem-solving steps, identifying solutions, evaluating solutions, maintaining solutions, real-world application, inductive reasoning, and deductive reasoning (Greenstein, 2012). The indicators for each of these aspects are presented in Table 2. Based on the survey results, students' problem-solving skills received an average total score of 74.49, which falls into the basic category.

Table 2. Aspects and Indicators of Problem-Solving Skills

No	Aspect	Indicator
1	Identifying problems	Clearly explains the problem with detailed support in relation to the situation
2	Applying problem-solving steps	Uses various steps and strategies that students have learned to solve problems
3	Identifying solutions	Generates at least four viable and clearly explained solutions
4	Evaluating solutions	Able to evaluate and analyze all possible options before choosing the most feasible
5	Maintaining solutions	Analyzes all solutions and chooses one that demonstrates students' understanding of the problem and its outcomes
6	Real-world application	Can demonstrate problem-solving skills successfully even when it is not part of a school assignment
7	Inductive reasoning	Can accurately identify and interpret relevant facts and information that help students draw logical conclusions
8	Deductive reasoning	Can work with the basic principles of a topic and use relevant generalizations to draw logical conclusions

The average total score for each aspect of problem-solving skills is presented in Figure 2. Based on the figure, the highest average total score was obtained in the "identifying problems" aspect, with a score of 87.10. This was followed by "deductive reasoning" with a score of 80.22. The third-highest score was recorded in the "inductive reasoning" aspect, which received a score of 78.47.

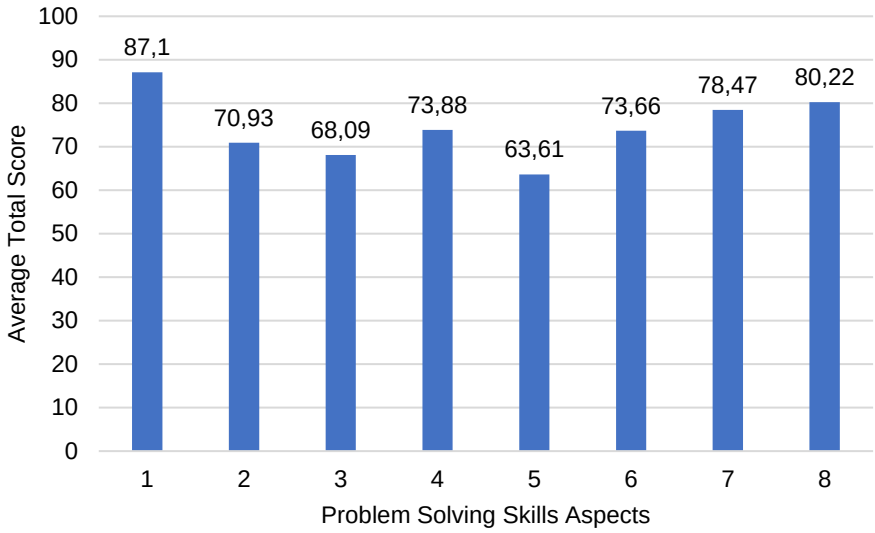

Figure 2. Average Total Score of Students' Problem-Solving Skills Aspects

Student Social and Cultural Awareness Profile

The five aspects of socio-cultural awareness measured in this study include: global issues, cultural understanding, contributing in and to the global community, perspective-taking, and justice and equality (Greenstein, 2012). The indicators for each of these aspects are presented in Table 3. Based on the survey results, students' socio-cultural awareness received an average total score of 75.43, which falls into the intermediate category.

Table 3. Aspects and Indicators of Social and Cultural Awareness

No	Aspect	Indicator
1	Global issues	Can explain various historical and current issues and how they affect people around the world
2	Cultural understanding	"Very knowledgeable about various cultural beliefs, values, and customs that routinely influence how people act and behave towards others"
3	Contributing in and to the global community	Works constructively with people from other cultural groups and strives to learn and understand their experiences and views. Participates in global initiatives to improve the world
4	Perspective-taking	Understands cultural complexity and has adequate knowledge to effectively see other cultural viewpoints
5	Justice and equality	Supports and promotes justice and equality for all members of the class

The average total score for each aspect of socio-cultural awareness is presented in Figure 3. Based on the figure, the highest average total score was obtained in the “cultural understanding” aspect, with a score of 83.39. This was followed by the “perspective-taking” aspect, scoring 75.96. The third-highest score was recorded in the “contributing in and to the global community” aspect, which received a score of 72.90.

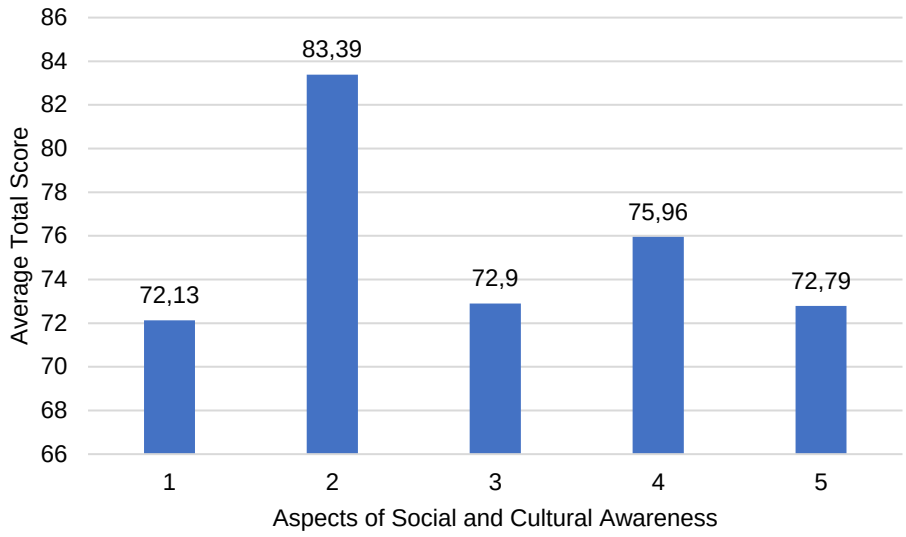

Figure 3. Average Total Score of Students' Social and Cultural Awareness Aspects

Comparison of Digital Literacy Profiles, Problem-Solving Skills, and Social Awareness of Students

Based on the survey results, the average total scores for digital literacy, problem-solving skills, and socio-cultural awareness are summarized in Figure 4. Digital literacy received the highest average total score of 78.91, which falls into the intermediate category. Socio-cultural awareness ranked second with an average total score of 75.43, also within the intermediate category. Problem-solving skills ranked last with an average total score of 74.49, which falls into the basic category.

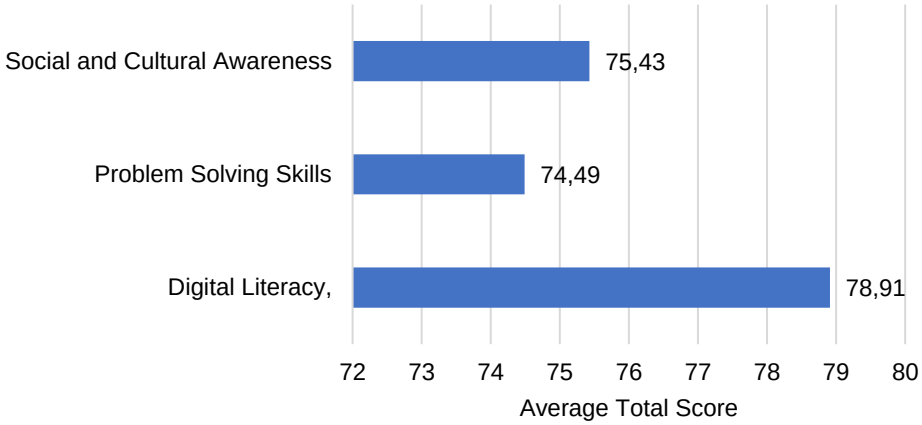

Figure 4. Average Total Scores For Digital Literacy, Problem-Solving Skills, and Socio-Cultural Awareness

Discussion

The digital literacy profile of the sampled students falls into the intermediate category. This condition requires improvement as proficient digital literacy is crucial in the rapidly evolving modern era. Efforts to enhance digital literacy can be carried out through several approaches.

Improving students' digital literacy can be achieved through integrated strategies involving curriculum strengthening, practical training, and optimal utilization of information technology in the learning process (Yadav, 2024). Higher education institutions need to integrate digital literacy into all courses, not only those based on technology but also in social sciences, humanities, and sciences, so that students become accustomed to using digital tools to search, evaluate, manage, and communicate information critically and ethically (Parveen et al., 2024). Furthermore, regular training on digital security, media ethics, the use of online collaborative tools, and data management is essential to ensure students possess digital competencies relevant to current demands (Temirkhanova et al., 2024). The development of digital literacy can also be supported by providing fast and

stable internet access, interactive digital learning spaces, and guidance from lecturers or mentors with adequate technological skills (Drossel et al., 2020). Through this approach, students will not merely become passive technology users but also be capable of creatively and productively leveraging technology to support learning, research, and personal development.

The problem-solving skills profile of the sampled students falls into the basic category. This condition also requires improvement, as problem-solving skills are vital in the modern era, characterized by increasing complexity of issues. Efforts to enhance problem-solving skills can be implemented through several measures.

Enhancing students' problem-solving skills can be achieved through learning approaches emphasizing exploration, critical analysis, and the application of knowledge in real-world contexts (G. A. C. Dewi et al., 2019). Universities should adopt active learning methods such as problem-based learning (PBL), project-based learning, and case studies that encourage students to identify problems, formulate solutions, and evaluate outcomes independently and collaboratively (Husin et al., 2025). Additionally, lecturers play a critical role as facilitators guiding students' thinking processes rather than merely delivering information. Extracurricular activities such as innovation competitions, scientific discussions, internships, and entrepreneurship programs can serve as platforms to train students' logical and adaptive thinking skills in addressing complex real-life problems (Tsai, 2010). Support for the development of soft skills, including communication, leadership, and teamwork, also strengthens students' capacity to solve challenges holistically (Albay, 2020). Thus, students' problem-solving skills can develop sustainably and become essential assets for their future professional and social lives.

The socio-cultural awareness profile of the sampled students is categorized as intermediate. This condition needs to be enhanced because socio-cultural awareness is crucial in the modern era to live harmoniously in a multicultural global environment while maintaining national cultural identity. Efforts to improve socio-cultural awareness can be conducted through several strategies.

Enhancing students' socio-cultural awareness can be achieved by integrating values of diversity, tolerance, and empathy into formal and non-formal educational processes (Wu et al., 2015). Higher education institutions can develop curricula that include materials on multiculturalism, local and global history, and contemporary social issues relevant to society (Uyun et al., 2024). Learning activities should also be complemented with cross-cultural discussions, national seminars, and collaborations among students from diverse backgrounds to foster understanding and appreciation of differences (Black & Duhon, 2006). Additionally, involving students in community service programs, student exchanges, and local arts and cultural activities will strengthen their sense of connection to broader communities and enhance social sensitivity (Pope et al., 2023). The role of lecturers as role models in fostering inclusive communication and open-minded attitudes is also vital in creating an academic environment that respects plurality. Through this comprehensive approach, students are expected to become individuals who are not only intellectually competent but also caring, adaptive, and responsible toward social and cultural dynamics around them.

The results of this study highlight the challenge of developing alternative learning programs capable of training students' digital literacy, problem-solving skills, and socio-cultural awareness. Such alternative programs should address every aspect and indicator of these three 21st-century skills. In other words, these programs must integrate digital-based learning, scientific inquiry-based learning, and learning grounded in local wisdom and multiculturalism.

One learning approach that can be implemented is project-based learning directly linked to the use of technology and real-life issues. Through this model, students engage collaboratively in solving authentic problems, requiring them to access, evaluate, and process digital information, thereby practically enhancing digital literacy skills (Dewi et al., 2022). Problem-solving abilities are also sharpened, as students go through critical thinking processes starting from problem identification, cause analysis, to designing applicable solutions (Rodil, 2024). Furthermore, students' socio-cultural awareness is nurtured when projects relate to diversity issues, local culture, or community social problems, encouraging them to understand and appreciate different perspectives. These activities can be enriched with group discussions, interdisciplinary collaboration, and self-reflection, fostering empathy and a sense of responsibility (Wu et al., 2015). Through this method, students not only acquire academic knowledge but also develop relevant life skills that are valuable and impactful in society.

Conclusion

The results of the study can be summarized as follows. Students' digital literacy achieved the highest average total score of 78.91, categorized as intermediate. Students' socio-cultural awareness obtained an average total score of 75.43, also categorized as intermediate. Meanwhile, students' problem-solving skills scored an average total of 74.49, falling into the basic category.

There is a need to develop alternative learning programs that effectively enhance students' digital literacy, problem-solving skills, and socio-cultural awareness. One viable approach is project-based learning, which directly integrates the use of technology and addresses real-life issues at both local and global levels.

Recommendations

The subsequent research will focus on developing a project-based digital learning tool integrated with Balinese Hindu local wisdom to enhance digital literacy, problem-solving skills, and socio-cultural awareness among biology education students.

Acknowledgments

The authors gratefully acknowledge the financial support provided by PPAPT, BPI, and LPDP for this research.

Reference

Aadzaar, R. M., & Widjajanti, D. B. (2019). Multimedia: An Alternative to Improve Self-Regulated Learning and Mathematical Problem-Solving Skills. *Journal of Physics: Conference Series*, *1320*(1), 012086. https://doi.org/10.1088/1742-6596/1320/1/012086

Albay, E. M. (2020). Towards a 21st Century Mathematics Classroom: Investigating the Effects of The Problem-Solving Approach Among Tertiary Education Students. *Asia-Pacific Social Science Review*, *20*(2), 69–86. https://doi.org/10.59588/2350-8329.1303

Aliu, J., & Aigbavboa, C. (n.d.). Reviewing Problem-Solving as a Key Employability Skill for Built Environment Graduates. *International Conference on Construction in the 21st Century*, London. Retrieved May 16, 2025, from https://www.scopus.com/record/display.uri?eid=2-s2.0-85101659191&origin=scopusAI

Annan-Brew, R. K., Ezugwu, I. J., Surman, S. H., & Dadzie, J. (2024). Enhancing Pre-Service Teacher Effectiveness: Integration of 21st-century skills during off-campus teaching experiences. *European Journal of Education*, *59*(4), e12737. https://doi.org/10.1111/ejed.12737

Berganio, M. E. C., Tanpoco, M. R., & Dumagay, A. H. (2024). Pre-service Teachers' Perceived Level of Digital Literacy: A Quantitative Study from a Developing Country. *Lecture Notes in Networks and Systems*, *1101*, 158–167. https://doi.org/10.1007/978-3-031-68675-7_16

Black, H. T., & Duhon, D. L. (2006). Assessing the Impact of Business Study Abroad Programs on Cultural Awareness and Personal Development. *Journal of Education for Business*, *81*(3), 140–144. https://doi.org/10.3200/JOEB.81.3.140-144

Bunch-Crump, K., & Hitt, S. B. (2025). Cultural Self-Awareness: An Initial Step in Home-School Partnerships. *Teaching Exceptional Children*, *57*(3), 234–242. https://doi.org/10.1177/00400599231188356

Chapman, R., Martin, C., & Smith, T. (2014). Evaluation of Staff Cultural Awareness Before and After Attending Cultural Awareness Training in an Australian Emergency Department. *International Emergency Nursing*, *22*(4), 179–184. https://doi.org/10.1016/j.ienj.2013.11.001

Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education* (8th ed.). Routledge.

Dewi, C. A., Awaliyah, N., Fitriana, N., Darmayani, S., Nasrullah, Setiawan, J., & Irwanto, I. (2022). Using Android-Based E-Module to Improve Students' Digital Literacy on Chemical Bonding. *International Journal of Interactive Mobile Technologies*, *16*(22), 191–208. https://doi.org/10.3991/ijim.v16i22.34151

Dewi, G. A. C., Sunarno, W., & Supriyanto, A. (2019). The Needs Analysis on Module Development Based on Creative Problem Solving Method to Improve Students' Problem Solving Ability. *Journal of Physics: Conference Series*, *1153*(1), 012129. https://doi.org/10.1088/1742-6596/1153/1/012129

Drossel, K., Eickelmann, B., & Vennemann, M. (2020). Schools Overcoming the Digital Divide: In Depth Analyses Towards Organizational Resilience in The Computer and Information Literacy Domain. *Large-Scale Assessments in Education*, *8*(1), 9. https://doi.org/10.1186/s40536-020-00087-w

Greenstein, L. (2012). *Assessing 21st century skills: A Guide to Evaluating Mastery and Authentic Learning*. Corwin.

Husin, M., Usmeldi, Masdi, H., Simatupang, W., Fadhilah, & Hendriyani, Y. (2025). Project-Based Problem Learning: Improving Problem-Solving Skills in Higher Education Engineering Students [Aprendizaje de Problemas basado en Proyectos: Mejora de las Habilidades de Resolución de Problemas en Estudiantes de Ingeniería de Educación Superior]. *International Journal of Sociology of Education*, *14*(1), 62–84. https://doi.org/10.17583/rise.15125

Karatas, I., & Baki, A. (2013). The Effect of Learning Environments Based on Problem Solving on Students' Achievements Of Problem Solving. *International Electronic Journal of Elementary Education*, *5*(3), 249–267. https://www.scopus.com/record/display.uri?eid=2-s2.0-84880945478&origin=scopusAI

Kasemsap, K. (2017). Digital Storytelling and Digital Literacy: Advanced Issues And Prospects. In *Deconstructing the Education-Industrial Complex in the Digital Age* (pp. 151–171). IGI Global. https://doi.org/10.4018/978-1-5225-2101-3.ch009

Kim, J., Heo, J., Lee, I. H., Suh, W., & Kim, H. (2015). The Contribution of Organized Activity to Cultural Sensitivity and Personal and Social Development: A Structural Equation Model. *Social Indicators Research*, *120*(2), 499–513. https://doi.org/10.1007/s11205-014-0593-y

Kuntjara, E. H. (2019). Students' Reflection on Their Service-Learning Experience as a Way of Fostering Critical Thinking and as a Peace Building Initiative. *Citizenship Teaching and Learning*, *14*(2), 225–237. https://doi.org/10.1386/ctl_00007_1

Kuo, N. C. (2024). Using Culturally Relevant pedagogy With All Children and Families. In *Early Childhood Special Education Programs and Practices* (pp. 23–39). Taylor and Francis. https://doi.org/10.4324/9781003523932-2

Leedy, P. D., & Ormrod, J. E. (2021). *Practical Research: Planning and Design* (2nd ed.). Pearson Education.

Makdee, S., Boontarig, W., & Puttasomsri, L. (2023). The Design and Implement of Digital Literacy Tracking System for Undergraduate Students. *7th International Conference on Information Technology, InCIT 2023*, 503–507. https://doi.org/10.1109/InCIT60207.2023.10413068

Odede, I., & Jiyane, G. (2019). Exploring Dimensional Constructs of Digital Literacy Skills for Higher Education. *Library Philosophy and Practice*, *2019*, 2806. https://www.scopus.com/record/display.uri?eid=2-s2.0-85072936967&origin=scopusAI

Parveen, A., Bashir, F., Nazir, A., Zimik, P. N., & Jan, S. (2024). Pedagogical Strategies for Developing Digital Literacy. In *Digital Literacy at the Intersection of Equity, Inclusion, and Technology* (pp. 251–269). https://doi.org/10.4018/979-8-3693-2591-9.ch011

Pope, K., Hewlin-Vita, H., & Chu, E. M. Y. (2023). The Human Library and the Development of Cultural Awareness and Sensitivity in Occupational Therapy Students: A Mixed Methods Study. *Frontiers in Medicine*, *10*, 1215464. https://doi.org/10.3389/fmed.2023.1215464

Rodil, M. S. P. (2024). Gearing towards Efficient Problem Solving: Exploring the Determinants That Influence Success. *Journal of Interdisciplinary Studies in Education*, *13*(2), 120–151. https://doi.org/10.32674/thv32d10

Sharif, M. Z., Lee, M. F., & Ab Rahman, A. (2021). Critical Thinking and Problem Solving Skills Comprehension Level Among Vocational Education Undergraduates [Nivel de Comprensión de las Habilidades de Pensamiento Crítico y Resolución de Problemas entre los Estudiantes de Formación Profesional]. *Estudios de Economia Aplicada*, *39*(10). https://doi.org/10.25115/eea.v39i10.5627

Shemshadsara, Z. G. (2012). Developing Cultural Awareness in Foreign Language Teaching. *English Language Teaching*, *5*(3), 95–99. https://doi.org/10.5539/elt.v5n3p95

Temirkhanova, M., Abildinova, G., & Karaca, C. (2024). Enhancing Digital Literacy Skills Among Teachers for Effective Integration of Computer Science and Design Education: A Case Study at Astana International School, Kazakhstan. *Frontiers in Education*, *9*, 1408512. https://doi.org/10.3389/feduc.2024.1408512

Tican, C., & Deniz, S. (2019). Pre-service Teachers' Opinions About the Use of 21st Century Learner and 21st Century Teacher Skills. *European Journal of Educational Research*, *8*(1), 181–197. https://doi.org/10.12973/eu-jer.8.1.181

Tsai, H. H. (2010). Development of an Inventory of Problem-Solving Abilities of Tertiary Students Majoring in Engineering Technology. *World Transactions on Engineering and Technology Education*, *8*(3), 268–272. https://www.scopus.com/record/display.uri?eid=2-s2.0-84904067777&origin=scopusAI

Uyun, M., Fahmi, I., Fitriani, Alimron, & Pratama, I. P. (2024). The Role of Local Wisdom, Cultural Values, and Religious Values on Cultivating Social Awareness and Enhancing Integrity in Students. *Humanities and Social Sciences Letters*, *12*(4), 1224–1238. https://doi.org/10.18488/61.v12i4.3906

Valtonen, T., Hoang, N., Sointu, E., Näykki, P., Virtanen, A., Pöysä-Tarhonen, J., Häkkinen, P., Järvelä, S., Mäkitalo, K., & Kukkonen, J. (2021). How Pre-Service Teachers Perceive Their 21st-Century Skills and Dispositions: A Longitudinal Perspective. *Computers in Human Behavior*, *116*, 106643. https://doi.org/10.1016/j.chb.2020.106643

Wu, J. S., Chuo, T. W., & Yen, S. C. (2015). Cultural Sensitivity Training Task: An Avenue of Enhancing Students' Cultural Awareness and its Perspectives of Web-Based Learning. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *8390*, 244–252. https://doi.org/10.1007/978-3-662-46315-4_25

Yadav, S. (2024). Enhancing Digital Competencies of Teachers: A Roadmap for Modern Educators in the Digital Era. In *Fostering Teacher Skills and Critical Thinking in Modern Education* (pp. 109–134). IGI Global. https://doi.org/10.4018/979-8-3373-1692-5.ch005