From Campus to Community: Embedding Purpose-Driven Learning in Pre-Service Stem Education through A Refugee-School Partnership

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ABSTRACT

This study explored student teachers' perceived learning outcomes and partnership experiences when Purpose-Driven Learning (PDL) was embedded within an early university–community collaboration supporting a refugee learning centre. Twenty-five second-year Bachelor of Education students participated in a 14-week project designing STEM learning aids informed by PDL principles, culminating in a one-day STEM Teachfest where they taught 32 refugee pupils using the developed materials. Data were collected immediately post-event through surveys analysed using descriptive statistics and semi-structured interviews with four student teachers and one centre teacher analysed thematically. Survey results indicated high levels of perceived development in self-inquiry (76%), creativity, interpersonal and collaborative skills (84% each), empathy (88%), pedagogical skills (84%), and understanding of STEM concepts connected to the learning aids (92%). Qualitative findings suggested two themes: (i) enactment of pedagogical knowledge under authentic constraints, including adaptation to learners' language needs, and (ii) emerging professional purpose through heightened awareness of educational inequities. From the partner perspective, the programme was perceived to enhance pupil engagement and inspire more interactive teaching practices, while transportation was noted as a practical challenge. Overall, the findings suggest that short-term, structured community-linked projects may provide meaningful opportunities for pre-service teachers to practise socio-emotional and pedagogical competencies in context. Implications are discussed for strengthening reciprocal school–university partnerships aligned with SDG 4, while noting the need for longitudinal and multi-source evidence to examine sustained outcomes.

Keywords: purpose-driven learning; industry–university collaboration; teacher education; socio-emotional skills; STEM; refugee education; mixed methods

INTRODUCTION

The landscape of education is rapidly evolving in the era of globalization, marked by cross-border learning opportunities, international student mobility, and the widespread accessibility of advanced technology and transportation. In tandem with this global shift, the emphasis on quality, equity, and inclusivity in education has gained paramount importance, as underscored by the United Nations' Sustainable Development Goals (SDGs). The SDGs, particularly Goal 4, advocate for inclusive and equitable quality education, recognizing its pivotal role in fostering sustainable development (UN General Assembly, 2015).

In light of these global imperatives, teacher education programs assume a critical role in shaping educators who can navigate diverse and authentic teaching contexts. The preparation of student teachers becomes a key

contributor not only to national educational frameworks but also to the overarching objective of achieving inclusive and equitable quality education on a global scale. This is aligned with what Steward et al. (2022) shared in their paper emphasizing the need for radical change in universities to promote lifelong learning. By embracing each individual's strengths, the focus is to drive students' learning through a purpose, of which is relevant in solving contemporary societal issues (Moreno, 2023). It requires universities to foster a sense of responsibility and empathy among students, encouraging them to actively engage with real-world challenges, which in turn, would unlock the innate sense of purpose for the students in learning, hence the term purpose-driven or purpose learning (Moreno, 2023).

Problem Statement

The quality of a teacher education program is crucial for producing teachers who are globally ready and capable of addressing the diverse needs of learners in the 21st century. However, teaching practices in universities could be siloed if they do not reflect the real-world challenges and opportunities that teachers face in their profession. While university pedagogy is sophisticated and involves project-based and active learning, student teachers may not be prepared to help students learn in a diverse learning environment (Liu & Ball, 2019; Valdivia & Montoto, 2018) and are under-informed on the issues and trends in education (Goh & Blake, 2015). Student teachers may develop a narrow view of teaching that is based on one paradigm or approach, limiting their effectiveness and adaptability when they graduate and enter the teaching profession. Therefore, there is a need for student teachers to be exposed to reality as much as possible, and one way to achieve this is through a partnership between industry and university, also referred to as Industry-University collaboration (IUC) (Ankrah & ALTabbaa, 2015). Such partnerships can provide student teachers with authentic learning experiences that enhance their knowledge, skills, and attitudes for teaching in diverse contexts, as well as giving them a sense of purpose in doing so. Although IUC has long been introduced in many universities across different academic programmes and faculties (Ankrah & ALTabbaa, 2015), the typical industrial exposure for student teachers usually occurs in their last academic semester when they are interns during their teaching practicum. Hence, little is known about how partnerships can benefit the learning of student teachers and the industry partner, or what challenges and issues may arise from such collaboration when introduced early in a teacher preparatory programme.

Research Objective And Questions

The purpose of this study is to examine the perceived learning and partnership outcomes associated with STEM Teachfest, a university–community collaboration that engaged pre-service teachers in designing STEM learning aids for learners at a refugee learning centre. Drawing on Purpose-Driven Learning (PDL) as a sensitising framework, this study focuses on (i) student teachers' perceptions of socio-emotional and pedagogical learning and (ii) the industry partner's perceived benefits and implementation constraints. Accordingly, the study addresses the following research questions:

a) What skills do student teachers perceive to be developed through their involvement in a project promoting purpose-driven learning?

b) How do the student teachers experience being involved in a project promoting purpose-driven learning?

c) How do the industry partner's perceived benefits and challenges based on their involvement in a project promoting purpose-driven learning?

LITERATURE REVIEW

Purpose-Driven Learning

Purpose Driven Learning (PDL) was coined by Moreno (2023) in which he described that all individuals have an innate ability to drive their own lifelong-learning, and this can be unlocked with a sense of purpose. When learning is driven by purpose, it challenges what many literature have reported on how learning was rote-learned, and not applied meaningfully to the real world (Jain et al., 2024). The concept of PDL provides a pedagogical framework rooted in intentionality, in getting students to connect academic learning to the world beyond their

classrooms and solve real problems. The keys to PDL, listed as 10 keys in Moreno's work and labelled as socio-emotional skills- Confidence, Enthusiasm, Creativity, Focus, Dependability, Initiative, Resilience, Empathy, and Effort are the foundational skills that drive meaningful learning for all students.

Socio-emotional skills encompass a range of psychological aspects, including personality traits, motivation, and values (Duckworth and Yeager, 2015; Lechner et al., 2019). It notably refers to functional capacities that enable individuals to work effectively, establish trustworthy relationships, handle stress and setbacks, lead and motivate others, and engage in creative exploration. Socio-emotional skills are also similar to one of the predominant frameworks for evaluating SEL, which is the Big Five personality traits: Conscientiousness, Agreeableness, Emotional Stability (Negative Emotionality), Extraversion, and Open-Mindedness (Danner et al., 2021).

Industry- University Collaboration in Teacher Education

In the realm of university programs, the increasing inclination towards collaboration with various industries is noticeable. In fact, the term IUC was coined because there is a heightened need for universities to innovate industry-relevant products and showcase their contributions to the community and society at large. However, the dynamics between educators based in universities and those in schools (the industry, in education's context) present a unique complexity compared to collaborations in other disciplines. Typically, these two entities are not perceived as true "partners." Teachers, on one hand, are often seen as subordinate to university practitioners, functioning as "students" in postgraduate studies and frequently serving as the "subjects" of academic research. Conversely, academics may be viewed as disconnected and "out-of-touch" from the actual classroom reality (Grundy, 2014).

One of the propositions is to make schools a learning community, in which they are not just consumers of knowledge, but also producers who studied it themselves (Stenhouse, 1975). For this, more University-schools events and programmes should be made more frequent so that the interinstitutional engagement is consistent throughout the years, and not just during the internship period where school-based educators are required to mentor student teachers interning in their workplace.

METHODOLOGY

Context of the study

A mixed-method approach was employed to extract data addressing the research questions. This project involved 25 student teachers in their second year of the Bachelor of Education (Hons.) program at a local Private University in Malaysia. Aligned with their learning and assignment requirements, the project focused on creating learning aids for teaching scientific or mathematical concepts to primary schoolers. The students were divided into seven groups, each comprising 3-4 members, with the conception and development of learning aids forming a semester-long project that lasted for 14 weeks.

Adhering to the PDL framework and providing a Learning Space of Belonging (Morano, 2023) for the student teachers, a briefing was conducted to outline the project's objective. The goal was for them to host and teach 32 students from a refugee learning center visiting the University to learn Mathematics and Science concepts through the learning aids they had constructed in groups. Examples were shared to illustrate how some students became refugees and the resource challenges faced by refugee learning centers. Prior to learning aids development, students were required to consult the lecturers for feasibility assessment. They were informed that all learning aids would be donated to the school to ensure perpetual use of the learning aids in school.

Contextualizing the project's goal was deemed essential to foster empathy and encourage the development of durable and suitable learning aids for the school. On the event day, named STEM Teachfest, the seven groups were stationed at designated teaching spaces with their learning aids. The 32 primary schoolers were divided into seven groups, rotating after each learning episode with a teaching group.

Following the event, all student teachers participated in a survey, and students were selected for further interviews based on their survey responses. Eventually, four students were part of the interview process based

on data saturation. A teacher from the Refugee School was approached for an interview to share her experience two weeks after the STEM Teachfest. This is to ensure that the teacher had ample time to reflect after the event and to also assess if the learning aids donated to the schools were making an impact within the time after which they were donated to the school.

Survey data were analyzed using descriptive statistical measures, while interview data were transcribed and subjected to thematic analysis. Participation in surveys and interviews was voluntary. Informed consent was obtained prior to data collection, and anonymised identifiers were used in reporting.

FINDINGS

Student-Teachers' Perceived-Development of Skills Through Their Involvement In A Project Promoting Purpose-Driven Learning

The examination of student teachers' experiences in STEM Teachfest sheds light on their perceived development of skills, revealing a substantial positive impact across various dimensions. Beginning with Self-Inquiry Skills, 76% of participants strongly affirm that their engagement in STEM Fest has significantly enhanced their ability to conduct self-inquiry. This indicates a notable shift towards a more self-reflective and inquisitive approach among student teachers.

Similarly, the data underscores a substantial engagement of the participants' Analytical Thinking and Problem-Solving Skills. A significant 72% of participants express a strong affirmation that STEM Teachfest has played a crucial role in honing their analytical thinking abilities and enhancing their problem-solving skills. This emphasizes that their involvement in the activities leading to the event and the event itself were effective in promoting critical thinking among student teachers. In the domain of Creativity, 84% of the participants strongly assert that their creative capacities have been positively influenced by their participation in STEM Teachfest. This highlights the festival's role not only in nurturing technical competencies but also in fostering a more imaginative and innovative mindset. Moreover, the same percentage (84%) strongly affirmed that their Interpersonal Skills as well their Collaborative skills have seen notable improvement. These findings emphasize the social and teamwork aspects integral to the festival's impact on student teachers.

"Motivation for learning support" emerges as another aspect with noteworthy outcome, as 84% express strong affirmation that STEM Fest has motivated them to support learning among their peers. This suggests a positive ripple effect, where the festival not only enhances individual skills but also fosters a collective motivation to contribute to the educational journey of others. The last item intended to investigate whether their participation in the event has cultivated a sense of empathy, particularly in terms of sharing knowledge and resources. 96% of the participants asserted that they agree and strongly agree that it did. This speaks to the community-building aspect of the festival, emphasizing a culture of sharing and mutual support. As indicated, they were informed at the outset of this project that all learning aids would be donated to the school to ensure perpetual use of the learning aids in school. They were geared towards completing the artifacts successfully knowing that they would then be used in schools for learning purposes. The high indicator of skills tapped into were consistent with the socio-emotional skills asserted by Moreno as the keys to PDl (Moreno, 2023).

The data also suggests a profound impact on the participants' understanding of STEM Concepts related to Learning Activities (LA). An overwhelming 92% strongly assert that STEM Teachfest has enhanced their comprehension of STEM concepts tied to learning activities, indicating a substantial academic and conceptual gain. Beyond the technical dimension, the festival has also effectively tapped on the participants' Pedagogical Skills, with 84% strongly affirming that their teaching methodologies and approaches have been positively impacted. This speaks to STEM Teachfest's potential in shaping not just socio-emotional competencies but also the broader pedagogical acumen of student teachers.

In conclusion, the findings indicate a multifaceted positive impact of STEM TeachFest on the perceived development of skills among student teachers. From Socio-emotional skills to a broader pedagogical understanding, the festival appears to be a catalyst for holistic professional growth among participants.

Table 1 Breakdown of percentage of student teachers' perceived development of skills and competencies based on their STEM Teachfest experience

Perceived development of skills and competencies	Strongly Disagree	Disagree	Agree	Strongly Agree
Self-inquiry skill	0%	0%	24%	76%
Analytical thinking	0%	4%	24%	72%
Problem-solving skills	0%	4%	24%	72%
Creativity	0%	0%	16%	84%
Interpersonal skill	0%	4%	12%	84%
Collaborative skill	0%	12%	4%	84%
Understanding of STEM concept of Learning aid	0%	0%	8%	92%
Pedagogical skills	0%	0%	16%	84%
Motivation	0%	8%	8%	84%
Empathy	0%	4%	8%	88%

Student-Teachers' Experience on Their Involvement in a Project Promoting Purpose-Driven Learning

The insights gathered from interviews with student teachers engaged in STEM Teachfest shed light on two distinct themes reflecting their varied experiences. The themes emerged are discussed below:

Theme 1: Enactment of pedagogical knowledge under authentic constraints

Student teachers described Teachfest as a rare opportunity to rehearse pedagogical concepts in a time-bound, real teaching context. Rather than merely "applying" coursework knowledge, participants characterised the experience as iterative and adaptive, involving rapid judgement, adjustment of explanations, and improvisation of strategies in response to learners' needs. For example, Student C's account reflects practical enactment of wait-time principles in real interaction, while Student B's narrative illustrates how language constraints reshaped lesson enactment and displaced planned activities.

"I applied what I learned by directly interacting with students…for example, in my previous class, we learnt about the principle of wait-time, on how we should wait for students to respond before we give them the answer…I did it during the teaching, and I was able to see what works and what not. I get to experiment different strategies." (Student C)

"I learned that teaching should adjust to students' needs, such as their language background. I immediately had to translate what I was teaching, from English to Malay Language because my students did not understand English well. It was challenging, because these scientific terms are all known to me in English, but we tried our best..we ended up focusing in translate instead of getting them to do fun activity which we have planned for" (Student B)

These accounts suggest that the value of Teachfest was not only in practising instructional strategies, but in confronting the complex contingencies of teaching which are often absent in campus-only assignments.

Student A mentioned:

"I learned how to explain a concept within a short period (of time). Normally we tend to go on and on regarding the definition of a science concept, but through this activity, I understand the need for learning aid. Our explanation of the concept supplemented the design of our learning aid, and all this can only be achieved if we plan the lesson with all the resources in mind. It makes the teaching and learning more effective." (Student A).

The design of mini-lesson or learning activities during the STEM Teachfest was also raised by another student. She asserted that planning the activity for the students is important, and putting the plan into action allowed them to see first-hand what strategy is effective and what needs to be adapted. She mentioned:

"when we found out about the students we will be teaching, we designed different level worksheet for different students. Seeing how it has effectively assessed the students' understanding during the event was great…We actually able to differentiate their learning for them (Student D).

Student D found it rewarding to be able to plan and to be able to see the effectiveness of differentiating instructions for her students. She was able to use her pedagogical knowledge in differentiating the worksheets and applying them to see what is feasible.

The insights provided by the students point to a reflective aspect of the STEM Teachfest experience, emphasizing an improved understanding of pedagogical strategies and learning aids.

Theme 2: Emerging professional purpose and social awareness

Participants frequently framed the partnership as meaningful because it exposed them to inequities in educational opportunity and prompted reflection on their professional role. Beyond "feeling grateful," narratives reflected a re-evaluation of what counts as inclusive teaching and an increased sensitivity to learners' diverse starting points. At the same time, these accounts raise an important tension: purpose-driven learning in under-resourced communities risks being interpreted through a charity lens unless reciprocity and community voice are systematically embedded in the programme design.

One student expressed:

"I'm truly grateful for the opportunity to contribute to society. We previously were able to visit mostly rich schools, and has an impression of what schooling looks like there. This is totally new to me…I am happy that we get to give them the learning aid and they get to learn by playing with it" (Student A).

This sentiment aligns with an appreciation for the initiative's societal impact, emphasizing purpose and acknowledgment of the unique opportunity STEM Teachfest provides. Moreover, an awareness of diverse cultural backgrounds is evident in the reflection,

"I learned about how not all students come to learn from the same starting line…the privileged ones normally have the headstart. I now know the importance of supporting diverse learners, especially from different cultures and backgrounds…It makes me feel like I want to do more for this community." (Student D)

In conclusion, these thematic findings, rooted in the nuanced experiences shared by student teachers, provide valuable insights into the impact of STEM Teachfest involvement.

Industry Partner's Perceptions on the Benefit and Challenges Through Their Involvement in a Project Promoting Purpose-Driven Learning

A nuanced understanding emerges from the partner school teacher's responses, revealing significant themes regarding perceived benefits and challenges, based on her direct experience.

Perceived benefits of partnership

The teacher's experiential insights underscored the importance of practical learning and heightened engagement, asserting,

"We have tried out a few of the teaching aids that were connected to the topics they covered this semester- for example, the water cycle, digestion, and shapes…Students appeared to participate more actively than in previous typical classroom instruction, in which teachers merely supplied worksheets and videos. The students actually told me how intriguing the teaching tools are because they help them comprehend more practically." (Teacher A)

In her elaboration, the teacher further mentioned:

"We generally focus on theory and worksheets, so even though kids are interested in science, they typically don't get to undertake experiments and projects. We are short on time and resources so this is an excellent method to get them interested in learning and comprehension. While some students may not be particularly fond of mathematics, one of them brought up the fact that Math is quite simple to understand." (Teacher A)

The teacher's reflections suggest that the main value of the partnership lies in resource amplification and pedagogical variation, providing opportunities for hands-on STEM learning that would otherwise be constrained by limited time and materials.

Perceived challenges of partnership

In addressing challenges faced, the teacher noted a logistical concern related to transportation, remarking,

"We haven't met any significant obstacle as of yet, only in terms of transportation. Due to the limited resources, we had to ensure that we pre-book the schools' van and we also had to drive our own car to the campus". (Teacher A)

This logistical constraint highlights that partnership sustainability is not determined only by pedagogical value but also by operational feasibility, particularly transportation and staffing.

DISCUSSION AND CONCLUSION

This study examined perceived learning outcomes and partnership experiences arising from a university–community Teachfest collaboration grounded in Purpose-Driven Learning (PDL). Overall, the findings suggest that even a short-term, structured community engagement activity can function as a meaningful pedagogical space for pre-service teachers to rehearse socio-emotional and instructional competencies in authentic contexts. This aligns with IUC literature emphasising experiential learning benefits for stakeholders when university programmes engage in real-world collaborations (Wang et al., 2016).

Quantitative survey patterns indicate high perceived development in empathy, creativity, collaborative skills, and pedagogical competence. However, these findings should be interpreted as short-term perceptions rather than measured competency gains, as the quantitative component relied on descriptive reporting and the data were collected immediately following the event.

Qualitative findings deepen this interpretation by showing that the value of Teachfest was not only motivational but also epistemic and practical. Student teachers described enacting pedagogical knowledge under constraints such as time, translation demands, and learner diversity. These constraints are not peripheral but central to teaching practice, suggesting that purpose-driven projects may accelerate professional learning precisely because they expose pre-service teachers to teaching complexity earlier than conventional practicum timelines.

At the same time, several tensions remain unresolved. First, the experience revealed linguistic barriers and limited time for planned activities, highlighting the need for greater scaffolding, translation support, and culturally responsive instructional preparation. Second, given that participant narratives frequently aligned with PDL constructs, future work should explicitly guard against framework-confirmation bias by incorporating independent coding checks and triangulation using artefact analysis (e.g., lesson plans, reflective journals) or classroom observations. Third, while participants expressed a desire to contribute to society, purpose-driven

engagement risks reproducing a charity narrative unless reciprocity is clearly embedded through shared decision-making with the partner community and mechanisms for community feedback.

From the partner teacher's perspective, the learning aids and interactive approaches were perceived as enhancing learner engagement and teacher inspiration. Nevertheless, logistical limitations (especially transportation) highlight a key constraint on sustainability and scalability. Thus, rather than asserting broad scalability, the programme may be best framed as a transferable model contingent on contextual resourcing and long-term partnership infrastructure.

In conclusion, this practice-informed study suggests that community-linked STEM Teachfest initiatives may offer a promising approach to embedding purpose-driven learning in pre-service teacher education. Future research should incorporate longitudinal follow-up, richer qualitative samples, and additional evidence sources to examine sustained pedagogical growth and partnership outcomes beyond immediate post-event perceptions.

Limitations

This study has several limitations. The quantitative analysis was descriptive and based on self-reports collected immediately after the event, which restricts inference about actual competency development or longer-term impact. Additionally, because Teachfest was designed around PDL principles, responses and interpretation may be influenced by expectancy effects and framework alignment.

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