CO-DESIGNING OPEN EDUCATIONAL RESOURCES: A DESIGN-BASED RESEARCH APPROACH TO ENHANCING TEACHER EDUCATOR CAPACITY IN AFRICA

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Abstract

This paper presents the origins, design, and implementation of a research-informed initiative aimed at capacitating African teacher educators in co-authoring Open Educational Resources (OER). It responds to the need to equip teacher educators with the competencies required to engage in and model open educational practices tailored to local educational contexts. Despite the global expansion of Open Educational Resources (OER), particularly during and after the COVID-19 pandemic, their integration into African teacher education institutions remains limited. The project brings together five initial teacher education institutions from four African countries: Botswana, South Africa, Nigeria, and Rwanda, in a collaborative effort to strengthen OER development using a design-based research approach. The initiative commenced with a webinar designed to raise awareness among African teacher educators about the potential of OER. Following this, a baseline case study was conducted to assess existing competencies and inform targeted training strategies. Drawing on these insights, a workshop employing experiential learning methodologies was held to equip participants with the necessary skills for OER co-creation. The process culminated in the collaborative development of outlines for a generic OER module and two STEM and two non-STEM subject modules, guided by the principles of communities of practice. By integrating research-driven design with collaborative authoring, this project provides a model for sustainable capacity building in teacher education. The paper concludes by highlighting key lessons learned and proposing strategies for scaling similar initiatives to foster greater OER adoption and use across the African education landscape.

Keywords: Open Educational Resources, Teacher Education, Design-Based Research, Experiential Learning, Communities of Practice

1 INTRODUCTION

Open Educational Resources (OER) are freely accessible teaching, learning, and research materials that reside in the public domain or are released under open licenses, allowing for use, adaptation, and redistribution in line with Creative Commons frameworks. While these resources offer considerable potential to enhance teaching and learning, evidence suggests that African teacher educators often lack the capacity to adapt, localise, or create OER suited to their unique educational contexts (Mays, 2020). The limited institutional uptake of OER across African teacher education programmes is compounded by the absence of national or institutional policies guiding their use and creation. Although there has been moderate adoption of OER by African higher education (HE) educators, 46% compared to the global average of 51% use them and only 11.3% have engaged in the creation of OER (de Oliveira, Daryono, & Cartmill, 2017; Cartmill, 2017). This low participation is linked to challenges such as limited awareness, inadequate technical and pedagogical capacity, and persistent infrastructural constraints. Consequently, teacher education graduates enter the profession underprepared to function at the Knowledge Creation level of the UNESCO ICT Competency Framework for Teachers (UNESCO, 2018) that demands teacher innovation and contextualisation of learning environments.

Most OER in circulation originate from the Global North, raising concerns about their cultural and pedagogical relevance in African classrooms. Mishra (2017) underscores the importance of contextualisation to ensure that OER are both accessible and meaningful to diverse learner populations. In many African contexts where resources are limited, co-authoring OER is essential, not just as a practical solution, but as a means to create educational content that is relevant, inclusive, and capable of driving meaningful change. This article responds to these challenges by demonstrating how teacher educators in Africa can collaboratively co-design OER that are locally relevant and pedagogically sound. Using a design-based research (DBR) approach, this study investigates how collaboration among teacher educators with a motive to localise learning materials working in a community of

practice can foster the co-creation of OER, thereby bridging the gap between policy, practice in African teacher education.

2 CO-DESIGNING OPEN EDUCATIONAL RESOURCES

Participation in OER for African practitioners has dividends, given the limited infrastructural challenges that are inherent and responsible for immobilising progress in this continent. The constraints are worsened by the incapacitation of teacher educators who should be taking a lead in preparing teachers for skills needed for the changing education systems. Thus, sharing both skills and resources amongst these experts can be a better strategy to ensure the African education sector does not fall behind. Co-designing OER has potential to create inclusive, content-sensitive educational materials customised for the African context. Involving teacher educators who share similar backgrounds, values, and educational experiences enhances the relevance, cultural responsiveness (Bali et al., 2020), and pedagogical effectiveness of educational practices (Cronin, 2017). This is particularly valuable for African teacher education, which tends to rely heavily on existing content developed in more industrialised or Western contexts (Czerniewicz et al., 2017). Often, these materials fail to reflect African realities, languages, and pedagogical needs.

Czerniewicz et al. (2020) posit that co-design in African contexts can promote decolonisation of the curriculum that values indigenous knowledge and teacher agency. Such a strategy would contribute to the breeding of educators who are able to adapt, create materials that reflect their own teaching contexts and share cultural frameworks, particularly, how they rise above existing resource constraints. Co-design is a catalyst to teacher educator professional development as participants collaborate in content creation and reflective practice (Hodgkinson-Williams & Arinto, 2017). Communities of practice are formed and that becomes fertile ground to produce quality OER customised for the African classroom. Co-design should not only end at educator level but must bring in students who can create resources that are customised to their classrooms (Wiley and Hilton, 2018). This can then help bridge the gap of scarcity of up-to-date teaching and learning resources (Mishra, 2017) and foster innovation and ownership.

3 OER IN AFRICAN TEACHER EDUCATION

Despite the evidence that there is a shortage of teaching and learning resources in the African context, there is limited literature covering OER activities that could help inform initiatives aimed at showcasing good practice in teacher education (Van Allen & Katz, 2019). The Teacher Education in Sub-Saharan Africa (TESSA) seems to be the main programme that involved teacher educators in creating digital quality OERs that can be easily accessed, adapted and be used in teacher education with an aim of improving teaching and learning in Africa (Murphy & Wolfenden, 2013). In addition, a project focusing on African teacher educators involved a team of nine participants from several universities who created and used OER to enhance access to quality mathematics teacher education resources (Sapire & Reed, 2018). The rest of the initiatives across Africa were not focused on teacher education but on challenges related to the access, supply and contextualisation of educational materials (Baijnath, et al., 2023). There is a need to implement strategies that empower educators to actively participate in the pedagogical co-creation, adaptation, and sharing of these resources to enhance the professional practices of African teachers.

4 THEORETICAL FRAMEWORK: COMMUNITIES OF PRACTICE

Community of practice is a phenomenon that refers to a community that shares a practice. The key insight is that learning is embedded in cultural practices. The concept of *communities of practice* (CoPs), first introduced by Lave and Wenger (1991), offers a robust theoretical lens for understanding how collaborative social learning fosters meaningful professional development. CoPs are also defined as groups of people who share a concern, set of problems, or a passion about a topic, and who deepen their knowledge and expertise by interacting on an ongoing basis (Wenger, 1998). Central to this framework is the idea of *legitimate peripheral participation*, where newcomers become part of a community and gradually move toward full participation through engagement with more experienced members (Lave & Wenger, 1991). In the context of Open Educational Resources (OER) development among African teacher educators, the CoP model provides valuable insight into how shared goals, sustained interaction, and mutual support contributed to this project's success.

Hoadley (2012) extends the CoP framework by emphasizing how learning communities function as "designed social systems" that encourage co-construction of knowledge and distributed expertise. This is particularly relevant in the digital age, where geographically dispersed individuals collaborate through shared platforms and open pedagogical practices. By functioning as a CoP, teacher educators involved in this OER project were not only creating and curating resources but also engaging in collective identity building and knowledge exchange that aligned with their professional values and local contexts. Therefore, the success of the OER rollout can be attributed not just to the materials produced, but to the robust social learning processes fostered within the community itself.

5 DESIGN-BASED RESEARCH APPROACH

This study employed a design-based research (DBR) approach, which is characterized by iterative cycles of design, implementation, analysis, and refinement in real-world settings (Design-Based Research Collective, 2003). DBR is particularly suited for educational innovation as it focuses on generating both practical solutions and theoretical insights through collaboration between researchers and practitioners (Anderson & Shattuck, 2012). In this project, the DBR approach enabled the co-development of OER materials by African teacher educators through sustained, context-sensitive iterations that responded to local needs. The flexible and participatory nature of DBR fostered deep engagement within the community of practice, allowing for continuous feedback, adaptation, and shared ownership of the resources. As a result, the project's success was not only in the creation of usable OER, but also in the empowerment and professional growth of the educators involved.

6 ORIGINS: THE OER TEACHER EDUCATOR PROJECT

This project aimed to build the capacity of educators in designing an online OER module for inclusion in an open repository. The development of the module was guided by the need to address the infrastructural challenges commonly faced by educational institutions across Africa (Menzli et al., 2022) and to leverage collaboration as a strategy for the effective creation and adaptation of OER (Czerniewicz et al., 2020). Central to this research-based initiative was the recognition that integrating African perspectives and cultural knowledge into the design process would result in a more contextually grounded OER module, one that not only prepares teachers to engage with OER but also affirms learners' identities by presenting content they can meaningfully relate to (Jensen, & Kimmons, 2022).

This collaborative OER project was funded by the South African University Capacity Development Programme (UCDP) through its Scholarship of Teaching and Learning (SOTL) initiative, spanning the period from 2022 to 2024. The funding framework emphasised key requirements, including cross-institutional collaboration, the potential for scholarly outputs, the long-term impact of the project, and clearly defined mechanisms for achieving its outcomes. These requirements provided a foundational structure for the initiative, positioning it as an innovative contribution to African teacher education.

The project team initially comprised six teacher educators from five institutions - four South African universities (North-West University, University of the Western Cape, University of Johannesburg, and University of the Witwatersrand) and one Nigerian teacher education institution. Individuals were selected for the team based on their expertise in key areas of materials development, such as programming, curriculum design, online instructional design, digital storytelling, and educational technology. Figure 1 below illustrates the allocation of roles, designed to strategically align project activities with the initiative's goals while leveraging the team's diverse strengths.

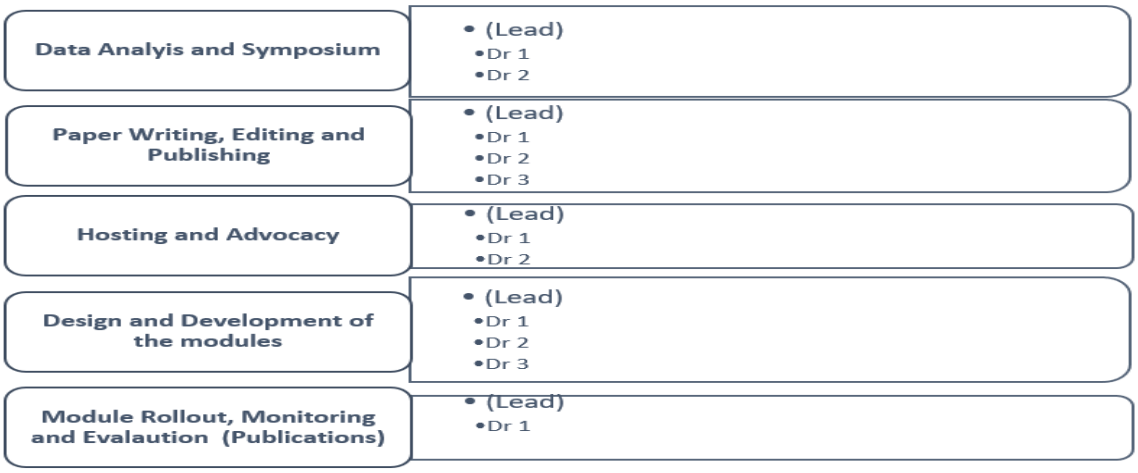

Figure 1: Overall project roles

Dr above is a pseudonym with numbers that represent the sub-team supporting the lead or the coordinator of the activity. Wenger, McDermott & Snyder (2002) argue that roles sustain community vitality, ensure knowledge sharing, and maintain focus on shared goals. In addition, different roles in a CoP (facilitator, participant, knowledge broker) contribute to community success (Li, et al., 2009). This structure assisted in ensuring full participation by all members and thus, sustaining the movement of the project to the successful end of its first phase. In addition, this arrangement facilitated smooth project implementation, as activity leads collaborated closely with their sub-teams, while the rest of the team provided support either at the task level or within their respective institutions.

6.1 Conceptual and Empirical Foundations

It was essential for the team to develop a solid understanding of the field before implementing the project's main activity - the development of an online OER module. This was pursued through two phases: first, a conceptual study, followed by an empirical investigation, both collaboratively undertaken by the team.

PHASE 1: Conceptual Study

In line with one of the project's outcomes, the team conducted a literature review aimed at co-authoring a conceptual paper to build a shared understanding of the field and support the adaptation of the OER module. Initially, team members' expertise did not include OER practices, as their prior experience was based on conventional teaching experiences that offered little or no exposure to participation in the area. However, for this task (literature review), each member was assigned a section, which was later shared and discussed during project meetings. This type of engagement in a CoP "shapes newcomers' identities and in the process gives structure and meaning to knowledgeable skill" (Lave, 1991, pg.74). As the team gained better understanding of OER the weekly sessions encouraged critical questions, deeper discussion, and further engagement with relevant literature. The paper was presented at a local conference and published in its proceedings.

The literature review for the paper identified gaps in the team's knowledge regarding the adaptation and creation of OER for the African context. It was therefore agreed that experts in the field should be invited to strengthen the project, especially since two members from local institutions had withdrawn after leaving their posts to pursue other careers. Through our professional networks, we identified one expert from Botswana Open University, three from the University of Rwanda, and later, an OER specialist from the University of South Africa (UNISA) also joined the team. These individuals contributed not only their subject-matter expertise, but also valuable experience gained from participating in national OER initiatives, thereby enriching the project with broader regional perspectives and practical insights.

PHASE 2: Empirical Study

Given that this project employed the design-based research in its activities, empirical research followed the conceptual paper to learn (Barab & Squire *(2004)* from contextualised OER experiences of the few local teacher

educators in our institutions who were in practice. Some of these experts co-authored resources with colleagues, while others engaged their students in the process, thereby demonstrating the potential for collaborative OER development. During individual interviews, they described how they built student (pre-service teachers) capacity and actively participated in OER initiatives. To document the findings, the project team was divided into two teams with leads, each collaborating on papers that are currently being refined for publication. The findings were presented at a hybrid seminar attended by participants from all partner institutions, where initial key ideas for the design of the OER module began to emerge.

6.2 Implementation

The implementation phase focused on the co-design of the modules. However, additional funding was required to support this undertaking. Following our application and presentation of the project to the Commonwealth of Learning (COL), we received additional funding. The funder supported the project because it was grounded in research and driven by a consortium of teacher educators with a shared goal: advancing OER participation tailored to the African educational context. The project's strength lay in its research-driven approach, its aim to develop a contextually relevant OER module, and its commitment to sharing the final output with colleagues across the continent. This commitment led to the successful completion of the following activities that were achieved in 7 months.

1. Case Study (baseline assessment)
2. Teacher Educator Awareness (webinar)
3. Capacity Building
4. Co-designing of OER module outlines
5. Development of Teacher Education OER Policy and Guidelines

Activity 1: Case Study (baseline assessment)

With the support of the funder, the next activity was preceded by a research phase designed to inform all subsequent project activities. The research employed a mixed-methods approach, using an explanatory sequential design (Creswell, (2014b). The survey was disseminated by team members within their respective institutions, followed by two online focus group interviews involving respondents from all participating institutions. The focus groups sought to gain deeper insights into why many teacher educators were not actively engaging in OER practices, despite their potential to improve educational outcomes. Valuable perspectives emerged, including recommendations for building the capacity of teacher educators, informing policy decisions, and promoting the sustainable adoption of OER in African teacher education.

Activity 2: Teacher Educator Awareness (Webinar)

The findings from the baseline assessment guided the selection of appropriate speakers and the development of a webinar theme aimed at raising awareness among teacher educators, an area of need highlighted in the baseline assessment. During the event, the Deputy Director for the South African Teacher Education branch in the Department of Higher Education and Training (DHET) emphasized the need for policy to support OER adoption in African teacher education, linking it directly to improved teacher performance and enhanced learning outcomes. Coincidentally, this was one of the deliverables from the funder. The benefits of this phase were far-reaching.

Activity 3: Capacity Building

The structure and approach of this hands-on capacity-building programme were shaped by input from the webinar. This project's collaboration facilitated the identification of presenters from local and international OER experts with national and international experience in training and policy development. This enabled the organisation of a three-day professional development programme, with all consortium members participating as audience and facilitators of the sessions. In addition to training consortium members, government education officials were also invited, resulting in an unexpected yet impactful development. The attendance of the provincial teacher professional development director led to the organisation of an OER conference the following year, where high-ranking education officials were invited to learn about the OER movement. Project team members served as keynote speakers and panellists.

Activity 4: Co-designing of OER module outlines

At this stage, it became necessary to develop a clear strategy and plan for coherence (Wiley & Hilton, 2018) to ensure the success of the project's key outcome - module outlines. Initially, the plan involved developing a single module, but with funding requirements, four more modules were added. The first was a generic module whose core content would be identified during the capacity-building workshop. The remaining modules were intended to focus on two STEM and two non-STEM subjects. Determining which subjects to develop was challenging, given the variations in curricula across the participating African countries. Reaching agreement on the selection criteria required thoughtful negotiation and extended dialogue among team members. Ultimately, subjects commonly offered across the five participating African institutions were identified. Coordinators for each subject were nominated by team members from their respective countries as follows:

Institution 1: Generic (Introduction to OER for teacher education)
Institution 2: Biology
Institution 3: Mathematics
Institution 4: English
Institution 5: Geography

The team member from **Institution 6** is our OER module development expert. Thus, her role involved training the authors and providing ongoing feedback on their module outlines. The identification of content to be covered was based on topics requiring greater attention or support across institutions. For example, in English, Academic English was prioritized because, as a foreign language in all African countries, students needed additional support to enhance their overall course performance. Decisions on how to package the module were discussed within country groups. This activity was conducted in one institution (University of Rwanda) with subject experts (authors) attending in person while authors from other countries joined via Teams, Zoom, or WhatsApp.

This phase posed the greatest challenge for the collaboration, largely due to the difficulty in reaching a shared understanding of what constituted a module. We began with two templates, one for the module content and another for the outline. This collaboration activity was supposed to focus only on the outline, but we later discovered that some groups had used the wrong template (module content). Such challenges are not uncommon in the co-authoring of OER (Wiley & Hilton, 2018; Petrides et al., 2011). Additionally, some colleagues participating online were unable to attend consistently - despite their enthusiasm - due to not having secured conference leave. Moreover, the three-day duration of the workshop proved insufficient for completing the task. Consequently, the team had to ask authors to continue working on the modules after the workshop. Coordinating this phase was extremely difficult, as team members had to resume their regular duties upon returning to their workstations. The additional workload, coupled with a lack of incentives (Otto, 2021), affected their availability and engagement. Attempts to delegate coordination to team members were unsuccessful when those selected lacked subject-specific expertise. Moreover, scheduled meetings were often unproductive due to the unavailability of some subject group members. Ultimately, we arranged a venue where all subject experts from the University of the Witwatersrand, South Africa (the project host) could meet and refine the module outlines with the expert's assistance. This solution proved effective, although hosting some participants for a full day was challenging and required them to complete their work over several days. Although we had prior experience developing modules, creating one specifically for OER publication was a distinct process that required extra time for adaptation. We are thankful to COL, our sponsor, for enabling us to convene, and we appreciate our reviewer's guidance and patience throughout the process.

Activity 5: Development of Teacher Education OER Policy and Guidelines

This activity was originally scheduled to run alongside the co-authoring workshop, with a full day dedicated to it. However, prolonged discussions around decision-making made this impossible. The three team members assigned to this task invested considerable time ensuring the policy closely reflected the research findings. Their primary focus was adapting the funder's template to suit the African teacher education context. Despite extensive preparation by the activity lead and the team, prior to the workshop, little progress was made during the event. It was agreed that work would continue afterward, but competing commitments hindered progress. Ultimately, the activity received attention only near the project's conclusion, creating significant pressure for all involved. We are grateful to a world-renowned policy expert outside the project who assisted in refining the final output.

7 LESSONS LEARNED

This project adopted a research-based approach grounded in the principles of design-based research (DBR), emphasizing iterative collaboration and collective decision-making as key to successfully managing this complex endeavour (Brown, 1992; Wang & Hannafin, 2005). Weekly meetings provided a space for this collaborative practice, reflecting Wenger's (1998) theory of communities of practice, where shared goals and mutual engagement foster learning and knowledge co-construction. Without administrative support, the project lead (the author) had to meticulously organise each activity with a structured table (simplified Gantt chart) assigning responsibility for each agenda item to specific members based on their project roles (see Figure 1). This approach enhanced coordination and accountability, enabling members to come prepared, thus keeping meetings concise and focused, except when difficult decisions arose.

The team demonstrated strong commitment, with 90% of scheduled meetings reaching quorum, reflecting a shared ownership of the project. Flexibility in rescheduling meetings to accommodate members' work demands helped maintain consistency and momentum. This collaborative and adaptive process enabled the timely completion of all implementation phase tasks, despite limited funding and other constraints, exemplifying how DBR and communities of practice can support effective teamwork and sustained project progress. Through their active involvement in all project activities, team members have gained recognition within their institutions as OER experts. They have been entrusted with responsibilities such as organizing workshops and conferences, and supervising Master's and PhD research in the field. Their contributions in research and the development of teacher education OER policies and guidelines further position them not only as emerging experts in OER practices but also as consultants in the field.

This project yielded the following lessons for collaborative OER development in teacher education:

- **Collaboration in leadership**: Distribution of leadership roles improved engagement and ownership.
- **Sustained Communication**: Weekly meetings were a platform for accountability and ensuring deadlines are met.
- **Flexible but Clear Coordination**: Meeting agendas and documented minutes with leads assigned to activities helped maintain momentum and accountability. Institutional representation in all meetings contributed to the success of this project and there were very few instances of rescheduling of meetings.
- **Sponsor/ Funder turned to opportunities for success**: The funders' requirements played a key role in shaping the Community of Practice (CoP) structure and processes, which fostered meaningful collaboration and contributed significantly to the successful completion of the project.
- **Professional Trust and Empathy**: Respecting team members' work and personal (e.g. family related) commitments promoted integrity and built resilience within the community.
- **Sustainability Beyond the Project**: The CoP should outlast the funding period to sustain resource creation and adaptation (Stuckey & Smith, 2004).

These findings confirm that successful OER initiatives in African teacher education require not only technical skills and funding but also sustained social structures that nurture collective ownership and contextual expertise. It is important to acknowledge funder requirements that immensely contributed to the design of the project.

CONCLUSION

This study offers a compelling model for how African teacher educators can learn through collaboratively developing contextualised OER through a design-based research approach. By leveraging communities of practice, the project succeeded in not only producing relevant educational resources but also cultivating a sustainable professional learning network. As African education systems seek scalable and equitable solutions, such community-driven, research-informed models offer promising pathways for innovation.

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