Journal of Education and Learning Technology (JELT)
ISSN 2720-7730 Volume 7 Issue 2 2026 pp 180 - 196
Available online at: https://noyam.org/journals/jelt/
DOI: https://doi.org/10.38159/jelt.20267212

The role of reflective practice in fostering collaborative learning for information technology students

Moretlo Tlale-Mkhize [1]

[1] Central University of Technology, Free State, South Africa.

ABSTRACT

This theoretical paper examines the significance of reflective practice in collaborative learning environments among Information Technology students. Many first-year Information Technology students struggle to collaborate effectively on assigned projects. Reflective practice has recently gained prominence in teaching and training. Integrating reflective practice within collaborative learning gives Information Technology students a transformative method to enhance their skills of working with others. Collaborative learning facilitates shared experiences that cultivate reflective skills, enabling students to evaluate their learning processes and results. Situated learning theory is adopted in this study, as it posits that participation in context and within communities of practice is the most effective way of acquiring new knowledge. This research employed qualitative methods complemented by a systematic literature review. Databases, such as Google Scholar, ScienceDirect, Scopus, and ProQuest, were used. This paper addresses two inquiries: the contribution of reflective practice to critical thinking development in collaborative settings and the challenges faced by students in collaborative learning, along with strategies for their resolution. This study argues that reflective practice allows IT students to critically assess their experiences and enhance their problem-solving skills. Industry prioritises graduates who can apply specialised knowledge in group contexts. Through reflective engagement, students are able to critically reflect on their actions, thereby improving their collaborative effectiveness in team settings. The research identifies strategies to strengthen students' critical thinking, teamwork, and practical application of theoretical knowledge, ultimately equipping them for IT industry challenges. This study contributes a framework for enhanced learning outcomes to the body of knowledge.

Keywords: Reflective Practice, Collaborative Learning, Information Technology, Problem-Solving Skills, Critical Thinking

INTRODUCTION

The rapid advancement of the Information Technology (IT) sector necessitates professionals who excel in technical skills, teamwork, critical thinking, and adaptability. To meet these demands, educational methodologies that combine theoretical knowledge with practical experiences are increasingly vital. This is also a fundamental expectation of the industry and the accrediting bodies, which increasingly recognise the importance of soft skills of communication, cooperation, and conflict resolution in the

CORRESPONDENCE – Moretlo Tlale-Mkhize Email: ctlale@cut.ac.za
PUBLICATION HISTORY - Received : 9th September, 2025 | Accepted: 2nd February, 2026 | Published: 12th March, 2026.
TO CITE THIS ARTICLE –Tlale-Mkhize, Moretlo. "The role of reflective practice in fostering collaborative learning for information technology students." *Journal of Education and Learning Technology* 7, no.2 (2026): 180 - 196. https://doi.org/10.38159/jelt.20267212

technical areas.[1] The relentless growth of Information and Communication Technologies continues to highlight this importance, changing the nature of work and the requirement for people to interact with their specialised knowledge in a group context.[2] The long-standing siloed approach to IT education must give way to teaching and learning practices that cultivate students' capacity for collaboration and group work skills.[3] This is all the more important in view of the widespread use of technologies that support and assist in collaborative work, where students are expected to learn not only teamwork, but the real use of teamwork in rich environments of technology.[4] Actually, students are not passive receptors of knowledge; doing little work in the group is not sufficient to become a good team player.[5] They require a more deliberate approach and development of the skills, which is a characteristic that many employers seek.[6] In particular, this paper examines the IT students' reflective practices on their thoughts and actions regarding their collaborative work undertaken in a group with the aim of enhancing their collective problem-solving and innovation abilities.

This paper focuses on active, student-centred approaches that prepare learners for multifaceted practical challenges in IT.[7] This also relates to providing key skills to survive in a globalised environment, such as critical thinking, active communication, and information technology.[8] Technology in education as a means of instruction aids in the development of higher-order thinking and reasoning skills, which are very important to graduates entering the IT industry.[9] Thoughtful reflection can formulate the practice of students in such a manner that the students are able to learn from the activities that are carried out, promoting a more profound understanding and skill refinement that is essential for their professional development.[10] This understanding goes beyond the technical abilities to the essential reasoning and self-evaluation that is important for improvement in professional settings. It also assists in the cultivation of the reflexive, flexible frame of mind that enables IT students to easily adapt to the vertical and horizontal changes in technology and to add new ideas and practices to their group work.[11] The multifaceted integration of reflective practice into collaborative settings aims to achieve a holistic development of a learner by nurturing the essential skills of technical expertise and the high-demand soft skills of critical thinking in the contemporary IT industry.[12] The ability to analyse, synthesise and evaluate information in order to arrive at a reasonable conclusion is considered to form the essence of critical thinking, and the development of such is deemed necessary at the level of tertiary

---

[1] Aimao Zhang, "Peer Assessment of Soft Skills and Hard Skills," *Journal of Information Technology Education: Research* 11 (2012): 155–68, https://doi.org/10.28945/1634.

[2] Nguyen Tan Hung, "The Impact of ICTs on Collaborative Learning: A Literature Review," *Innovations in Information and Communication Technology Series*, February 28, 2021, 46–52, https://doi.org/10.46532/978-81-950008-7-6_004; Anu A. Gokhale, "Collaborative Learning and Critical Thinking," in *Encyclopedia of the Sciences of Learning* (Boston, MA: Springer US, 2012), 634–36, https://doi.org/10.1007/978-1-4419-1428-6_910.

[3] Anil Kumar Dubey et al., "Pragmatic Study on HCI Laws," *International Journal of Science, Engineering and Technology Research (IJSETR)* 3, no. 12 (2014).

[4] Olga Kozar, "Towards Better Group Work: Seeing the Difference between Cooperation and Collaboration.," in *English Teaching Forum*, vol. 48 (ERIC, 2010), 16–23.

[5] Aparajita Jaiswal et al., "A Reflection on Action Approach to Teamwork Facilitation," in *Proceedings ASEE Annual Conference*, 2022.

[6] Theda Ann Thomas, "Developing Team Skills through a Collaborative Writing Assignment," *Assessment & Evaluation in Higher Education* 39, no. 4 (2014): 479–95.

[7] André Vasconcelos et al., "Applying Gestalt Approach as a Method for Teaching Computer Science Practice in the Classroom: A Case Study in Primary Schools in Brazil," *Education and Information Technologies* 28, no. 2 (February 16, 2023): 2383–2403, https://doi.org/10.1007/s10639-022-11278-z.

[8] Janette B Torrato, Maricar S Prudente, and Socorro E Aguja, "Technology Integration, Proficiency and Attitude: Perspectives from Grade School Teachers," in *Proceedings of the 2020 11th International Conference on E-Education, E-Business, E-Management, and E-Learning*, 2020, 70–75.

[9] Ruth Swart, "Purposeful Use of Technology to Support Critical Thinking," *JOJ Nursing & Health Care* 4, no. 1 (August 28, 2017), https://doi.org/10.19080/JOJNHC.2017.04.555626.

[10] Sven Veine et al., "Reflection as a Core Student Learning Activity in Higher Education - Insights from Nearly Two Decades of Academic Development," *International Journal for Academic Development* 25, no. 2 (April 2, 2020): 147–61, https://doi.org/10.1080/1360144X.2019.1659797.

[11] Fan Chen and Gaowei Chen, "Technology-Enhanced Collaborative Inquiry in K–12 Classrooms: A Systematic Review of Empirical Studies," *Science & Education* 34, no. 3 (June 3, 2025): 1731–73, https://doi.org/10.1007/s11191-024-00538-8.

[12] Nguyen-Thinh Le, "How Do Technology-Enhanced Learning Tools Support Critical Thinking?," in *Frontiers in Education*, vol. 4 (Frontiers Media SA, 2019), 126.

education.[13] Furthermore, the ability to engage in RP means one is able to go through their learning processes with the aim of altering deep-seated assumptions and having a flexible approach, a necessity in the contemporary world of IT, owing to the fact that change is the order of the day.[14] By contextualising learning in real-world situations, IT students can effectively connect classroom theories with industry practices, utilising reflection to enhance their skills and adaptability. This combined emphasis on collaboration and reflection not only improves technical skills but also develops the interpersonal and problem-solving abilities crucial for success in the IT domain.

This paper investigates the role of reflective practice (RP) within collaborative learning for IT students. Reflective activities such as peer reviews and project debriefs can facilitate student autonomy, improve team dynamics, and develop essential skills for success in a dynamic industry. This can be done through problem-solving activities. By integrating RP into collaborative learning, educators can foster a transformative educational experience that prepares IT students for academic and professional achievement. The paper starts with the underpinning theory: situated learning theory, followed by the methodology. Reflective practice for IT students, the role of RP in collaborative learning, and challenges experienced in collaborative learning for students are presented. A conceptual framework of this research is given, and it is then followed by the findings.

Underpinning Theory: Situated Learning Theory

The concept of situated learning theory emphasises that learning is a community-centric process that is integrated with context and practical engagement.[15] This theory enhances RP and collaborative learning for IT students by emphasising context, integrating classroom and field experiences for holistic learning.[16] It facilitates cohesive learning by integrating classroom and real-world experiences, promoting formal and informal education across varied settings.

Situated learning theory significantly advances RP and collaborative learning for IT students. By emphasising context and real-life applications, the theory cultivates an environment for deep engagement, effective collaboration, and reflective learning. It promotes the use of real-world scenarios, facilitating the application of theoretical knowledge, and emphasises social interaction in a "community of practice."[17]

This theory is pertinent to this study as it supports IT students in programming contexts. It encourages deeper dialogue and comprehension among peers. Situated learning theory enhances RP and collaborative learning for IT students by contextualising knowledge.[18] By situating learning in varied contexts, students participate in meaningful praxis, fostering a deeper understanding of concepts in collaborative settings. The theory is crucial in promoting collaborative learning through contextual emphasis and social interaction, supporting integration across formal and informal learning environments.

METHODOLOGY

This research employed qualitative methods complemented by a systematic literature review (SLR). The qualitative approach is most suitable for this study because it aimed not to gather new data but to interpret existing information, establish new connections, identify thematic variations, and explore the relationships between RP and collaborative learning, particularly in IT Education. The SLR provided

[13] Raafat George Saadé, Danielle Morin, and Jennifer D.E. Thomas, "Critical Thinking in E-Learning Environments," *Computers in Human Behavior* 28, no. 5 (September 2012): 1608–17, https://doi.org/10.1016/j.chb.2012.03.025.

[14] Patricia Raber Hedberg, "Learning Through Reflective Classroom Practice," *Journal of Management Education* 33, no. 1 (February 15, 2009): 10–36, https://doi.org/10.1177/1052562908316714; Minna Saunila and Juhani Ukko, "Reflective Practice as a Determinant of Performance Outcomes in Services," *International Journal of Quality and Service Sciences* 7, no. 4 (November 16, 2015): 392–403, https://doi.org/10.1108/IJQSS-02-2015-0015.

[15] Sue Sentance and Simon Humphreys, "Understanding Professional Learning for Computing Teachers from the Perspective of Situated Learning," *Computer Science Education* 28, no. 4 (2018): 345–70.

[16] Gustavo Zurita and Nelson Baloian, "Situated Learning Theory and Geo-Collaboration for Seamless Learning," in *Seamless Learning in the Age of Mobile Connectivity* (Springer, 2015), 181–200.

[17] Zurita and Baloian, "Situated Learning Theory and Geo-Collaboration for Seamless Learning."

[18] Rod Pederson, "Situated Learning: Rethinking a Ubiquitous Theory," *Journal of Asia TEFL* 9, no. 2 (2012).

a structured and replicable method for finding and evaluating peer-reviewed evidence relevant to the research question, and for synthesising knowledge from this evidence.

For the review, the SLR was finalised guided by best practices for evidence synthesis, particularly the clear articulation of search queries, inclusion and exclusion parameters, screening, and data extraction procedures. The review was narrowed down to research studies on RP and collaborative learning with the IT student learning environments at the tertiary level. Searches were performed on the following databases: Google Scholar, Taylor and Francis, Scopus, ProQuest, Elsevier and ScienceDirect. The studies had to be published from 2010 to 2025 so that current trends on reflective and collaborative pedagogies in IT education would be reviewed.

Table 1: The inclusion and exclusion criteria for the role of reflective practice in fostering collaborative learning for IT students

Inclusion Criteria:	Exclusion Criteria:
Conference papers and articles accepted in peer-reviewed journals.	Papers and other sources that were not peer-reviewed or that are not academic in nature.
Research focused on teaching and learning context, and/or IT education and/or problem-based learning.	Research that has no connection to the teaching and learning context.
Reflective practice and/or collaboration in the research.	Research that discusses only technical abilities without pedagogy
Publications in the English language.	Full text not available and duplicate publications.
Theoretical and/or empirical studies	

The total number of papers that were reviewed is 78.

Reflective practice for Information Technology students

RP is essential for promoting critical thinking and deeper comprehension in collaborative learning contexts. This is more so for students at the University of Technology who are enrolled on the programming module. RP is essential for IT students, enhancing adaptability and problem-solving capabilities.[19] By nurturing these dispositions, educators enhance students' competency for dynamic professional challenges. RP for IT students includes both reflection-in-action and reflection-on-action.[20] This iterative process strengthens problem-solving skills and identifies knowledge gaps, preparing students for industry challenges through project-based learning. It also promotes critical thinking and self-awareness, essential for IT students' professional development amid technological advancements.[21] RP deepens understanding, connects concepts, and highlights strengths and areas for improvement, fostering collaborative learning and professional growth in computing education.

RP enables self-assessment and strategic recalibration of one's actions, which cumulatively enhances the level of decision-making sophistication required to cope with multifaceted scenarios in

[19] Jason K. McDonald, "Preparing Instructional Design Students for Reflective Practice," in *The Instructional Design Trainer's Guide* (New York: Routledge, 2022), 29–37, https://doi.org/10.4324/9781003109938-4.

[20] Ali Amran et al., "Analysis of Critical Thinking, Creativity, Communication, and Collaboration Skills (4C) for Junior High School Students," in *Proceedings of the 3rd International Conference on Biology, Science and Education (IcoBioSE 2021)* (Springer Nature, 2023), 191.

[21] Juanita T Janse van Rensburg and Roelien Goede, "A Reflective Practice Approach for Supporting IT Skills Required by Industry through Project-Based Learning," in *Annual Conference of the Southern African Computer Lecturers' Association* (Springer, 2018), 253–66; Neeta Baporikar, "Reflective Teaching and Technology Integration in Management Education," in *Research Anthology on Business and Technical Education in the Information Era* (IGI Global, 2021), 435–52, https://doi.org/10.4018/978-1-7998-5345-9.ch024.

Information Technology.[22] This includes advanced thinking capabilities such as constructing techniques for reflection, evaluating the quality of judgments concerning different views, and probing the underlying assumptions.[23] Complex IT issues require evidence-based, decisive thinking; therefore, strong thinking skills and self-assessment capabilities are paramount for efficient strategic self-modification, which reflective thinking indeed anchors.[24] Critical thinking formation is one of the pivotal skills that ensure students' academic success and occupational effectiveness; the burden rests heavily on educational institutions.[25] IT educators have the professional ethos to help students gain not only technical and professional knowledge but also lifelong learning tools, which reflect organisational metacognitive skills of learning and applying self-adaptive strategies of changing the thinking framework within the domain.[26] It is the focus on reflective teaching practices that can help the students with the core issues of critical analysis, collaborative work, and flexibility, as there is a growing demand for modern workforce skills, and for less emphasis on rigid and mechanical learning.[27] The practice of thinking critically and creatively about any issue is the focus of educational practice, the importance of which rests on its positive correlation with the learning gain and self-efficacy of the students.[28] Hence, the metacognitive approach,

The development of RP depends on critical thinking.[29] Flores argued that stressing cognitive skills is important.[30] This has often been pointed out by many that graduates lack critical thinking skills that are important for working and taking up leadership positions.[31]

The role of reflective practice in collaborative learning

Collaborative work is vital for IT students to confront real-world tech industry challenges.[32] Key strategies for enhancing collaborative learning include establishing clear goals and expectations to align group efforts and accountability. Group projects that necessitate the collective application of technical skills are encouraged, such as software development or research initiatives.[33] Additionally, pair programming enhances coding skills and teamwork.[34] This method not only enhances coding skills but also fosters communication and teamwork. Reflective practice is essential for collaborative learning, guiding teamwork management, enhancing decision-making, and fostering deeper understanding.[35] It also enables critical assessment of experiences to enhance understanding and improve outcomes.[36]

---

[22] Amran et al., "Analysis of Critical Thinking, Creativity, Communication, and Collaboration Skills (4C) for Junior High School Students."

[23] Amran et al., "Analysis of Critical Thinking, Creativity, Communication, and Collaboration Skills (4C) for Junior High School Students."

[24] Yeon Hee Kim et al., "Effects of a Work-Based Critical Reflection Program for Novice Nurses," *BMC Medical Education* 18, no. 1 (December 27, 2018): 30, https://doi.org/10.1186/s12909-018-1135-0.

[25] Catalina Cortázar et al., "Promoting Critical Thinking in an Online, Project-Based Course," *Computers in Human Behavior* 119 (June 2021): 106705, https://doi.org/10.1016/j.chb.2021.106705.

[26] Kim et al., "Effects of a Work-Based Critical Reflection Program for Novice Nurses."

[27] Kristi Giselsson, "Critical Thinking and Critical Literacy: Mutually Exclusive?," *International Journal for the Scholarship of Teaching and Learning* 14, no. 1 (May 31, 2020), https://doi.org/10.20429/ijsotl.2020.140105.

[28] Hilda Martínez-Huamán, Josué Edison Turpo-Chaparro, and Carlos D Abanto-Ramírez, "Psychometric Properties of the Critical Thinking Disposition Scale in Peruvian Adolescents," in *Frontiers in Education*, vol. 10 (Frontiers Media SA, 2025), 1537797.

[29] Silvia F. Rivas, Carlos Saiz, and Carlos Ossa, "Metacognitive Strategies and Development of Critical Thinking in Higher Education," *Frontiers in Psychology* 13 (June 15, 2022), https://doi.org/10.3389/fpsyg.2022.913219.

[30] KEVIN L. FLORES et al., "Deficient Critical Thinking Skills among College Graduates: Implications for Leadership," *Educational Philosophy and Theory* 44, no. 2 (January 9, 2012): 212–30, https://doi.org/10.1111/j.1469-5812.2010.00672.x.

[31] Brenda Ping Ping Yong and Ying-Leh Ling, "Skills Gap: The Perceptions of Importance of Soft Skills in Graduate Employability between Employers and Graduates," *Journal of Techno-Social* 15, no. 1 (2023): 16–33.

[32] Maria Cristina Rodriguez-Sanchez, Pinaki Chakraborty, and Norberto Malpica, "International Collaborative Projects on Digital Electronic Systems Using Open Source Tools," *Computer Applications in Engineering Education* 28, no. 4 (2020): 792–802.

[33] Hany Liana Masri and Khairul Shafee Kalid, "GrouPro: Developing a Group-Formation System to Support Collaborative Learning in Group Projects," in *2019 6th International Conference on Research and Innovation in Information Systems (ICRIIS)* (IEEE, 2019), 1–6.

[34] Caio Matheus Campos de Oliveira et al., "Improving Student's Learning and Cooperation Skills Using Coding Dojos (in the Wild!)," in *2018 IEEE Frontiers in Education Conference (FIE)* (IEEE, 2018), 1–8.

[35] Marietjie Havenga, "Reflective Team Meetings: A Learning Experience for First-Year Engineering Students in Joint Projects," in *2018 IEEE Global Engineering Education Conference (EDUCON)* (IEEE, 2018), 314–19.

[36] Georgina Barton, "Reflective Practice in Music: A Collaborative Professional Approach," in *Teaching Reflective Learning in Higher Education* (Cham: Springer International Publishing, 2015), 65–76, https://doi.org/10.1007/978-3-319-09271-3_5.

Central to RP is the deliberate analysis of one's thoughts and actions within a learning environment. This approach encourages consideration of both learned content and learning processes, fostering deeper insights into individual and group dynamics.[37] In collaborative settings, RP promotes transparent communication and mutual comprehension among team members.[38] Engaging in reflective dialogues allows participants to examine various perspectives, refine their thoughts, and express their experiences.[39] Such exchanges enrich learning experiences and cultivate a sense of community and trust vital for effective collaboration.[40] When individuals feel secure in sharing their reflections, they are more inclined to engage and contribute substantially to group discussions and tasks.[41]

Furthermore, RP augments critical thinking skills, enabling learners to discern patterns, scrutinise assumptions, and challenge established knowledge frameworks.[42] This critical perspective allows participants to collectively evaluate successes and failures, deriving lessons that guide future actions and strategies.[43] The iterative nature of reflection and action not only enhances individual capabilities but also nurtures a culture of continuous improvement within the group.[44] Additionally, incorporating RP into collaborative learning fosters accountability and ownership among participants.[45] When individuals contemplate their contributions and their effects on group objectives, they cultivate a stronger sense of responsibility for their own learning and that of their peers.[46] This shared accountability promotes a more engaged learning environment, where each member is committed to the overall success of the group. Ultimately, the interaction between RP and collaborative learning establishes a dynamic ecosystem that encourages deeper learning, innovation, and growth.[47]

By emphasising reflection as a core aspect of collaboration, learners can gain new insights, improve interpersonal skills, and create a solid framework for lifelong learning.[48] This approach enables individuals to assume responsibility for their educational pathways while cultivating an environment of trust and support, which is essential for fostering creativity and resilience within the collective.[49] Such a culture promotes open dialogue and feedback, allowing members to constructively challenge one another's ideas while embracing diverse perspectives that enhance the learning

[37] Sandra Schruijer, "Working with Group Dynamics While Teaching Group Dynamics in a Traditional Classroom Setting: An Illustration of a Systems-Psychodynamic Point of View," *Team Performance Management* 22, no. 5–6 (2016): 257–68; Nadia Rania, Ilaria Coppola, and Laura Pinna, "Reflective Practices to Study Group Dynamics: Implement Empowerment and Understand the Functioning of Groups," *Frontiers in Psychology* 12 (November 29, 2021), https://doi.org/10.3389/fpsyg.2021.786754.

[38] Guanqun Liu and Xiangdong Chen, "The Design of Collaborative Reflective Activity Based on Shared-Regulation," in *2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)* (IEEE, 2020), 104–8.

[39] I. Meijlof, "Reflective Dialogue in Professional Learning Communities" (University of Twente, 2018); María Concepción Bort Albarracín and Manoli Pifarré, "Using Blogs to Promote Reflective Dialogue in Vocational Education," *International Journal of Technology Enhanced Learning* 10, no. 3 (2018): 235, https://doi.org/10.1504/IJTEL.2018.092706.

[40] Hungwei Tseng, Hsin-Te Yeh, and Yingqi Tang, "A Close Look at Trust Among Team Members in Online Learning Communities," *International Journal of Distance Education Technologies* 17, no. 1 (January 2019): 52–65, https://doi.org/10.4018/IJDET.2019010104.

[41] Lina Nguyen et al., "Relationships Matter! Social Safeness and Self-disclosure May Influence the Relationship between Perceived Social Support and Well-being for In-person and Online Relationships," *Journal of Applied Social Psychology* 52, no. 12 (December 16, 2022): 1211–20, https://doi.org/10.1111/jasp.12921.

[42] Carolyn Mair, "How Technology Can Facilitate Students' Reflective Practice," *Dialogue* 1 (2011): 1–4.

[43] Clémentine Schelings and Catherine Elsen, "Assessing Participation: Toward Long-Term Experiences, Trajectories and Maturity," *Architecture* 2, no. 3 (2022): 518–43.

[44] Elisa Bindels et al., "Sharing Reflections on Multisource Feedback in a Peer Group Setting: Stimulating Physicians' Professional Performance and Development," *Academic Medicine* 96, no. 10 (October 4, 2021): 1449–56, https://doi.org/10.1097/ACM.0000000000004142.

[45] Dewi Rawani et al., "The Reflective Teaching Practices Using PMRI and Collaborative Learning," *Jurnal Pendidikan Matematika* 17, no. 1 (2023): 69–88.

[46] Simone Volet et al., "Individual Contributions in Student-Led Collaborative Learning: Insights from Two Analytical Approaches to Explain the Quality of Group Outcome," *Learning and Individual Differences* 53 (2017): 79–92.

[47] L. F. S. Sidgi, "The Benefits of Using Collaborative Learning Strategy in Higher Education," *International Journal of English Literature and Social Sciences* 7, no. 6 (2022): 217–24.

[48] Margaret M Plack and Anita Santasier, "Reflective Practice: A Model for Facilitating Critical Thinking Skills within an Integrative Case Study Classroom Experience," *Journal of Physical Therapy Education* 18, no. 1 (2004): 4–12.

[49] Paula Hueso Espinosa, Stefan Persaud, and Elisa Giaccardi, "Myrubric, a Co-Creative Journey to Activate Resilient Learning Communities," in *24th International Conference on Engineering and Product Design Education: Disrupt, Innovate, Regenerate and Transform, E and PDE 2022* (The Design Society, 2022), EPDE2022-1336; Ronald Gardner and Tammy L Stephens-Pisecco, "Empowering Educators to Foster Student Resilience," *The Clearing House: A Journal of Educational Strategies, Issues and Ideas* 92, no. 4–5 (2019): 125–34.

experience.[50] This environment not only enhances analytical problem-solving abilities but also prepares learners to adeptly navigate the complexities of real-world challenges with assurance and flexibility.[51]

RP promotes collaborative learning by enhancing cognitive skills and student reflection.[52] Results show significant improvements in students' reflective capabilities, indicating that effective collaborative strategies foster deeper cognitive engagement. RP allows educators to critically evaluate their pedagogical methods, thereby enhancing collaborative learning.[53] It creates a supportive environment where students of varying competencies engage in problem-solving through collective experiences. This is particularly impactful for IT students engaged in programming tasks. It is reported that RP in collaborative settings encourages students to challenge their assumptions and deeply engage with diverse educational contexts, facilitating transformative learning.[54]

RP enhances collaborative learning by enabling experiential analysis and discussion.[55] This process cultivates critical thinking, self-organization, and tailored guidance, thereby enriching students' pedagogical understanding across varied educational contexts. RP also aids educators in scrutinizing personal narratives and biases, fostering inclusivity in learning environments.[56] The authors note that this strategy promotes dialogue, mentorship, and community engagement, supporting diverse perspectives and facilitating intellectual and personal development among students.

RP through self- and peer-reflection advances collaborative learning by refining goal-setting and perceived social performance.[57] Specifically, self-reflection results in more insightful goals and superior social outcomes relative to peer reflection. RP enhances collaborative learning through critical experiential analysis, documentation of learning, and development of design competencies.[58] This process engenders independence, confidence, and a profound comprehension of industry-related challenges, effectively preparing students for professional design scenarios.

Challenges experienced in collaborative learning for Information Technology students

Even though there are significant advantages provided by collaborative learning for IT students, there are also several challenges, such as fair distribution of individual workload, managing different skill levels, and promoting inter-group communications.[59] In addition, even though there exist ideal groups of balanced expertise, real-life classrooms are not able to create such groups in a manner that all students can finish their work individually, to the detriment of group discussions, while other students are likely to be quite lazy.[60] The depth of the knowledge within a particular discipline that an individual contributor possesses ought to be a major consideration, and lacking such, the group would face greater challenges, some of which may include obstacles that are also cognizant of the individual complexity, as even the best may not be able to adequately break down the knowledge into teachable bits and elevate

[50] Flávio Azevedo et al., "Towards a Culture of Open Scholarship: The Role of Pedagogical Communities," *BMC Research Notes* 15, no. 1 (December 22, 2022): 75, https://doi.org/10.1186/s13104-022-05944-1.

[51] Isnaul Maslamah and Nurita Apridiana Lestari, "Penerapan Model Pembelajaran Problem Based Learning Berbasis Environment Learning," 2021.

[52] Norhasyimah Hamzah et al., "The Effectiveness of Collaborative Learning in Improving Higher Level Thinking Skills and Reflective Skills," *Journal of Advanced Research in Applied Sciences and Engineering Technology* 42, no. 1 (March 26, 2024): 191–98, https://doi.org/10.37934/araset.42.1.191198.

[53] Espinosa, Persaud, and Giaccardi, "Myrubric, a Co-Creative Journey to Activate Resilient Learning Communities."

[54] Corné Kruger and Jan Buley, "Collaborative Learning to Foster Critical Reflection by Pre-Service Student Teachers within a Canadian–South African Partnership," *Journal of Teaching and Learning* 16, no. 3 (December 27, 2022): 69–95, https://doi.org/10.22329/jtl.v16i3.7203.

[55] Niki Lambropoulos and Charikleia Pitsou, "Blended Collaborative Learning Supporting Pedagogy Students' Reflective Practice," *Creative Education* 11, no. 10 (2020): 1930–46, https://doi.org/10.4236/ce.2020.1110141.

[56] Nuria Alonso Garcia and Sarah Elizabeth Campbell, "Co-Creating Spaces for Reflective Practice in Teacher Education," 2023, 94–119, https://doi.org/10.4018/978-1-6684-7270-5.ch005.

[57] H S Viereck, "The Influence of Self-and Peer-Reflection on Collaborative Learning in Educational Institutions," *University of Twente*, 2019.

[58] Nathan Kotlarewski et al., "Collaborative Design Education with Industry: Student Perspective by Reflection," 2017.

[59] Adrián Carruana Martín, Carlos Alario-Hoyos, and Carlos Delgado Kloos, "A Study of Student and Teacher Challenges in Smart Synchronous Hybrid Learning Environments," *Sustainability* 15, no. 15 (2023): 11694.

[60] Tong Wu et al., "The Impact of Group Discussion and Formation on Student Performance: An Experience Report in a Large CS1 Course," in *Proceedings of the 56th ACM Technical Symposium on Computer Science Education V. 1*, 2025, 1260–66.

the learning of their colleagues.[61] The context of IT, as one of the fastest advancing fields, makes the challenges even greater, since there are lower levels of technical skills required and thus greater disparities in such cohesively advancing and all properly contributing to the resolution of a given task.[62] The integration of technology in such collaborative environments also brings in a different kind of challenge, which stems from the fact that the impact of Computer Supported Collaborative Learning, as a particular type of learning, is determined by the way educational technology is used and the interactions amongst students.[63] In particular, disparities in access to the required technology, differences in levels. Technological integration is highly influenced by the advanced digital competence of students and teachers, as well as the issues related to the security and confidentiality of data on digital systems.[64]

Participating in collaborative reflection presents several challenges for students, particularly in terms of communication, inclusivity, and the management of diverse perspectives. The challenges experienced by IT students are diverse, and they include:

- Communication Barriers: Students often struggle with effective communication, especially in online settings, which can hinder collaboration and lead to misunderstandings.[65]
- Inclusivity and Safety: Creating a safe space for sharing diverse viewpoints is essential. Students may feel uncomfortable expressing their thoughts, which can limit the depth of reflection.[66]
- Time Management: Collaborative activities can consume significant class time, which may detract from other learning objectives[67] and
- Technical Difficulties: In collaborative writing, students face challenges related to research technicalities and the integration of contributions from multiple authors.[64]

The results indicate that this can be addressed by implementing structured prompts and fostering inclusive environments that encourage open sharing and consideration of different perspectives[65]. Research technicalities, communication, and collaboration during collaborative reflection are some of the challenges identified by Roxas in the research conducted.[68]

Collaboration challenges in project-based learning include priority conflicts and uncertainty in assignments.[69] The results of the paper emphasise that collaboration challenges can be addressed through a structured project-management approach, emphasising planning, communication, flexibility, and fostering an inclusive environment that supports openness and problem-solving among team members. Addressing the above-mentioned challenges is crucial for fostering effective collaborative learning environments.

---

[61] Mark Joshua Roxas, "Collaborative Research Writing in the New Normal: Students' Views, Challenges, Coping Strategies, and Takeaways," *Journal of Learning for Development* 10, no. 2 (2023): 297–311.

[62] Amal Hayati Yahya and Nurul Farhana Jumaat, "The Effectiveness of Online Collaborative Learning towards Programming Skills among Undergraduate Students in Learning Programming," *Malaysian Journal of Social Sciences and Humanities (MJSSH)* 8, no. 7 (2023): e002398–e002398.

[63] Hung, "The Impact of ICTs on Collaborative Learning: A Literature Review."

[64] Samadara Amarasinghe and Mirjam Brodacz-Geier, "ICT-Enable Teacher Professional Development from the Pedagogical Dimension for 21st Century: A Preliminary Analysis of the ICT Integration of CONTESSA Modules," in *Empowering Education in Cambodia and Sri Lanka: Quality Improvement in Teaching and Learning in the 21st Century* (Springer, 2024), 151–59.

[65] Roxas, "Collaborative Research Writing in the New Normal: Students' Views, Challenges, Coping Strategies, and Takeaways."

[66] Michael Paskevicius, Michelle Harrison, and Elizabeth Childs, "The Challenges and Opportunities to Learning in the Making Through Dialogue in Networked Spaces: A Reflection Framework for Encouraging Diverse Perspectives," in *Proceedings of the International Conference on Networked Learning*, vol. 14, 2024.

[67] Meghan Owenz, "A Collaboratively Designed Course: Student Perceptions, Challenges, and a Critical Reflection," *Teaching and Learning Inquiry* 11 (December 18, 2023), https://doi.org/10.20343/teachlearninqu.11.35.

[68] Amarasinghe and Brodacz-Geier, "ICT-Enable Teacher Professional Development from the Pedagogical Dimension for 21st Century: A Preliminary Analysis of the ICT Integration of CONTESSA Modules."

[69] Amarasinghe and Brodacz-Geier, "ICT-Enable Teacher Professional Development from the Pedagogical Dimension for 21st Century: A Preliminary Analysis of the ICT Integration of CONTESSA Modules."

CONCEPTUAL FRAMEWORK

The IT field needs teaching methods that allow students to gain the skills needed to address complex real-world challenges. Problem-solving within the IT field, be it academically or in the workplace, requires students to learn to work together in teams. Collaboration, along with constructive self-assessment, must be included in the partnerships to enhance the value of the learning experience. Thus, situated learning theory creates a solid base for understanding learning as the result of participation, interaction and engagement in real-life contexts. Figure 1 presents the conceptual framework for this paper.

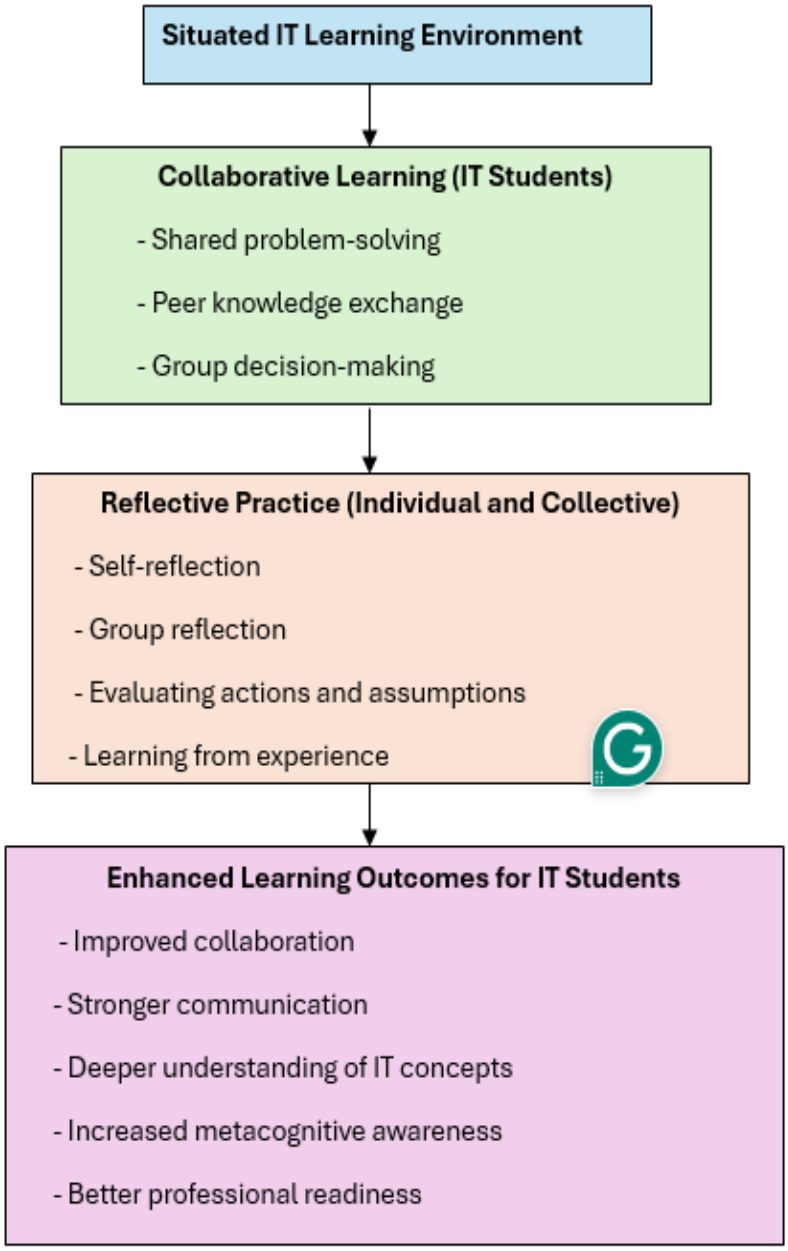

Figure 1: Reflective practice and collaborative learning conceptual framework

This conceptual framework encompasses three dimensions:

- *Situated learning theory* as the overarching structure,
- *Collaborative learning among IT students* - highlights shared problem-solving, peer knowledge exchange and group decision-making,

- *Reflective practice (individual and collective)* – self-reflection, group reflection, evaluating actions and assumptions and learning from experience,
- *Enhanced learning outcomes for IT students* – improved collaboration, stronger communication, deeper understanding of IT concepts, increased metacognitive awareness and better professional readiness.

The flexibility of the framework makes it applicable across IT modules, projects, practical work, or team assignments. It also recognises the positive and negative aspects of collaborative learning and RP in IT education.

PRESENTATION OF FINDINGS AND DISCUSSION

In programming modules, IT students are taught through teamwork and collaboration to prepare them for real-world industry challenges. It fosters important skills such as engagement in effective communication, analytical problem-solving, and making room for change, which are key factors in one's professional career.[70] Group projects and peer programming deepen the comprehension of the technical components and interpersonal ones as well.[71]

The findings of this study underscore a theoretical shift toward conceptualising RP as a foundational lens for developing versatile IT professionals. Such an advance contributes to the modified educational arrangements focused on including cooperation and advanced problem-solving as fundamental skills in reflective learning. Focusing on deliberation and systematic thinking is beneficial at this stage, as it aids students in developing a capability to assess and synthesise multitiered and multilayered cognitive constructs, a fundamental requirement of the 21st century workforce.[72] It assists students not only in achieving a better learning outcome, but also in bracing the diverse issues of the IT world, where critical and agile thinking is a requisite.[73] Through self-assessment, students gain a deeper understanding of disciplinary issues and produce technical work collaboratively. This is achieved through the combination of robust frameworks and the critical issue of developing RP skills in graduates.[74] Future research should examine how continuous RP interventions affect graduates' employability and their capacity for innovative problem-solving in IT.

Equally important, studying how various types of reflective writing, feedback reflection, and portfolio development influence the acquisition of critical thinking skills is beneficial for curriculum design. For instance, it has been pointed out that further research might evaluate the relationship between the amount of engagement and the level of reflective thinking on particular dimensions of critical thinking, like analysis, inference, and evaluation, and the standardised assessment of those dimensions.[75] Investigating how technology supports and captures RP, particularly in distributed IT collaboration, may identify new ways to foster reflective thinking. These inquiries would help to develop new approaches for integrating critical thinking and problem-solving into the curriculum, thereby equipping students for success in the 21st century.[76] This includes assessing how instructional approaches such as problem-based learning, reflection, and collaborative learning influence the development of these skills, positioning this evaluation as a central aim of the curriculum.

---

[70] McDonald, "Preparing Instructional Design Students for Reflective Practice."
[71] de Oliveira et al., "Improving Student's Learning and Cooperation Skills Using Coding Dojos (in the Wild!)."
[72] V H Elfi Susanti, "Critical Thinking Skills of 10th Grade Students and the Effect on Learning Achievement," in *3rd International Conference on Learning Innovation and Quality Education (ICLIQE 2019)* (Atlantis Press, 2020), 953–56.
[73] Patricia Nicole Benedicto and Rose Andrade, "Problem-Based Learning Strategies and Critical Thinking Skills Among Pre-Service Teachers," *International Journal of Science, Technology, Engineering and Mathematics* 2, no. 2 (June 6, 2022): 1–28, https://doi.org/10.53378/352885.
[74] Rodriguez-Sanchez, Chakraborty, and Malpica, "International Collaborative Projects on Digital Electronic Systems Using Open Source Tools."
[75] Michael L Arter, Lacey N Wallace, and Thomas L Shaffer, "The Use of Reflective Journals to Stimulate Critical Thinking in the Academic Internship," *Journal of Criminal Justice Education* 27, no. 1 (2016): 140–56.
[76] Lisnawati Rusmin et al., "Critical Thinking and Problem-Solving Skills in the 21st Century," *Join: Journal of Social Science* 1, no. 5 (August 22, 2024): 144–62, https://doi.org/10.59613/svhy3576.

Also, studying the effects of scaffolding reflection tasks on an entire program rather than individual courses could uncover more effective approaches that nurture deep and transformative critical thinking.[77] Another area of research could examine the cultural and institutional factors that shape the use and impact of RP within various contexts of IT education, which would add a more globally informed understanding of its impact.[78] In the end, more educators will be able to craft "effective" curricula that go beyond the impartation of technical know-how to include critical thinking, reflection, collaboration, and other essential skills needed from an IT professional when the above factors and the underlying dynamics are well understood.

Overall synthesis suggests that RP improves the processes of collaborative learning through RP both for individual students and peers, though the former tends to be better for goal and social outcomes. This enhances the processes of collaborative learning as well as the cohesion of the team, which is beneficial for IT students at the University of Technology. RP helps the students to examine the situation and experience as a team first, and then promotes motivation and organisation, teaching them to be critical and to adapt to different environments.

When students have mastered RP and collaborative learning, they enter the workforce being able to assess their decisions, learn from their experiences, and adapt to new technologies with agility. This closes a gap in skills and assists companies to save on onboarding and retraining, as well as on mentorship programs.

CONCLUSION

This paper examined the role of RP in collaborative learning for IT students, highlighting its significance in cultivating critical thinking, communication, and teamwork. Literature suggests that RP is effective in helping facilitate inclusivity and enhances critical thinking, which goes a long way in fostering collaborative learning. RP, for IT learners, relates theory to practice, while for learners, it aims at creating effective student engagement in the learning process. This holistic perspective ensures that learners are sufficiently prepared for their studies as well as their future careers. Practising reflective techniques and integrating such learning with practical aspects provides IT students with a rounded education. This method ensures that upon the graduates' exit, they hold the technical skills and other appropriate skills that are needed in the very fast-changing world of technology. RP also acts as a necessary tool to enhance collaborative learning between IT students, enabling RP also acts as a necessary tool to enhance collaborative learning between IT students, enabling them to acquire the cognitive and social capabilities needed to manage complex group dynamics. Students are able to apply RP to become more self-aware, more critically reflective and more flexible, such that they are active in the education they receive, the things they take for granted and work together to come up with solutions.

This study incorporated RP into collaborative learning for IT students, utilising Situated Learning Theory to facilitate authentic learning experiences. The application of RP allows IT students to apply theory into practice, especially in programming or even when developing software, as it is embedded into collaborative learning structures. Through reflective methodologies, including self- and peer-assessment, goal-setting, and experiential evaluation, students develop a profound comprehension of their contributions within a team, enhance their technical proficiencies, and bolster their problem-solving abilities. RP additionally fosters the acquisition of crucial workplace skills, encompassing communication, teamwork, and decision-making, thereby equipping students to navigate real-world challenges.

BIBLIOGRAPHY

Albarracín, María Concepción Bort, and Manoli Pifarré. "Using Blogs to Promote Reflective

[77] Raymond Boon Tar Lim et al., "Correlates, Motivating Factors, and Barriers of Engaging in Regular Self-Reflection among Public Health Students in Higher Education—A Mixed Methods Approach," *Frontiers in Public Health* 10 (November 3, 2022), https://doi.org/10.3389/fpubh.2022.1023439.

[78] Rebecca Schendel et al., "Pedagogies for Critical Thinking at Universities in Kenya, Ghana and Botswana: The Importance of a Collective 'teaching Culture'','" *Teaching in Higher Education* 28, no. 4 (May 19, 2023): 717–38, https://doi.org/10.1080/13562517.2020.1852204.

Dialogue in Vocational Education." *International Journal of Technology Enhanced Learning* 10, no. 3 (2018): 235. https://doi.org/10.1504/IJTEL.2018.092706.

Amarasinghe, Samadara, and Mirjam Brodacz-Geier. "ICT-Enable Teacher Professional Development from the Pedagogical Dimension for 21st Century: A Preliminary Analysis of the ICT Integration of CONTESSA Modules." In *Empowering Education in Cambodia and Sri Lanka: Quality Improvement in Teaching and Learning in the 21st Century*, 151–59. Springer, 2024.

Amran, Ali, Nidya Fitri, Afriwes Afriwes, and Alfadila Hasan. "Analysis of Critical Thinking, Creativity, Communication, and Collaboration Skills (4C) for Junior High School Students." In *Proceedings of the 3rd International Conference on Biology, Science and Education (IcoBioSE 2021)*, 191. Springer Nature, 2023.

Arter, Michael L, Lacey N Wallace, and Thomas L Shaffer. "The Use of Reflective Journals to Stimulate Critical Thinking in the Academic Internship." *Journal of Criminal Justice Education* 27, no. 1 (2016): 140–56.

Azevedo, Flávio, Meng Liu, Charlotte R. Pennington, Madeleine Pownall, Thomas Rhys Evans, Sam Parsons, Mahmoud Medhat Elsherif, Leticia Micheli, and Samuel J. Westwood. "Towards a Culture of Open Scholarship: The Role of Pedagogical Communities." *BMC Research Notes* 15, no. 1 (December 22, 2022): 75. https://doi.org/10.1186/s13104-022-05944-1.

Baporikar, Neeta. "Reflective Teaching and Technology Integration in Management Education." In *Research Anthology on Business and Technical Education in the Information Era*, 435–52. IGI Global, 2021. https://doi.org/10.4018/978-1-7998-5345-9.ch024.

Barton, Georgina. "Reflective Practice in Music: A Collaborative Professional Approach." In *Teaching Reflective Learning in Higher Education*, 65–76. Cham: Springer International Publishing, 2015. https://doi.org/10.1007/978-3-319-09271-3_5.

Benedicto, Patricia Nicole, and Rose Andrade. "Problem-Based Learning Strategies and Critical Thinking Skills Among Pre-Service Teachers." *International Journal of Science, Technology, Engineering and Mathematics* 2, no. 2 (June 6, 2022): 1–28. https://doi.org/10.53378/352885.

Bindels, Elisa, Myra van den Goor, Albert Scherpbier, Kiki Lombarts, and Sylvia Heeneman. "Sharing Reflections on Multisource Feedback in a Peer Group Setting: Stimulating Physicians' Professional Performance and Development." *Academic Medicine* 96, no. 10 (October 4, 2021): 1449–56. https://doi.org/10.1097/ACM.0000000000004142.

Carruana Martín, Adrián, Carlos Alario-Hoyos, and Carlos Delgado Kloos. "A Study of Student and Teacher Challenges in Smart Synchronous Hybrid Learning Environments." *Sustainability* 15, no. 15 (2023): 11694.

Chen, Fan, and Gaowei Chen. "Technology-Enhanced Collaborative Inquiry in K–12 Classrooms: A Systematic Review of Empirical Studies." *Science & Education* 34, no. 3 (June 3, 2025): 1731–73. https://doi.org/10.1007/s11191-024-00538-8.

Cortázar, Catalina, Miguel Nussbaum, Jorge Harcha, Danilo Alvares, Felipe López, Julián Goñi, and Verónica Cabezas. "Promoting Critical Thinking in an Online, Project-Based Course." *Computers in Human Behavior* 119 (June 2021): 106705. https://doi.org/10.1016/j.chb.2021.106705.

Dubey, Anil Kumar, Khushbu Gulabani, Ashish Guwalani, and Rakesh Rathi. "Pragmatic Study on HCI Laws." *International Journal of Science, Engineering and Technology Research (IJSETR)* 3, no. 12 (2014).

Espinosa, Paula Hueso, Stefan Persaud, and Elisa Giaccardi. "Myrubric, a Co-Creative Journey to Activate Resilient Learning Communities." In *24th International Conference on Engineering and Product Design Education: Disrupt, Innovate, Regenerate and Transform, E and PDE 2022*, EPDE2022-1336. The Design Society, 2022.

Flores, Kevin L., Gina S. Matkin, Mark E. Burbach, Courtney E. Quinn, And Heath Harding. "Deficient Critical Thinking Skills among College Graduates: Implications for Leadership." *Educational Philosophy and Theory* 44, no. 2 (January 9, 2012): 212–30.

https://doi.org/10.1111/j.1469-5812.2010.00672.x.
Garcia, Nuria Alonso, and Sarah Elizabeth Campbell. "Co-Creating Spaces for Reflective Practice in Teacher Education," 94–119, 2023. https://doi.org/10.4018/978-1-6684-7270-5.ch005.
Gardner, Ronald, and Tammy L Stephens-Pisecco. "Empowering Educators to Foster Student Resilience." *The Clearing House: A Journal of Educational Strategies, Issues and Ideas* 92, no. 4–5 (2019): 125–34.
Giselsson, Kristi. "Critical Thinking and Critical Literacy: Mutually Exclusive?" *International Journal for the Scholarship of Teaching and Learning* 14, no. 1 (May 31, 2020). https://doi.org/10.20429/ijsotl.2020.140105.
Gokhale, Anu A. "Collaborative Learning and Critical Thinking." In *Encyclopedia of the Sciences of Learning*, 634–36. Boston, MA: Springer US, 2012. https://doi.org/10.1007/978-1-4419-1428-6_910.
Havenga, Marietjie. "Reflective Team Meetings: A Learning Experience for First-Year Engineering Students in Joint Projects." In *2018 IEEE Global Engineering Education Conference (EDUCON)*, 314–19. IEEE, 2018.
Hung, Nguyen Tan. "The Impact of ICTs on Collaborative Learning: A Literature Review." *Innovations in Information and Communication Technology Series*, February 28, 2021, 46–52. https://doi.org/10.46532/978-81-950008-7-6_004.
Jaiswal, Aparajita, Devang Patel, Yi Zhu, J Lee, and Alejandra J Magana. "A Reflection on Action Approach to Teamwork Facilitation." In *Proceedings ASEE Annual Conference*, 2022.
Janse van Rensburg, Juanita T, and Roelien Goede. "A Reflective Practice Approach for Supporting IT Skills Required by Industry through Project-Based Learning." In *Annual Conference of the Southern African Computer Lecturers' Association*, 253–66. Springer, 2018.
Kim, Yeon Hee, Ja Min, Soon Hee Kim, and Sujin Shin. "Effects of a Work-Based Critical Reflection Program for Novice Nurses." *BMC Medical Education* 18, no. 1 (December 27, 2018): 30. https://doi.org/10.1186/s12909-018-1135-0.
Kotlarewski, Nathan, Louise Wallis, Michael Lee, Gregory Nolan, and Megan Last. "Collaborative Design Education with Industry: Student Perspective by Reflection," 2017.
Kozar, Olga. "Towards Better Group Work: Seeing the Difference between Cooperation and Collaboration." In *English Teaching Forum*, 48:16–23. ERIC, 2010.
Kruger, Corné, and Jan Buley. "Collaborative Learning to Foster Critical Reflection by Pre-Service Student Teachers within a Canadian–South African Partnership." *Journal of Teaching and Learning* 16, no. 3 (December 27, 2022): 69–95. https://doi.org/10.22329/jtl.v16i3.7203.
Lambropoulos, Niki, and Charikleia Pitsou. "Blended Collaborative Learning Supporting Pedagogy Students' Reflective Practice." *Creative Education* 11, no. 10 (2020): 1930–46. https://doi.org/10.4236/ce.2020.1110141.
Le, Nguyen-Thinh. "How Do Technology-Enhanced Learning Tools Support Critical Thinking?" In *Frontiers in Education*, 4:126. Frontiers Media SA, 2019.
Lim, Raymond Boon Tar, Claire Gek Ling Tan, Kenneth Wee Beng Hoe, Cecilia Woon Chien Teng, Andre Matthias Müller, Julian Azfar, Suganthi Narayanasamy, and Chee Hsiang Liow. "Correlates, Motivating Factors, and Barriers of Engaging in Regular Self-Reflection among Public Health Students in Higher Education—A Mixed Methods Approach." *Frontiers in Public Health* 10 (November 3, 2022). https://doi.org/10.3389/fpubh.2022.1023439.
Liu, Guanqun, and Xiangdong Chen. "The Design of Collaborative Reflective Activity Based on Shared-Regulation." In *2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)*, 104–8. IEEE, 2020.
Mair, Carolyn. "How Technology Can Facilitate Students' Reflective Practice." *Dialogue* 1 (2011): 1–4.
Martínez-Huamán, Hilda, Josué Edison Turpo-Chaparro, and Carlos D Abanto-Ramírez. "Psychometric Properties of the Critical Thinking Disposition Scale in Peruvian Adolescents." In *Frontiers in Education*, 10:1537797. Frontiers Media SA, 2025.

Maslamah, Isnaul, and Nurita Apridiana Lestari. "Penerapan Model Pembelajaran Problem Based Learning Berbasis Environment Learning," 2021.

Masri, Hany Liana, and Khairul Shafee Kalid. "GrouPro: Developing a Group-Formation System to Support Collaborative Learning in Group Projects." In *2019 6th International Conference on Research and Innovation in Information Systems (ICRIIS)*, 1–6. IEEE, 2019.

McDonald, Jason K. "Preparing Instructional Design Students for Reflective Practice." In *The Instructional Design Trainer's Guide*, 29–37. New York: Routledge, 2022. https://doi.org/10.4324/9781003109938-4.

Meijlof, I. "Reflective Dialogue in Professional Learning Communities." University of Twente, 2018.

Nguyen, Lina, Cara V. Phillips, Amelia Rodriguez, Amber R. Young, and Jeff V. Ramdass. "Relationships Matter! Social Safeness and Self-disclosure May Influence the Relationship between Perceived Social Support and Well-being for In-person and Online Relationships." *Journal of Applied Social Psychology* 52, no. 12 (December 16, 2022): 1211–20. https://doi.org/10.1111/jasp.12921.

Norhasyimah Hamzah, Normah Zakaria, Arihasnida Ariffin, and Siti Nur Kamariah Rubani. "The Effectiveness of Collaborative Learning in Improving Higher Level Thinking Skills and Reflective Skills." *Journal of Advanced Research in Applied Sciences and Engineering Technology* 42, no. 1 (March 26, 2024): 191–98. https://doi.org/10.37934/araset.42.1.191198.

Oliveira, Caio Matheus Campos de, Edna Dias Canedo, Henrique Faria, Luis Henrique Vieira Amaral, and Rodrigo Bonifácio. "Improving Students' Learning and Cooperation Skills Using Coding Dojos (in the Wild!)." In *2018 IEEE Frontiers in Education Conference (FIE)*, 1–8. IEEE, 2018.

Owenz, Meghan. "A Collaboratively Designed Course: Student Perceptions, Challenges, and a Critical Reflection." *Teaching and Learning Inquiry* 11 (December 18, 2023). https://doi.org/10.20343/teachlearninqu.11.35.

Paskevicius, Michael, Michelle Harrison, and Elizabeth Childs. "The Challenges and Opportunities to Learning in the Making Through Dialogue in Networked Spaces: A Reflection Framework for Encouraging Diverse Perspectives." In *Proceedings of the International Conference on Networked Learning*, Vol. 14, 2024.

Pederson, Rod. "Situated Learning: Rethinking a Ubiquitous Theory." *Journal of Asia TEFL* 9, no. 2 (2012).

Plack, Margaret M, and Anita Santasier. "Reflective Practice: A Model for Facilitating Critical Thinking Skills within an Integrative Case Study Classroom Experience." *Journal of Physical Therapy Education* 18, no. 1 (2004): 4–12.

Raber Hedberg, Patricia. "Learning Through Reflective Classroom Practice." *Journal of Management Education* 33, no. 1 (February 15, 2009): 10–36. https://doi.org/10.1177/1052562908316714.

Rania, Nadia, Ilaria Coppola, and Laura Pinna. "Reflective Practices to Study Group Dynamics: Implement Empowerment and Understand the Functioning of Groups." *Frontiers in Psychology* 12 (November 29, 2021). https://doi.org/10.3389/fpsyg.2021.786754.

Rawani, Dewi, Ratu Ilma Indra Putri, Zulkardi Zulkardi, and Ely Susanti. "The Reflective Teaching Practices Using PMRI and Collaborative Learning." *Jurnal Pendidikan Matematika* 17, no. 1 (2023): 69–88.

Rivas, Silvia F., Carlos Saiz, and Carlos Ossa. "Metacognitive Strategies and Development of Critical Thinking in Higher Education." *Frontiers in Psychology* 13 (June 15, 2022). https://doi.org/10.3389/fpsyg.2022.913219.

Rodriguez-Sanchez, Maria Cristina, Pinaki Chakraborty, and Norberto Malpica. "International Collaborative Projects on Digital Electronic Systems Using Open Source Tools." *Computer Applications in Engineering Education* 28, no. 4 (2020): 792–802.

Roxas, Mark Joshua. "Collaborative Research Writing in the New Normal: Students' Views, Challenges, Coping Strategies, and Takeaways." *Journal of Learning for Development* 10, no. 2 (2023): 297–311.

Rusmin, Lisnawati, Yuni Misrahayu, Fien Pongpalilu, Radiansyah Radiansyah, and Dwiyanto Dwiyanto. "Critical Thinking and Problem-Solving Skills in the 21st Century." *Join: Journal of Social Science* 1, no. 5 (August 22, 2024): 144–62. https://doi.org/10.59613/svhy3576.

Saadé, Raafat George, Danielle Morin, and Jennifer D.E. Thomas. "Critical Thinking in E-Learning Environments." *Computers in Human Behaviour* 28, no. 5 (September 2012): 1608–17. https://doi.org/10.1016/j.chb.2012.03.025.

Saunila, Minna, and Juhani Ukko. "Reflective Practice as a Determinant of Performance Outcomes in Services." *International Journal of Quality and Service Sciences* 7, no. 4 (November 16, 2015): 392–403. https://doi.org/10.1108/IJQSS-02-2015-0015.

Schelings, Clémentine, and Catherine Elsen. "Assessing Participation: Toward Long-Term Experiences, Trajectories and Maturity." *Architecture* 2, no. 3 (2022): 518–43.

Schendel, Rebecca, Tristan McCowan, Caine Rolleston, Christine Adu-Yeboah, Mary Omingo, and Richard Tabulawa. "Pedagogies for Critical Thinking at Universities in Kenya, Ghana and Botswana: The Importance of a Collective 'teaching Culture'". *Teaching in Higher Education* 28, no. 4 (May 19, 2023): 717–38. https://doi.org/10.1080/13562517.2020.1852204.

Schruijer, Sandra. "Working with Group Dynamics While Teaching Group Dynamics in a Traditional Classroom Setting: An Illustration of a Systems-Psychodynamic Point of View." *Team Performance Management* 22, no. 5–6 (2016): 257–68.

Sentance, Sue, and Simon Humphreys. "Understanding Professional Learning for Computing Teachers from the Perspective of Situated Learning." *Computer Science Education* 28, no. 4 (2018): 345–70.

Sidgi, L F S. "The Benefits of Using Collaborative Learning Strategy in Higher Education." *International Journal of English Literature and Social Sciences* 7, no. 6 (2022): 217–24.

Susanti, V H Elfi. "Critical Thinking Skills of 10th Grade Students and the Effect on Learning Achievement." In *3rd International Conference on Learning Innovation and Quality Education (ICLIQE 2019)*, 953–56. Atlantis Press, 2020.

Swart, Ruth. "Purposeful Use of Technology to Support Critical Thinking." *JOJ Nursing & Health Care* 4, no. 1 (August 28, 2017). https://doi.org/10.19080/JOJNHC.2017.04.555626.

Thomas, Theda Ann. "Developing Team Skills through a Collaborative Writing Assignment." *Assessment & Evaluation in Higher Education* 39, no. 4 (2014): 479–95.

Torrato, Janette B, Maricar S Prudente, and Socorro E Aguja. "Technology Integration, Proficiency and Attitude: Perspectives from Grade School Teachers." In *Proceedings of the 2020 11th International Conference on E-Education, E-Business, E-Management, and E-Learning*, 70–75, 2020.

Tseng, Hungwei, Hsin-Te Yeh, and Yingqi Tang. "A Close Look at Trust Among Team Members in Online Learning Communities." *International Journal of Distance Education Technologies* 17, no. 1 (January 2019): 52–65. https://doi.org/10.4018/IJDET.2019010104.

Vasconcelos, André, Jomar Monsores, Tania Almeida, Laura Quadros, Eduardo Ogasawara, and João Quadros. "Applying Gestalt Approach as a Method for Teaching Computer Science Practice in the Classroom: A Case Study in Primary Schools in Brazil." *Education and Information Technologies* 28, no. 2 (February 16, 2023): 2383–2403. https://doi.org/10.1007/s10639-022-11278-z.

Veine, Sven, Martha Kalvig Anderson, Nina Haugland Andersen, Thomas Christian Espenes, Tove Bredesen Søyland, Patric Wallin, and Jonathan Reams. "Reflection as a Core Student Learning Activity in Higher Education - Insights from Nearly Two Decades of Academic Development." *International Journal for Academic Development* 25, no. 2 (April 2, 2020): 147–61. https://doi.org/10.1080/1360144X.2019.1659797.

Viereck, H S. "The Influence of Self-and Peer-Reflection on Collaborative Learning in Educational Institutions." *University of Twente*, 2019.

Volet, Simone, Marja Vauras, Anne-Elina Salo, and Deep Khosa. "Individual Contributions in Student-Led Collaborative Learning: Insights from Two Analytical Approaches to Explain the

Quality of Group Outcome." *Learning and Individual Differences* 53 (2017): 79–92.

Wu, Tong, Xiaohang Tang, Sam Wong, Xi Chen, Clifford A Shaffer, and Yan Chen. "The Impact of Group Discussion and Formation on Student Performance: An Experience Report in a Large CS1 Course." In *Proceedings of the 56th ACM Technical Symposium on Computer Science Education V. 1*, 1260–66, 2025.

Yahya, Amal Hayati, and Nurul Farhana Jumaat. "The Effectiveness of Online Collaborative Learning towards Programming Skills among Undergraduate Students in Learning Programming." *Malaysian Journal of Social Sciences and Humanities (MJSSH)* 8, no. 7 (2023): e002398–e002398.

Yong, Brenda Ping Ping, and Ying-Leh Ling. "Skills Gap: The Perceptions of Importance of Soft Skills in Graduate Employability between Employers and Graduates." *Journal of Techno-Social* 15, no. 1 (2023): 16–33.

Zhang, Aimao. "Peer Assessment of Soft Skills and Hard Skills." *Journal of Information Technology Education: Research* 11 (2012): 155–68. https://doi.org/10.28945/1634.

Zurita, Gustavo, and Nelson Baloian. "Situated Learning Theory and Geo-Collaboration for Seamless Learning." In *Seamless Learning in the Age of Mobile Connectivity*, 181–200. Springer, 2015.

ABOUT AUTHOR

Moretlo Tlale-Mkhize serves as a Departmental Manager and lecturer at the Central University of Technology in Free State, where she specializes in Graphical User Interface (GUI) Design. She holds a PhD in Computer Science and Information Systems from North West University. With a strong academic and professional focus, her research spans several key areas, including teaching and learning technologies, Artificial Intelligence (AI), Human-Computer Interaction (HCI), and Reflective Practice. Throughout her career, Moretlo has actively contributed to the academic community by presenting her research and insights at both national and international conferences, allowing her to share valuable knowledge and findings with a wider audience. Her work is dedicated to advancing the intersection of technology, user experience, and education, as she continues to explore innovative approaches in these fields. Additionally, her commitment to fostering reflective and interactive teaching practices plays a key role in shaping modern educational methodologies in the realm of technology and design.