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Fostering design students' professional confidence for workplace success through transdisciplinary online collaborative problem-based learning

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Abstract

This paper builds on previous research and the insights gained from thematic analysis of reflections by students and educator panels on an online collaborative problem-based learning (CPBL) project across four campuses at a South African private higher education institution. The research found a strong connection between student and educator reflections and reveals that collaborative project-based learning (CPBL) is crucial to building students' confidence in transdisciplinary collaboration within a real-world online setting. Consequently, the researchers begin this paper with a proposed *framework for fostering confident transdisciplinary CPBL online*. The interrelated insights obtained from the longitudinal study thus form a foundation for the researchers to delve deeper into the experiences of disciplines and, in this instance, the reflections of design educators and project designers on how transdisciplinary CPBL can nurture soft skills for workplace success. Soft skills, which are transversal or non-technical and cross-disciplinary, are often unnoticed by lecturers and not evaluated in tests or projects. The paper contextualises Royo's taxonomy (2019) and soft skills mentioned in the literature that are further enhanced through CPBL. The research focuses on *communication, teamwork, and a positive attitude*.

Thematic analysis of the reflections of design lecturers and programme developers (2023) reveals an embedded confidence, but also discipline-specific lines of tension in the collaborative thinking and doing of design students. The responsibilities of educators as transdisciplinary facilitators emerge in the approach and practices of project panels and in the critical role of supporting students to articulate their professional self-efficacy and to express their professional worth confidently and effectively. Project design also plays a critical role in this regard. The research considers the nature of confidence within and beyond disciplines and reveals that, ideally, all study programmes should be sufficiently latticed to ultimately enable online transdisciplinary collaboration.

Keywords: Collaborative problem-based learning (CPBL), soft skills, transdisciplinary project.

Introduction

Collaborative problem-based learning (CPBL) has become essential in an online post-COVID pandemic World of Work environment. Thus, graduate talent must have the confidence and competence to participate and perform in transdisciplinary online collaboratives (Deloitte 2021), and collaborative

co-design approaches in contemporary curricula must develop analytical and critical thinking; complex problem-solving; resilience, stress tolerance, and creativity (Lee et al. 2019; McAra & Ross 2020; Moreira 2018; Rowe 2020; World Economic Forum 2020). However, few studies have investigated the pedagogical or technological approaches that can be used to facilitate CPBL online (Fleischmann 2020; Marshalsey & Sclater 2020; McLachlan & Tippett 2023).

This paper builds on previous research (Cronje & Enslin 2023) and the insights gained from a qualitative thematic analysis of reflections by students (187 reflective essays – 2021) and educator panels (seven focus groups – 2022) on an annual online collaborative project across four campuses at a South African private higher education institution. The research specifically aimed to explore experiences in collaborative problem-based learning (CPBL) online.

The study found a strong connection between student reflections and educator focus groups (Appendix A), confirming the importance of CPBL in fostering student confidence and engagement in online transdisciplinary collaboration. It also highlights the crucial role of educators in problem-solving and creative solution development. This research paper presents the interrelated insights obtained from thematic analyses and delves deeper into the experiences of design educators and project designers.

The researchers present a framework that highlights the systemic nature of key insights gained from analysing student reflections and educator discussions. This framework serves as a foundational argument for transdisciplinary CPBL. It suggests that when students develop a strong sense of professional identity and team members share the same, confidence, respect, and effective collaboration can emerge. This, in turn, enables the development of original and meaningful solutions to complex real-world challenges.

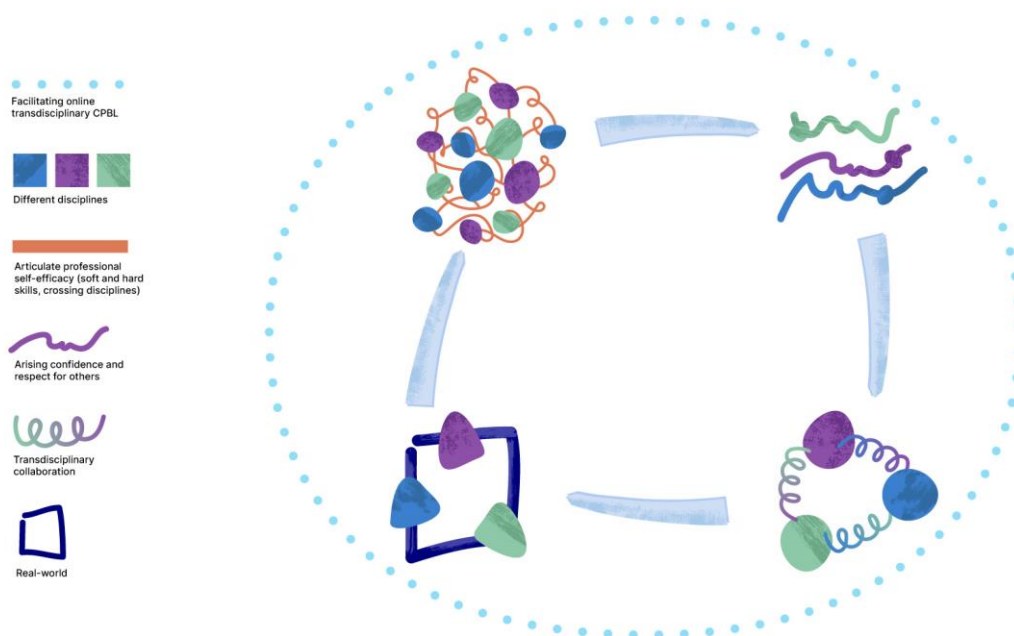


Figure 1: Framework for fostering confident transdisciplinary CPBL online

Therefore, transdisciplinary cooperation for problem solving and the development of creative solutions requires the considerable responsibility of educators. In essence, the research reveals that the central role emerges in facilitating students' and team confidence to participate and perform in

an online real-world transdisciplinary collaboration. In general, it positions educators with the responsibility to produce graduates better prepared for the industries they are about to enter.

Taking into account the above-mentioned insights and the proposed framework through a constructivist lens, the researchers concluded that educators who guide and support cross-disciplinary CPBL projects should assume important responsibilities and active roles in: (i) **building trust within individuals and teams** while maintaining a firm focus on the application of the required skills to address a complex challenge; (ii) **guiding individuals towards establishing a clear sense of identity and professional worth** within their cross-disciplinary collaboration teams, (iii) encouraging the emergence and growth of **mutual respect and positive team dependency**; (iv) facilitating **collaborative thinking** to enable all disciplines to come into play in order to construct original and meaningful solutions to such challenges (Cronje & Enslin 2023). It is as Padurean and Cheveresan (2010, p. 127) reason, the confidence in individual students and teams that motivate them to **explore beyond their own disciplines and collaboratively find innovative and significant solutions for complex challenges**.

Reflections from both students and educators mostly converged on the **orientation phase** of a transdisciplinary CPBL project. The research thus reinforces the views of Han and Resta (2020) and Kauppi, Muukkonen, Suorsa and Takala (2020) in flagging the crucial influence of establishing guidelines and support in preparation for social interaction and collaboration online. The orientation phase of the online transdisciplinary CPBL should provide students with the opportunity to share and acknowledge their unique professional identities and personal skillsets from the beginning. Hence, the proposed framework for fostering confident transdisciplinary CPBL online.

The importance of soft skills is evident for students and educators in transdisciplinary online collaboration. This paper specifically explores how design lecturers can facilitate collaborative problem-based learning to enhance student confidence in online projects. Two focus groups were conducted in 2023: one with design lecturers who participated in previous project panel focus groups (2022), and another with developers of the design programmes involved in the online collaboration. Both groups built on insights gained from previous research for a deeper discussion (Hall 2020).

Soft skill development with CPBL

When the concept of soft skills, or 'transversal and non-technical skills' (Joie-La Marle et al. 2023, p. 1) emerged in 1972, little consensus could be reached on a precise definition. However, fifty years later, various researchers have created a number of taxonomies and descriptions of the concept. Joie-La Marle et al. (2023, p. 18) categorise them into emotions (emotional expression, awareness, positivity and emotional skills), interaction and relationship (non-verbal communication, influence, human management and conflict management) with other skills that seem to be more cognitive-based such as quick learning, strategic thinking, and awareness of detail. More recently, soft skills are frequently mentioned in the context of adaptability, such as dealing with stressful situations in creatively solving problems (2023, p. 4).

The 21st century skills framework (Stehle & Peters-Burton 2019) identifies a set of skills essential for success in the modern world, including critical thinking, communication, collaboration, creativity, and problem solving. Furthermore, in an analysis of the soft skills that employers require from 21st-century employees, Royo (2019, p. 8) identified ten categories, namely communication, time management, teamwork, research, goal setting, leadership skills, creative thinking, positive attitude, assessment, and a strong work ethic.

We argue that the inherent ability of PBL to build interpersonal skills, communication skills and confidence, works toward the ‘improved interpersonal skills necessary for thriving in a teamwork setting’ (Landrum 2020, p. 7) and therefore connects with the 21st-century skills framework (communication, collaboration) toward professional readiness (Stehle & Peters-Burton 2019). The framework emphasises the integration of soft skills with academic content, the application of knowledge and skills to real-world problems, and, as researchers argue, the need to facilitate soft skills development among students working in groups (CPBL) (Deep et al. 2020; Najah et al. 2019; Nurtanto, Fawaid & Sofyan 2020; Royo 2019).

The results of the research honed the focus on three aspects contained in Royo’s taxonomy (2019), namely all modes of communication, teamwork skills (interpersonal skills, active listening, cooperation and flexibility), and a positive attitude (confidence and inspiring team members). In order to contextualise the results of collaborative work and soft skills of the 21st century, the graphic below contains all aspects of Royo's taxonomy on the right, as well as those soft skills mentioned in the literature that are further enhanced through CPBL, on the left (Deep et al. 2020; Najah et al. 2019; Nurtanto, Fawaid & Sofyan 2020).

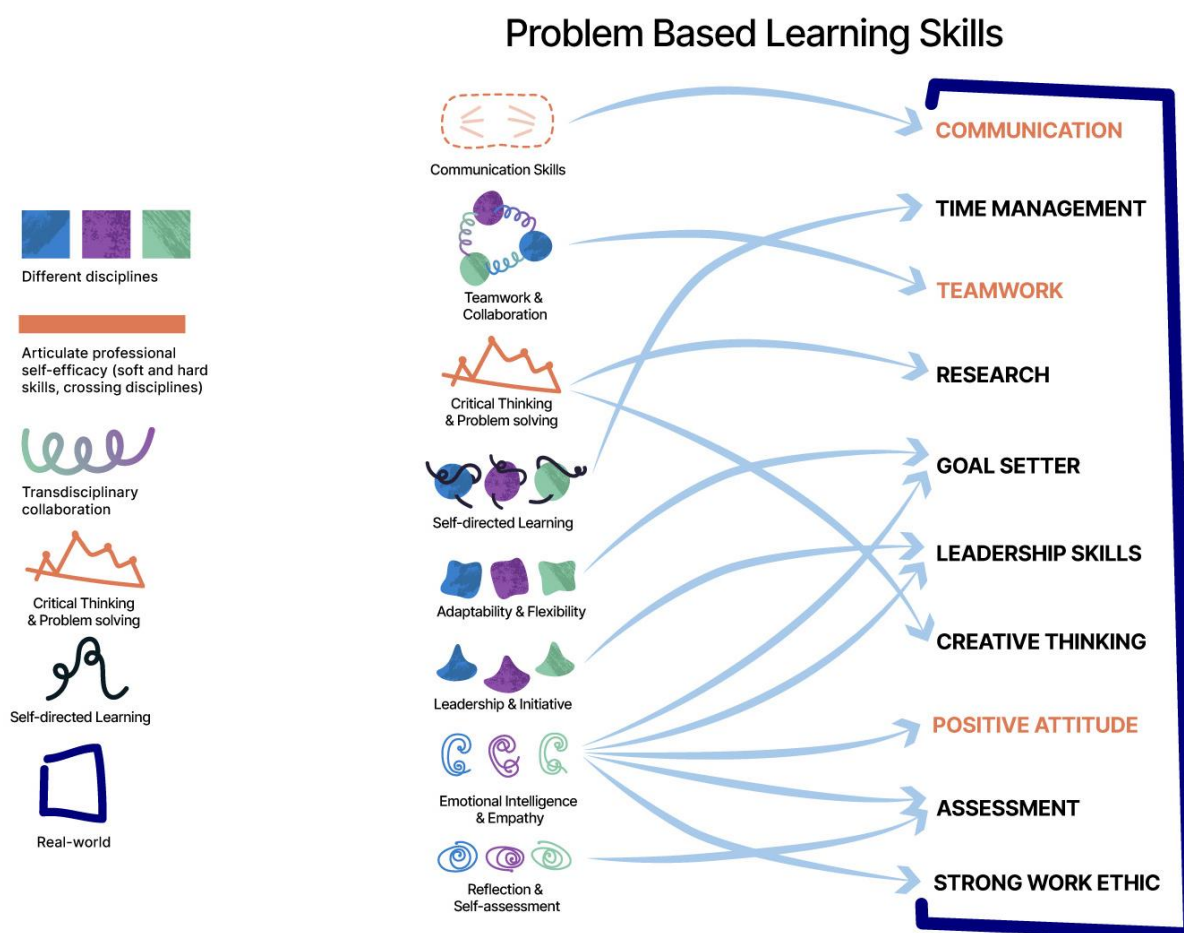


Figure 2: 21st-century employee requirement categories

Evidently, no theoretical framework fully captures the complexity of soft skills development in PBL. Educators can draw upon multiple frameworks and adapt them to their specific pedagogical context and learning objectives (Kamis 2007). Additionally, theories, such as Transformative Learning Theory

(Kohonen in Little et al. 2003), Self-Determination Theory, or Situated Learning Theory (Gómez Puente, Van Eijck & Jochems 2013), may also provide valuable insights to support of soft skills development in PBL.

In the case of this research, social constructivism forms a natural fit for OCPBL. The emphasis is on the social essence of knowledge construction Harasim (2012, p. 70) and, as Geitz and de Geus remind us of Vygotsky's Constructivism Theory, 'knowledge is co-constructed in a social environment' (2019, p. 2). Soft skills are not only individual attributes but are also shaped through social interactions and the sharing of diverse perspectives. Students also engage in reflection on their group interactions and problem-solving approaches, and actively experiment with different strategies (Deep et al. 2020). Social constructivism supports the development of soft skills by providing experiential opportunities for students to practice and refine their communication, teamwork, critical thinking, and problem-solving abilities. Kolb's approach then also explicitly positions confidence development as a central aspect of the experiential learning process and is made up of a continuous cycle of concrete experiences, reflective observation, abstract conceptualisation, and active experimentation (Kamis 2007). Learners are encouraged to apply their knowledge and skills in real-world settings or simulations, to engage in hands-on experiences, take risks, and try new approaches in order to gain a sense of mastery and confidence in their abilities. Successes and failures encountered thus contribute to the development of confidence and self-efficacy (Acevedo-Osorio, Hofmann-Souki & Cruz Morales 2020; Huttunen in Little et al. 2003).

Research method and analysis

Exploring how the confidence of design students and the accompanying soft skills for workplace success can be nurtured through transdisciplinary CPBL online, this paper reports on a thematic analysis of the reflections of design lecturers and programme developers (2023) on the key insights gained from previous research cycles, as well as their own lived experiences. Two focus groups were conducted (2023). The first involved the design lecturers who served on the educator panels in the project under study and the second involved the developers of the design programmes involved in the transdisciplinary CPBL online. These transcripts were then thematically analysed in order for the prominent themes to crystallise (Nowell, Norris, White & Moules 2017). The researchers obtained institutional ethical clearance and used anonymous verbatim quotes only to illustrate the discussion (Jowett 2020).

Thematic analysis: Design educators and programme developers

The focus group of design educators agreed from the outset with the findings of prior research, stating that the challenge is universal for students across all disciplines: **collaborative project-based learning (CPBL) is crucial for building students' confidence in transdisciplinary collaboration within a real-world online setting**. However, participants noted that design students face additional tensions. While they are already somewhat experienced in collaboration due to their discipline – *'design students are used to working together across disciplines'* – they may struggle to encourage effective collaboration within less experienced or less confident transdisciplinary teams. This often leads to the demarcation of roles and responsibilities, hindering the team's ability to function cohesively. Consequently, design students can feel isolated towards the end of a project: *'This is not how [collaboration] works'*. In order to address these concerns, the participants discussed two key points. First, they stressed the importance of introducing collaborative projects early in students' study programmes. Second, they highlighted the potential impact of educator panels on students' confidence to participate in collaborations. The design lecturers reflected that panels can inadvertently reinforce disciplinary silos

if members do not transcend their disciplines in working together effectively – ‘surely it all depends on how lecturers are seen working together?’

This discussion group, reflecting on the key insights gained from the series of focus groups with panel members from all disciplines, concluded that:

Table 1: Design lecturers' conclusive insights

The Project Design Team	
A transdisciplinary project design team must remain attentive to the level of exposure that students from different disciplines may have experienced on project-based collaboration. Ideally, study programmes should be sufficiently latticed to ultimately enable online transdisciplinary collaboration.	
Students in Teams	Educator Panels
Students must gain knowledge and insight in their understanding of “what other disciplines actually do”. The lecturers proposed that the orientation stage of the project should actively encourage students to share their professional profiles and portfolios, preferably by example of the strategic and creative work produced.	Project educator panels must be orientated in holistic transdisciplinary engagements with fellow panel members and student project teams.
Students and Educator Panel Members	
That the principles of collaboration be reinforced among students as well as panels from the very onset of a transdisciplinary project.	

The focus group with design programme developers explored insights into key research findings and the thoughts of design lecturers regarding their project experiences. They discussed the sense of collaborative confidence and natural proficiency of design students to contribute effectively to all aspects of the transdisciplinary project – ‘they have got a strategic role to play as well’. Also, design students are accustomed to ‘thinking and doing’ and to ‘do, reflect and move on’. However, participants reflected on two sets of soft skills that they observed design students to struggle with, despite their previous experience and confidence as collaborators. That is, they may not always have the skills to ‘practice empathy’ meaningfully, nor to ‘frame and deliver (their) message’ effectively. This observation aligns with previous research (Cronje & Enslin 2023), and the self-reflections of students on the specific skills that they wish to develop to become ‘a future confident self’.

Focus group participants discussed the confidence of design students, concluding that these students ‘just passionately want things to work and work the best way it can’. They find it especially difficult when ‘near derogatory’ statements or instructions belittle their skills and abilities.

The design programme developers concluded that online CPBL requires transdisciplinary awareness of professional identity beyond the skill set and should facilitate authentic collaboration with orientation phase exercises that uncover and gamify ‘capabilities beyond the box’ – ‘pitch your value to the team’. A participant encouraged the collective to critically reflect on the current project ‘icebreaker’, which requires students to create a team identity, including assigning specific ‘job’ roles to individuals. Might this not be counterproductive to the transdisciplinary collaborative orientation that the project requires? Participants supported the idea of having two to three experienced educators who excel in transdisciplinary team collaboration and proposed that educator panels could always seek input from discipline experts when needed. The programme developers explained that such educator-panels would possess the experience to facilitate real-world CPBL online and ensure optimal authentic learning through client engagement with student teams.

Discussion and conclusion

The longitudinal study presents an alignment between the reflections of students, educators, and programme developers and posits that CPBL is fundamental to building the confidence of students to participate and perform meaningfully in a real-world transdisciplinary collaboration online. The research also highlights the significant responsibility of educators in fostering the professional confidence of students in workplace success through transdisciplinary online CPBL.

The proposed *framework for fostering confident transdisciplinary CPBL online* presents the individual student's sense and expression of professional self-efficacy and, consequently, that of team members, as essential to fully collaborate and to develop original and meaningful solutions to complex real-world challenges. Therefore, educators, programme developers, and project designers must consider every aspect of a CPBL project in relation to its role in building student and team confidence and facilitating transdisciplinary collaboration. Focus groups with design lecturers and programme developers suggested that design students are versed in collaboration, have a '360' role to play and '*just passionately want things to work and work the best way it can*'. However, a holistic reflection on all disciplines and project variables is a key requirement, as any individual team member or project dimension can (in)advertently create or reinforce specialisation silos and stereotypes that stand in the way of confidence of students' to perform and participate in a transdisciplinary collaboration. For example, the research flagged the influence of panel member feedback styles and approaches, which may enhance or dilute student and team confidence to participate in full and potentially collaborate on transdisciplinary levels.

The thematic analysis of design lecturers and programme developers' reflections amplify the influence of Joie-La Marle et al.'s (2023, p. 18) category of emotions (emotional expression, awareness, positivity and emotional skills). However, the research also reveals that CPBL scenarios should facilitate students to express their professional worth confidently and effectively, in addition to actively listening to others, communicating their ideas, and engaging in constructive dialogue (Deep et al. 2020; Najah et al. 2019; Nurtanto, Fawaid & Sofyan 2020). The research thus contributes to the thinking of Deep et al. (2020) by identifying not only the influence of students, but also educators and programme developers on problem solving, group interactions, and actively experimenting with different strategies to improve transdisciplinary collaboration. Considering that the real-life transdisciplinary online CPBL under study presents active experimentation, our research in essence confirms, as Kolb (Kamis 2007) and Royo (2019) suggest, that confidence building is an integral part of the learning process. Leaning on Royo's soft skills that employers demand from 21st-century employees, this research emphasises the role of a positive self-confident attitude in fully collaborating. We posit that a transdisciplinary and online environment potentially magnifies this requirement and the educator and project designer's responsibility to facilitate individual and team confidence to collaborate. In order to build the confidence to engage, to take risks, and try new approaches (Acevedo-Osorio, Hofmann-Souki & Cruz Morales 2020), educators and project designers must facilitate student awareness and articulation of professional identity beyond specialisation-specific skills, to build self-efficacy and respect for others.

The research reveals that, ideally, all study programmes should be sufficiently latticed to ultimately enable online transdisciplinary collaboration. Considering Experiential Learning Theory, CPBL then presents a continuous cycle of concrete and active experimentation (Huttunen in Little et al. 2003). With regard to facilitating online transdisciplinary collaboration, the thematic analyses suggest that

- A transdisciplinary online CPBL project should actively support students in exploring, defining, and articulating their professional value appropriately. Such articulations should share and enable the practice of hard and soft skills that confidently cross disciplines.
- The orientation stage of a transdisciplinary online CPBL project should actively encourage students to share their professional value through profiles and portfolios.
- Project icebreakers should facilitate and not counter-transdisciplinary professional identity development.
- Project educator profiles, panel composition and facilitation styles should transcend discipline specifics, and that
- Educator panels should be orientated in holistic transdisciplinary engagement with fellow panel members and student project teams.

The results of the focus group discussions beg the question: What does confidence look like for students, educators, and programme developers from different disciplines? For the design student, the team-tendency to delineate roles and responsibilities when the going gets tough presents a particular challenge that requires continuous facilitated exploration of confidence and soft skill development. For educators responsible for the facilitation of transdisciplinary CPBL online, there is a unique opportunity to take advantage of the embedded confidence of design students in thinking and doing, reflecting on, moving on, and engaging all students to further develop this professional capability. Exploring the sense of confidence of students from different disciplines in relation to one another presents a further potential source of insight into the promotion of 21st-century graduate skills in transdisciplinary online collaboration.

Illustrations

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References

- Acevedo-Osorio, Á, Hofmann-Souki, S & Cruz Morales, J 2020, 'Holistic competence orientation in sustainability-related study programmes: lessons from implementing transdisciplinary student team research in Colombia, China, Mexico and Nicaragua', *Sustainability Science*, vol. 15, no. 1, pp. 233–246 <<https://doi.org/10.1007/s11625-019-00687-8>>.
- Cronje, F & Enslin, C 2023, 'Delineating the role of educators and project designers in transdisciplinary collaborative problem-based learning in an online environment', *Proceedings of the Future of Education Conference*, Florence.
- Deep, S et al. 2020, *The problem-based learning approach towards developing soft skills: a systematic review*, Educational Leadership Commons.
- Geitz, G & de Geus, J 2019, 'Design-based education, sustainable teaching, and learning', *Cogent Education*, vol. 6, no. 1, viewed 20 May 2023, <<https://doi.org/10.1080/2331186X.2019.1647919>>.
- Hall, JN 2020, *Focus groups: culturally responsive approaches for qualitative inquiry and program evaluation*, Myers Education Press.
- Joie-La Marle, C et al. 2023, 'Effects of a new soft skills metacognition training program on self-efficacy and adaptive performance', *Behavioral Sciences*, vol. 13, no. 3, p. 202, viewed 2 June 2023 <<https://doi.org/10.3390/bs13030202>>.
- Kamis 2007, 'Network subnetting: an instance of technical problem solving in Kolb's experiential learning cycle', *Proceedings of 2007 40th Annual Hawaii International Conference on System Sciences (HICSS'07)*, viewed on 7 May 2023, <<https://doi.org/10.1109/hicss.2007.399>>.

- Landrum, B 2020, 'Examining students' confidence to learn online, self-regulation skills and perceptions of satisfaction and usefulness of online classes', *Online Learning Journal*, vol. 24, no. 3, pp. 128–146, <<https://doi.org/10.24059/olj.v24i3.2066>>.
- Little, DG et al. 2003, 'Learner autonomy in the foreign language classroom: teacher, learner, curriculum and assessment', Authentik.
- Najah, AA et al. 2019, 'The implementation of problem based learning (PBL) model improving students' oral communication skill through lesson study', *Journal of Physics: Conference Series*, Institute of Physics Publishing, <<https://doi.org/10.1088/1742-6596/1227/1/012004>>.
- Nurtanto, M, Fawaid, M & Sofyan, H 2020, 'Problem based learning (PBL) in Industry 4.0: improving learning quality through character-based literacy learning and life career skill (LL-LCS)', *Journal of Physics: Conference Series*, IOP Publishing, <<https://doi.org/10.1088/1742-6596/1573/1/012006>>.
- Pădurean, A 2010, 'Transdisciplinarity in education', *Journal Plus Education*, vol. 6, no. 1, pp. 127–133.
- Royo, AJ 2019, *Soft skills that employers are seeking*, viewed 8 June 2023, <https://knowledge.e.southern.edu/facworks_lang>.
- Scholes, V 2012, 'Learning theory and online technologies', *Journal of Open, Flexible and Distance Learning*, vol. 16 no. 22, pp. 41–42, <<https://doi.org/10.4324/9780203846933>>.
- Stehle, SM & Peters-Burton, EE 2019, 'Developing student 21st century skills in selected exemplary inclusive STEM high schools', *International Journal of STEM Education*, vol. 6, no. 1, <<https://doi.org/10.1186/s40594-019-0192-1>>.

Appendix A

Table 1: Previous research: Alignment between themes (students and educators) (Cronje & Enslin 2023).

Student reflections (2021)	Educator reflections (2022)	Tier descriptions
Theme 2: I've learned a lot about me	Theme 1: The real-world 'unknowns', an 'exercise in confidence'.	Tier 1: Educators predominantly deliberated evolving levels of individual and team confidence upon the progression of real-world transdisciplinary collaboration, and many student reflections revealed authentic learning towards work readiness and a future-confident self.
Theme 1: All disciplines and three years came into play Theme 5: Challenge and discovery	Theme 2: All specialisations come into play; the 'aha moments' Theme 4: 'This is how real-world teams are being built' but we 'miss' the face-to-face interaction	Tier 2: Educators in focus group discussions noted students' realisation of project interconnections and interdisciplinary benefits. Students value diverse specialisations for meaningful, original solutions to real-world challenges.
Theme 3: A code of conduct Theme 4: The matter of time	Theme 3: 'Individual worth', mutual potential	Tier 3: The educator reflections were mostly focused on students deriving a clear sense of identity and true value within their teams to engender mutual respect and positive dependency. As far as the students were concerned, respect for the perspectives and skillsets of their counterparts mostly emerged from their experience of productive transdisciplinary collaboration and collectively making progress on the project.

One aspect that was prominent in student reflections but received less attention in the teacher focus group analyses was the concept of time (**Theme 4**). Students frequently made authentic references to it, such as mentioning instances when they came very close to missing deadlines, which led the team to stress. Consequently, many reflections emphasised the importance of establishing effective principles for managing time. Conversely, a different aspect emerged during the focus group discussions with teachers, which students did not widely acknowledge. In 2021, due to the COVID-19

pandemic, this collaborative effort across disciplines transitioned to an online format and has remained online ever since. It was generally perceived that the students involved were better equipped for the industries and roles they were entering. Some educators retained reservations about this (**Theme 4**).