Toward Bidirectional Faculty Development: A Collaborative Model for Designing and Implementing Faculty Trainings on Evidence-Based Strategies for Supporting Student Learning in Low- and Middle-Income Countries

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Abstract

This evidence-based practice paper describes a collaborative, bidirectional faculty development project implemented by engineering faculty from Malawi and the United States. The aim of the project was improving undergraduate educational practices at a university in Malawi by integrating active learning strategies across the undergraduate engineering curriculum and catalyzing curricular transformation. First this paper describes the framework used for the project, and then it describes how it was applied for the design and implementation of a week-long faculty development workshop for 52 engineering faculty and staff from two universities in Malawi. This project was collaboratively implemented by a faculty team from Malawi and the United States in a way that facilitated bi-directional exchange between facilitators and participants.

This paper contributes to the literature by offering a novel perspective on engineering faculty development programs that have been collaboratively designed, developed, and implemented by partners in a low-income country (LIC), i.e., Malawi, and high-income country (HIC), i.e., the United States. Often models for global faculty development involve a one-way transfer of knowledge from higher-resourced to lower-resourced settings (Olayemi, et al., 2021), despite increased calls for bidirectional exchanges between faculty in low- and middle-income countries (LMICs) and high-income countries. Further, such models are not usually evaluated for whether they are best framed for LMICs. These kinds of unilateral and untested models create problematic power imbalances between partners, prohibit parity in educational experiences for engineering faculty in LMICs and may not lend themselves well to eventual self-sustaining efforts among faculty in LMICs. As a result, engineering educators in LMICs often lack access to workshop-style faculty development training, including training on evidence-based instructional strategies to improve student learning. From the perspective of faculty facilitators, this paper offers practical reflections on culturally-relevant translation and integration of active learning in a low-income country.

1. Background

There is a strong consensus across the engineering education research literature that lecture-based, teacher-centered approaches are not highly effective in supporting student learning. Instead, strong evidence exists to support the positive impacts of active learning (AL) on both achievement of learning outcomes and student retention (Davis & Yadav, 2014; Kolmos & De Graaff, 2014; Lichtenstein et al., 2014). Grabinger and Dunlap (2011) define rich environments for active learning according to the following criteria:

- "evolve from and are consistent with constructivist philosophies and theories;
- promote study and investigation within authentic (i.e. realistic, meaningful, relevant, complex, and information-rich) contexts;
- encourage the growth of student responsibility, initiative, decision-making, and intentional learning;
- cultivate an atmosphere of knowledge-building learning communities that utilize collaborative learning among students and teachers;
- utilize dynamic, interdisciplinary, generative learning activities that promote high-level thinking processes (i.e. analysis, synthesis, problem-solving, experimentation, creativity, and examination of topics from multiple perspectives) to help students integrate new knowledge with old knowledge and thereby create rich and complex knowledge structures; and,
- assess student progress in content and learning-to-learn through realistic tasks and performances" (p. 10).

Tinto (1999) asserts that active involvement in the learning process is the most important factor in student achievement of learning outcomes *and* retention, noting "students who are actively involved in learning activities and spend more time on task, especially with others, are more likely to learn, and in turn, more likely to stay" (p. 2). In 2014, a meta-analysis quantified the impact of AL on student learning, concluding that students who were actively engaged in their learning environments had increases in learning at 0.5 standard deviations higher than their passive peers (Freeman et. al, 2014).

However, despite over two decades of evidence which support that AL approaches are more effective than lecture-based approaches (Du Plessis, 2020), there is still not widespread implementation of AL strategies (Essop & Beselaar, 2022). Multi-faceted barriers impede curricular change toward implementing active learning strategies. At a high level, case studies across Botswana (Tabulawa, 2003), South Africa (Harley et. al, 2000; Nykiel-Herbet 2004), and Tanzania (Vavrus, 2009) highlight four salient barriers to curricular change:

1. Educators' training on and personal experiences in learner-centered approaches is often limited (Coultas and Lewin, 2002; Schweisfurth, 2015);
2. A lack of available resources in physical learning environments can inhibit implementation of learner-centered approaches (Schweisfurth, 2015)
3. Cultural expectations at the institutional and national level (eg., appropriate educator-learner relationships, educators' self-image as authorities) can be mis-aligned with aspects of learner-centered approaches, including active learning (Schweisfurth, 2015)
4. Even successful curricular change initiatives at the institutional level may be met with significant challenges due to national examination strategies, which often leverage high-stakes testing and a fixed curriculum (Schweisfurth, 2015)

As we work to understand and decrease barriers to implementation of AL approaches, it is necessary to thoughtfully consider the extent to which AL resonates across cultural contexts. Given the push to expand the use of AL globally (Schweisfurth, 2015), it is necessary to wrestle with important questions surrounding how well such pedagogical strategies translate across cultural contexts (Mtika & Gates, 2010; Smith-Keiling, 2019). We know that both learners' engagement and educators' pedagogical beliefs are shaped by their social, historical, and cultural knowledge (Schweisfurth, 2015); however, currently, there is a limited understanding about which aspects of AL are replicable across contexts and which aspects may be highly context-dependent. While much exploration remains, current research suggests that factors such as language, cultural context, teacher beliefs, student learner, teacher-learner relations, and curricular structure influence the implementation of active learning strategies (Ramnarain & Hlatswayo, 2018; Mtitu, 2014). Therefore, to support educators and learners across global contexts, further work is needed to explore the implementation and adaptation of AL across global contexts (Mtika and Gates), particularly from the firsthand perspective of educators leading curricular transformation.

To contribute to this gap in literature, our purpose is to describe the curricular design and implementation of a bidirectional faculty development workshop, designed to support Malawian faculty in integrating AL approaches into engineering courses. The faculty development workshop was collaboratively led by Malawi-trained engineering faculty and United States-trained engineering faculty, providing an example of bidirectional knowledge-sharing on the implementation of AL approaches across global contexts. Specifically, we aim to describe **1**) **our framework for the faculty development training model**, **2) brief case studies of faculty development training curriculum** as collaboratively developed and implemented in Blantyre, Malawi, by faculty trainers from Malawi and the United States, and **3) implications for future implementation** of faculty development initiatives, particularly faculty development initiatives that prioritize creating equitable educational experiences for faculty across global settings. Through this paper, we aim to share a bidirectional faculty development approach that adapts

workshop materials to the local context, bridges local institutional capacity in low resource settings, and avoids pitfalls associated with power imbalances between partners.

Framework

There are three key approaches we used both for developing and running the workshop, including:

1. A *collaborative leadership* model both for the front-end development and running of the workshop by the facilitation team,
2. Designing the workshop exclusively with *active learning,* and
3. Framing the workshop using a *community of learners* approach.

First, we used a *collaborative leadership* model for the front-end development of the workshop. An equal number of facilitators from Malawi- and U.S.-based institutions worked together virtually prior to the workshop to design the experience for participants. This approach was important for a number of reasons, including ensuring that academic terminology and workshop materials were relevant and well adapted to the local institutional context. Further, it helped build capacity and expertise through authentic partnership and knowledge sharing. There was also parity in leadership and contribution for running the workshop exercises. Finally, agile approaches–like on-the-fly changes to facilitation activities in response to the energy and experiences of the faculty participants in the room, as well as post-mortem reflections at the end of each day–help the team pivot exercises.

Secondly, the workshop was designed exclusively using *active learning* strategies. A pitfall of workshops on active learning strategy is that the pedagogical approach is not used in the design of the workshop. Examples of how the active learning strategies were employed are described in a later section. Finally, a c*ommunity of learners* framing was used to help facilitate authentic, bidirectional faculty exchanges and development experiences. Learning communities intentionally have "…interaction, interplay, and collaboration among the community's members as they strive for specified common learning goals" (Lenning, et al., 2013). This approach helped facilitate exchanges between the facilitation team and the workshop participants. These three elements are

Key approaches used in the Framework

Key Element	Description	Example from workshop
Collaborative leadership	Parity in leadership and contribution for developing and running the workshop exercises	Collaborating on the workshop design virtually; Post-mortem reflections at the end of each day to pivot and adapt the following day are examples.
Active learning	Using active learning strategy experience to design the entire workshop experience	Several examples are in the *Program Description* section.
Community of Learners	Facilitating bidirectional exchanges by encouraging knowledge sharing from the workshop participants	Throughout the workshop, when a difficult question would arise the facilitation team would encourage a room conversation around the topic to learn from participants.

2. Program Context

Context. The faculty development workshop was run in Blantyre, Malawi in collaboration with a mid-sized, relatively new university (officially opened in 2014) during the summer of 2022. The University is government-owned and was primarily established to champion research and teaching in science, technology and engineering. The Department of Engineering is one of the largest at this institution.

Workshop Participants. Fifty-two engineering faculty and staff members, from the host university and one other, attended the workshop. Faculty attendees had various backgrounds including mechanical engineering, electrical engineering, materials engineering and biomedical engineering. It was established, at the beginning of the workshop, that less than 5 of the participants (10%) had prior experience in a faculty development workshop centered on active learning.

Workshop Facilitators. The team of facilitators for the workshop was composed of engineering faculty from both Malawi and the United States. In contrast to the common arrangement where facilitators are primarily drawn from high-income countries (HIC) to low-income countries (LIC), the current workshop was designed to provide a balanced, context and culturally adaptive facilitator team. The composition of the team encouraged a cross-fertilization of ideas based on

unique insights of the facilitators due to their diverse social background. That is, although the curriculum framework was designed based on current research (chiefly conducted in the HICs), the actual implementation incorporated input from local facilitators – contextualizing the curriculum to the needs of Malawian faculty.

3. Program Description

The faculty development training curriculum was rooted in active learning techniques both in terms of the facilitation approach taken, and how bidirectional exchanges and knowledge sharing between the facilitation team and workshop participants and among the workshop participants were supported. The workshop took place over five days for 8 hours (8a-4p) each day. The content of the workshop was derived from a combination of facilitation model frameworks that encouraged cooperation, inquiry and hands-on practical experiences (Hodges, 2015) of the participants as they engaged with the facilitation team, each other and the materials in the workshop. Briefly, cooperative and inquiry-based activities were designed to give participants opportunities to collaboratively address a task, to review each other's work, and to engage in both small-group and whole-group discussions and explorations as means to drive their own understanding. Experiential activities allowed participants to apply ideas from the workshop as they reimagined artifacts from their own courses such as learning objectives, teaching and learning activities, and syllabi, and as they reflected on new ways to engage their students. Examples of the AL approaches described, demonstrated, practiced, discussed and dissected to enhance student engagement, collaboration, critical thinking, and skill development were: think-pair-share, in-class problem-solving, project-based learning, peer review and statement of muddiest points (Hodges, 2015; Odom et al, 2009; Reese-Durham, 2005). Brief descriptions of each of these follow:

1. Think-pair-share asks students to explain a concept or answer a question in pairs.
2. In-class problem-solving can be viewed as a variation of think-pair-share in which students may work independently initially, but then work collaboratively in small groups toward addressing a problem. Like think-pair-share, in-class problem-solving exposes students to the thoughts of other students and, therefore, potential alternative ways of solving a problem.
3. Project-based learning takes in-class problem-solving to an extreme by having students spend most of their time working on real-world, cross-disciplinary and open-ended problems in and out of class. In this type of learning, teaching teams primarily serve as facilitators while students drive their own learning through engagement with the project.
4. Peer review gives students an opportunity to grade, rate or give feedback on other students' work. Peer review has the benefit of enhancing student learning because being critical of the work of others naturally makes you critical of your own.

5. Muddiest points are students' greatest sticking points or points of confusion. The use of muddiest points is an evaluation technique that gives students the opportunity to reflect on what they have been learning after a lesson or a hand-full of lessons and gives course instructors the opportunity to pivot as needed to address problematic areas for students.

One of the earliest and most palpable examples of bidirectional exchanges occurred when the workshop shifted to focusing on peer review and muddiest points. These AL approaches were introduced when the facilitation team modeled the design, delivery and scaffolding of a mini-lecture to the workshop participants. Following the lecture activity, the faculty participants, who pretended to be students during the activity, were given the opportunity to assess the activity. The simple act of having the faculty discuss, dissect and critically review what the facilitation team presented was transformative. That act leaned into the idea that everyone, workshop facilitators and participants alike, were members of *one* learning community where everyone could learn from and support each other (Grabinger and Dunlap, 2011). Interestly, the tenor of the workshop noticeably shifted and the faculty participants really began to see themselves as collaborators and influencers in the workshop.

Contextualizing the curriculum to local conditions was thematic during the workshop. The adopted collaborative community of learners model supported curriculum contextualization - it inherently encourages real time adaptation of the curriculum through bidirectional exchanges between facilitators and participants.

An example where contextualizing the curriculum to the needs of Malawian faculty occurred when the workshop shifted to syllabus design. The ability to change/improve the syllabus over time is crucial in ensuring that students are taught relevant material. It can also help in ensuring that the content of the material being taught is well understood as one might choose to include background information that would be crucial for students to understand more complex concepts. During the workshop, it was noted that American lecturers had much greater control when it comes to changing the syllabus of their courses that they teach as compared to lecturers in Malawi. When it comes to changing the content of the syllabus in Malawian Universities, every syllabus is eligible for review after it has been offered for a full cycle (which is one year longer than the length of the program , mostly 5 to 6 years). The following steps are followed:

1. The current syllabus is presented to stakeholders to get their input on what needs to be changed. These stakeholders include prospective employees of graduates, and alumni.
2. Faculty then make changes to the syllabi according to the stakeholder consultations and in line with what other universities in the same field are teaching.
3. The proposed changes are then presented to the stakeholders for Vetting. After which, any other changes would be made.
4. The syllabus is then presented to the department, then faculty/school, and finally to the University for approval.

5. After it has been approved, the syllabus will be offered for another cycle before it can be reviewed again.

This structured approach is different to that which is followed in the US where faculty have the freedom to amend one's syllabus whenever a need arises. Given this difference, this part of the workshop focused on changes to learning objectives that faculty could take until syllabus changes could be made.

4. Conclusions and Discussion

Through our pre- and post-workshop reflections, the aforedescribed week-long faculty development offers valuable observations and lessons on translating generally accepted AL strategies across cultural contexts. We divide these observations into two broad categories namely future implications and potential challenges.

Implications for future implementation: A work-shop style faculty development program can provide invaluable opportunities to engineering educators in LICs. To increase chances of success, such a workshop should employ a community of learners approach, where the program designers and facilitators engage in authentic and equitable collaboration among themselves and with the faculty attending the workshop. This helps to build trust and good rapport between the workshop attendees and facilitators, opening doors for buy-in from all workshop participants. Beyond this, the collaboration will naturally translate pedagogical approaches to local context. At the fundamental level, the community of learners framework lends itself well to an iterative approach of curriculum development - leading to easy localisation of the final curriculum to be delivered. As an example, during this workshop we continuously changed terminologies in the pre-developed presentation slides to align with local context, using academic terms that can be well understood by the local participants.

Another local context that should be carefully considered when designing and delivering these kinds of workshops is whether or not the faculty being trained in AL strategies have the agency to modify their curriculum and, If yes, by how much. It is our observation that there exist variances between HICs and LICs in terms of the authority given to faculty to change their course materials - the latter being more structured/rigid than the former. In addition, localization of curriculum must also consider cultural contexts like deference to elders, power distances and the implications of high-context versus low-context communication. Clearly, developing a successful faculty development workshop in a cross-cultural environment requires a consideration of multiple factors. Eventually, this demands thoughtful planning and attention to details including the activities to be modeled - since AL strategies need to be modeled to the participants as opposed to being 'taught' to them.

Potential challenges and mitigation: We observe that the road to translating AL strategies in different cultural contexts is mired with various challenges. Firstly, the physical environment of classrooms may be challenging for active learning approaches, such as team-based in-class work. There are some classrooms that were designed with immovable furniture, for example. Secondly, AL strategies that rank higher on the Bloom's Taxonomy, like project-based learning, may not be easily implemented in some contexts considering the amount of curricular changes required. Thirdly, in hierarchical context AL strategies would require more effort to implement than in progressive environments. For example, students and faculty may have preferences for separating personal and professional lives - making it hard to build trust which is generally important in successful AL-based lessons. Another impediment ensues when students prefer to maintain anonymity, being extraordinarily reserved or not wanting to be personally embarrassed. The end result is low class participation; potentially destroying the foundation of AL-based strategies. We reflected on some strategies that have potential to counteract some of the aforementioned challenges, namely:

(a) the facilitator can consider intentionally creating opportunities for one-on-one engagements with the students. Slowly, this process may lead to building trust between the student and the facilitator

(b) The facilitator should devise ways of establishing oneself as someone students can freely talk to. This is more art than science and will require careful navigation. Some ways to achieve this could include encouraging students to visit the facilitator during office consultation hours and using less formal channels of communications like whatsapp.

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