



Delineating the Role of Educators and Project Designers in Transdisciplinary Collaborative Problem-Based Learning in an Online Environment

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Abstract

This paper presents a qualitative thematic analysis of reflections by students and educator panels on an online collaborative project across four campuses at a South African Private Higher Education Institution. The study aims to understand experiences in Collaborative Problem Based Learning (CPBL) in an online and post-Covid World of Work context. The researchers argue that educators play a crucial role in facilitating students' confidence and preparing them for future industries through transdisciplinary collaboration. The paper offers practical suggestions to enhance CPBL involving different disciplines, particularly during the orientation phase. The authors believe that these recommendations can also inform future research on the role of educators and project designers in transdisciplinary CPBL in an online setting.

Keywords: online learning; constructivism; enhancing student engagement; curriculum development; collaborative problem-based learning (CPBL).

1. Introduction

Problem solving skills (PSS) such as observation, reasoning, analysing, and creative thinking, but also online collaboration is the focal point of the 21st century post-Covid professional World of Work (WoW). Asking what role transdisciplinary online collaboration on a real-world project plays in the authentic learning process of final year students, the researchers argue that transdisciplinary collaboration for problem-solving and creative solution development requires a significant responsibility of educators.

2. Literature

Collaborative problem-based learning

Many authors stress that PBL prepares students for the WoW [1]. Transdisciplinary PBL is vital for authentic projects in OCL, and Dale, Newman, and Ling [2] emphasise the importance of soft skills and online dialogic techniques for collaboration in professional teams engaged in OCL. Post-Covid-19, graduates should contribute effectively to online project teams addressing real-world issues [3]. Truly, today's interconnected world requires confident and competent graduates for transdisciplinary online collaboration. Contemporary education should integrate collaborative co-design approaches to develop essential skills such as analytical thinking, innovation, active learning, problem-solving, critical thinking, resilience, stress tolerance, and creativity [4]–[8].

Reeves, Herrington & Oliver [9] utilise constructivist theory for interactive PBL, encouraging diverse approaches to curriculum content. This study focuses on an OCL project engaging strategy and creative students in transdisciplinary teams addressing real-world challenges in South Africa or Africa. The research is based on Linda Harasim's OCL principles [10] as explained by Johnson and Johnson [11]. These principles imply that transdisciplinary student teams collaborating online would need:

1. **Positive mutual dependency:** Team members must rely on each other's unique skills.
2. **Personal accountability:** Members are dependent on each other; a team ethic is needed.
3. **Promoting interaction:** Teams engage online via various online platforms.
4. **Social skills:** Members need advanced communication and collaboration skills, and empathy for various perspectives.
5. **Group process:** The transdisciplinary problem-solving expected from teams depends on the comprehensive skills set of all role players, relying on high levels of collective processing.



Pădurean and Cheveresan [12] stress that transdisciplinary learning in education promotes holistic understanding and unity of knowledge. It encourages students to explore across disciplines and collaborate in problem-solving. Online transdisciplinary collaborative learning develops essential skills for ideation, organisation, convergence, and knowledge construction [13]–[15].

3. Methodology: educator reflections, with reference to student reflections.

Using online Voyant textual analysis tools [16], the researchers analysed artifacts with numerical and narrative data [17]. Considering Plowright's emphasis on context for evaluating and improving workplace practice [18], the analysis focused on students' reflective insights first (2021 project corpus). Reflective writing is vital in higher education, especially in professional fields, allowing students to self-evaluate and understand their learning [19]. Hence, 187 reflective essays in a Voyant corpus revealed frequent keywords like "reflection," "learning," and "experience." Extracted passages with these keywords were thematically analysed, unveiling key themes on authentic learning and transdisciplinary CPBL.

Educator focus groups (from review panels) had valuable discussions on the value of transdisciplinary CPBL for students (2022). Each panel had one focus group, and seven educator panels were engaged. A significant alignment between the student reflections and the educator groups emerged. Thematic analysis was done ethically, and anonymous quotes are used to illustrate themes.

Table 1: Alignment between themes (students and educators)

Student reflections (2021)	Educator reflections (2022)	Research Results
Theme 2: I've learned a lot about me.	Theme 1: The real-world "unknowns", an "exercise in confidence".	Tier 1: A real-world exercise in confidence.
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.	Tier 2: Transdisciplinary CPBL online: all come into play.
Theme 3: A code of conduct. Theme 4: The matter of time.	Theme 3: "Individual worth", mutual potential.	Tier 3: Mutual respect and team potential.

4. Results: the role of transdisciplinary online collaboration on a real-world project

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.

Table 2: Tier 1, A real-world exercise in confidence



Students	Educators
<p>The analysis of student reflections (Theme 2) reveal that the self in relation to personal and team confidence featured far more frequently than related to actual discipline skillsets. “(Project X) has given me the edge of being able to handle a brief like this in the future”.</p>	<p>Most educators remarked on the increased and evolving levels of confidence shown by individual students and teams as they first experienced and later reflected upon the progression of the project (Theme 1). “as the work starts developing, and they (students) see that they are succeeding, confidence comes to life, it’s absolutely amazing”.</p>
<p>Student self-reflections also featured the aim to become even more confident and authentic participants in future transdisciplinary collaborations - to be able to express ideas and share views forthright and openly. “I need to be able to articulate my ideas or needs well”, “to be more forthright about the concepts I’ve come up with and to speak out when I believe it’s necessary”, “That’s the person I want to be in the future”.</p>	<p>Blending excitement and anxiety, the students “wrestle” with the “unknowns” and typically what their team members might be like, who the “clients” could be, and especially, whether their teams would prove to be cohesive and productive. “Project X is an exercise in confidence” and “there is something to be said for learning to collaborate with people that you did not know” - “it’s the teamwork and the dynamics of that.” Educators also commented on signs of newfound professional clarity, confidence and maturity after completion of the online transdisciplinary collaborations. “they’ve grown into themselves as creatives and strategists.”</p>

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.

Table 3: Tier 2, Transdisciplinary CPBL online: all come into play

Students	Educators
<p>For students the primary value of the project became to foster dedicated transdisciplinary work “to come together” (Theme 1).</p>	<p>For their part, the expert educators in the focus group discussions made frequent mention of those “aha” or “lightbulb” moments – where “things click into place” and students realise how parts of the project and disciplines enable another (Theme 2).</p>
<p>Most of the student reflections chronicled the transdisciplinary online project as the most significant experience during their typical three years of study: “the most satisfying thing about (project X) was seeing how all of our research, strategy and ideation came together to produce the final product”.</p>	<p>It is also in the student and team interfaces with actual real-world clients and real-world challenges where the educators found the deeper value of the transdisciplinary online collaboration: “interfacing with a client is another level of understanding”, “students gain a real-world perspective, a sense of accountability”.</p>
<p>Students discovered a previously unknown interest in another discipline or, due to team circumstances, were made to stretch themselves to exercise a skill that they did not realise they possessed or that they were able to master (Theme 5) - ‘I learnt that I have a gift in mediating and dealing with people in a very calm manner’.</p>	<p>Several of the educator focus groups turned their attention to those teams where high levels of group tension and/or the inability to make project milestones were found. Some educators drew positive conclusions since such conditions could then add impetus to those proverbial “unicorn” transdisciplinary students to step up to the challenge.</p>

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.

Table 4: Tier 3, Mutual respect and team potential



Students	Educators
<p>Respect for the perspectives and skillsets of counterparts ultimately emerged in <i>“coming together to produce the final product”</i>. Many student reflections also referred to the value of familiarisation with each other before the start of the transdisciplinary online collaboration (Theme 4). Some teams invested time and energy upfront to develop shared or agreed-upon codes of conduct – <i>“Right at the start we stated that as we work together, we needed to lay out a few ground rules”; “to establish a shared identity”</i>.</p>	<p>Educator discussions involved the upfront value and importance of instilling individual worth, mutual respect, and team potential. (Theme 3). Several educators’ reflections underscored the notions that respect for individual disciplines and a recognition of interdependence with other disciplines, are (or should be) prominently supported by all educators during all years of study – <i>“respect for one’s own and other disciplines start in the classroom”</i>.</p>

One property emerged in student reflections and significantly less in the analyses of educator focus groups: that of time (Theme 4). The student reflections featured numerous authentic mentions, such as *‘there were a lot of times I came really close to the deadline, and it caused the team to stress’*. Consequently, many reflections expressed the need to develop working principles with respect to time management. Likewise, one property emerged in the focus groups with lecturers that few students considered. In 2021, this transdisciplinary collaboration moved online under Covid pandemic conditions and has since remained online. The students concerned mostly considered themselves to be better prepared for the industries and positions that they were about to enter. However, a few educators expressed reservations (Theme 4).

5. Discussion and conclusion

It is trite that professional self-identity coupled with respect for that of others enables the ‘positive mutual dependency’ that the theory refers to and that is required in productive real-world transdisciplinary CPBL, especially when conducted online. However, in delineating the role of educators and project designers in transdisciplinary CPBL in an online environment, the researchers find it noteworthy that the central role of educator advisory panels emerges in facilitating the confidence to participate and perform in a transdisciplinary collaboration, and thus ultimately, producing graduates better prepared for the industries that they are about to enter. With respect to Pădurean and Cheveresan’s [12] contemplation on the purpose of transdisciplinary learning in education, the researchers argue that educators who encourage the ability of individual students and teams, help to build the confidence to enable the discovery of what lies within, between, across, and beyond own disciplines. The potential to collaborate in full to develop original and meaningful solutions to complex real-world challenges is thus enhanced.

In practical terms, students and educators agree on the importance of the orientation phase in a transdisciplinary OCL project. Han and Resta [15] emphasise its significance, while Kauppi, Muukkonen, Suorsa, and Takala [20] highlight the need for guidelines and support in preparing for online social interaction and collaboration. Key research findings include:

- Educator panels must be orientated about the significant responsibility of facilitating individual student, and team confidence when navigating complex real-world challenges in a transdisciplinary CPBL online environment.
- The orientation phase of transdisciplinary OCL should help students and teams establish professional identities and skills while promoting mutual respect. Educators suggested conversation starters for teams, such as sharing their worth, skills, and contributions. To combat assumptions and stereotypes about specialisation or role, educators also recommended presenting successful projects and team dynamics from previous years.
- Unprompted, focus groups debated the role of an assessment rubric for transdisciplinary collaboration. Students and teams lacking confidence or direction often prioritise tick-boxing over critical reflection on collaboration quality. Some groups also questioned educators, who tend to create silos and focus on specialised progress. Online transdisciplinary projects should carefully consider how students and educators approach the assessment rubric, using it as a guide rather than a template or checklist.



- Educator focus groups expressed gratitude to researchers and each other for the chance to reflect on their experiences. They suggested that such sessions should be an essential part of the educator project experience since they can learn from existing knowledge rather than making mistakes themselves. Reflection potentially plays a crucial role in promoting transdisciplinary online collaboration, offering practical and developmental benefits for project designers, educators, and researchers.

Lastly, exploring how an online transdisciplinary collaboration can practically embrace the merits of both a contact and online world presents a useful recommendation for further research – what is ‘missed’ most about collaborating face-to-face that will enable the transdisciplinary team to confidently generate meaningful solutions to complex challenges online? And how can these qualities be addressed if not leveraged in an online transdisciplinary project design?

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