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CHALLENGES FOR INNOVATION AND EDUCATIONAL CHANGE IN DIGITAL EDUCATION IN LOW RESOURCED SETTINGS: A KENYAN EXAMPLE

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Abstract

Many governments invest in digital education and deliver multi-faceted initiatives to develop the capacity of educational institutions and staff confidence in use of technology for enhanced learning and better student outcomes. However, the impact of these initiatives does not always result in improved technology-supported learning or successful digital educational products. Research shows many factors impede the achievement of such objectives. Yet, they are not well understood particularly in low-resourced educational settings. Thus, this paper as part of a larger study aimed to explore barriers to implementing TEL for higher education in low-resourced contexts and potential solutions from the perspective of educators, managers and support staff. The unique inclusion of support staff and management in this research provides a deeper understanding of current barriers to TEL, and the value of multi-stakeholder engagement to develop meaningful context-driven solutions. Using a qualitative oriented mixed-method approach underpinned by Beyond Prototypes conceptual model of TEL complex, the study found that most barriers and enablers of effective TEL implementation are related to the ecology in which it is practised, together with the influence of the salient communities. Findings also suggest that most stakeholders are aware and prioritise barriers related to their role, but have limited awareness of barriers faced by other stakeholders or how others perceived their role in supporting TEL. While the study supports findings of previous research, it adds further insight by considering the views of all implementing stakeholders and the relationships between them.

Keywords:

Technology-enhanced learning (TEL), Educational change, innovation, LMIC

1. Introduction and background

Many governments invest in digital education through staff capacity building to enhance learning and teaching and contribute to better student outcomes (McCowan et al., 2022; Kings, 2014). Governments plan and deliver multi-faceted initiatives to develop the capacity of educational institutions and staff confidence in use of technology (Gabriel et al., 2022). The impact of these initiatives does not always result in improved technology-supported learning and teaching or successful digital educational products (Scanlon et al., 2013; Darling-Hammond et al., 2017). Factors including lack of shared vision, resourcing issues, limited opportunities for reflection or transformative learning (McCowan et al., 2022), little contextual fit, and staff agency (McChesney and Aldridge, 2021) impede the achievement of objectives. In low-resourced settings, additional factors influence the extent and nature of uptake and implementation of Technology-enhanced learning (TEL) initiatives and educational change. These include lack of policy at national and institutional levels, inadequate ICT infrastructure, conflicting goals and priorities, heavy staff workload, and limited funding (Agava et al., 2021; Hudson, 2017). According to McCowan et al. (2022:2) these factors “are not well understood” in low-income countries particularly Sub-Saharan Africa and “consequently national policies and local initiatives struggle to move beyond rhetorical impact”.

After studying nearly 100 TEL initiatives and relevant stakeholders, Scanlon et al. (2013) conclude that the ways in which TEL innovation is designed, funded and implemented must be changed in order to radically improve the quality of learning and teaching. They suggest a move from short-term initiatives to sustained ways of building capacity in TEL. Responding to this call and considering limited understanding of factors influencing TEL implantation in a low-resourced context (McCowan et al., 2022), this paper focuses on a nationwide TEL capacity building initiative in a low-resourced context (Kenya) and reports part of a longitudinal study. This paper presents

the barriers and identifies changes needed to support delivery and management of TEL initiatives in higher education from the perspective of three stakeholders (educators, support staff and institutional managers) and reports proposed solutions. It addresses two questions:

1. What problems did participants of Skills for Prosperity Kenya programme face in supporting, delivering or managing TEL in their institutions?
2. What solutions did participants propose for the problems identified by question 1?

1.1 Skills for Prosperity Kenya programme

Skills for Prosperity Kenya (SFPK) is an FCDO-funded TEL initiative to develop capacity of public universities in Kenya to offer digital education, with the longer-term goal of increasing access to university education. The Open University (UK) designed and offered a 2.5-year capacity development programme for university staff at all levels and varied roles. This ran 2020-2023, based on Beyond Prototypes model of TEL innovation (see 2.1) and JISC Digital Capabilities Framework. Over 300 teaching, support and management staff (selected by Kenya Ministry of Education) from 37 public universities participated in the open, online course Digital Education for Universities in Kenya. Table 1 outlines the programme's two strands.

Table 1: Skills for Prosperity Kenya TEL capacity building initiative

Skills for Prosperity Kenya (2020-23)	
Fundamental Capacity Building (Aug 2021- Mar 2022)	Mastery Capacity Building (May 2021- Jan 2023)
<ul style="list-style-type: none"> • 29 public universities, 254 staff • 8-session self-study online course (Level 2, 30 hours of study) • Wraparound webinars • Online community of practice 	<ul style="list-style-type: none"> • 8 public universities, 80 staff • Thought-leader training (32 leaders completed a 150-hr microcredential course) • 8-block online course (Level 3, 72 hours of study) with moderated discussions • Expert webinars with moderated discussions • Practical workshops • University capacity building projects supported by expert mentors

2. Methodology

To design the Skills for Prosperity Kenya initiative and evaluate its short and medium-term impact, a mixed-method study with a continuous data collection procedure (Figure 1) was designed. It included data collection at four points using different tools. The study adopted a problem-based approach to identify problems in TEL implementation and the areas of practice and/or behaviour that require improvement. Understanding the problems was crucial in enhancing academic and practical knowledge and addressing the knowledge and practice gap (Van de Ven, 2007).

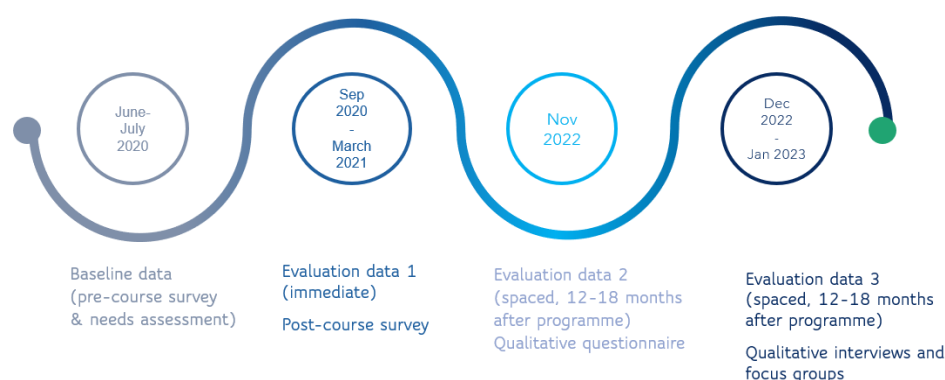
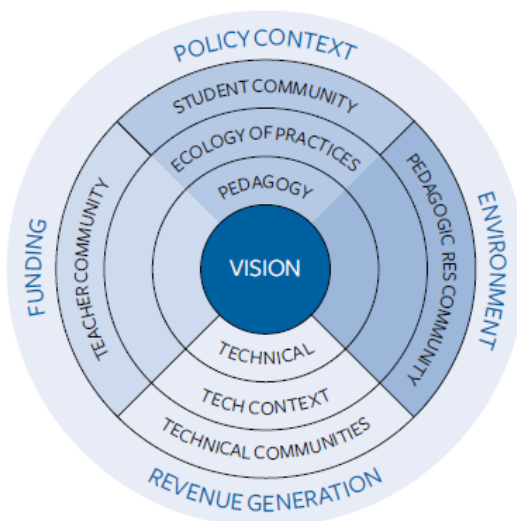


Figure 1. Skills for Prosperity Kenya evaluation timeline and data collection tools

2.1 Conceptual framework *Beyond Prototypes model of the TEL complex*

TEL is a complex system (Scanlon et al, 2013) which cannot be fully understood without consideration of all its interconnected elements. Figure 2 sets out Scanlon et al.'s (2013) model of the TEL complex. All elements must be addressed if innovation is to be successfully implemented, leading to sustained impact.

Figure 2. The *Beyond Prototypes* model of TEL complex (Scanlon et al., 2013:29)

These main elements of the TEL complex are:

- *Vision*: Initiatives are unlikely to succeed if it is not clear what they are intended to achieve.
- *Pedagogy*: a successful TEL initiative must support learning. This requires both teacher and learner engagement in educational activities
- *Technical components*: the most visible element of the TEL complex, technologies that support pedagogy with the aim of enhancing learning and achieving the vision
- *Ecology of practice and technical context*: including both existing teacher and learner practices and technical considerations such as local infrastructure
- *Communities*: includes stakeholders such as learners, researchers, teachers and technical staff. Engagement with the wider community (e.g. learners' families) should also be considered
- *Policy, funding and revenue generation*: the wider context for implementing a TEL initiative including financial support for initiation, delivering, innovation and sustainability. (Scanlon et al, 2013).

The Beyond Prototypes model is the conceptual framework for this study because of its comprehensive view of factors contributing to successful implementation of a TEL initiative. In addition, it supports coding and analysing data through classification of barriers (and relevant solutions) to TEL implementation in a low-resourced context while enabling the relationship between several factors to be unpacked.

2.2. Participants

Most studies that examine TEL initiatives at tertiary level in Kenya involve teaching staff (e.g. Agava et al. 2021; Makokha and Mutisya, 2016) with few studies including educational leaders and managers (e.g. McCowan et al. 2022). To our knowledge no study has considered support staff (for example, librarians and learning designers). Since TEL is multidisciplinary and requires a combination of expertise including subject matter experts, learning designers, production and support teams (Dalton et al., 2019; Scanlon et al., 2013), this study involved

participants in various roles, revealing factors related to teaching and learning (educators and support staff) and the management of TEL (managers).

Participants completed both the pre- and post-course surveys for the SFPK programme and had a 12-18-month gap following completion. 120 of the programme's 300 participating staff were invited to participate. 92 participants from 25 universities including 45 educators, 28 managers and 19 support staff completed the relevant survey. 20 different departments and a range of disciplines are represented.

2.3 Data collection and data analysis

A two-staged approach to data collection was used. First, participants completed a survey comprising eight questions about the focal area(s), scope and context of the barriers and their significance in relation to factors that affect educational changes, as well as potential solutions to address them. Thirty educators, support staff and managers and four university teams (including 12 participants) were then selected for semi-structured interviews and focus groups respectively. This combination of approaches provided a rich dataset to understand barriers to TEL implementation after our capacity development programme and potential ways to address them. Two questions from the survey are the focus of this paper.

Applying a directed content analysis (using NVivo), answers to survey questions were coded and analysed based on the Beyond the Prototypes Complex of TEL model. All sub-components of the model were considered to avoid limited insight. The coding process was open to new codes to ensure new variables were not excluded. Results are reported in the next section, based on number of references in each code using descriptive statistics. These are then discussed in more depth and differences between different stakeholder groups and their proposed solutions explored further.

3. Findings

3.1 Barriers to implementation of TEL in low-resourced settings

The most cited barriers to TEL implementation (Figure 3) relate to the ecology of practice (56%), followed by challenges related to involved communities (33%), pedagogy (4%) and technical components (4%).

Each group of participants emphasised a different group of barriers. Educators mostly cited barriers related to the ecology of practice (49%), communities involved (47%) and pedagogy (46%) while managers' most cited barriers were pedagogy (54%), communities (34%) and issues related to the ecology of practice (31%). Technical barriers (30%) were considered of equal importance. Support staff emphasised technical components (60%) and technologies required for TEL implementation and referred to the ecology of practice (20%) and communities involved (19%) to a lesser extent. This can be largely attributed to most support staff being based in Open and Distance Learning and ICT departments.

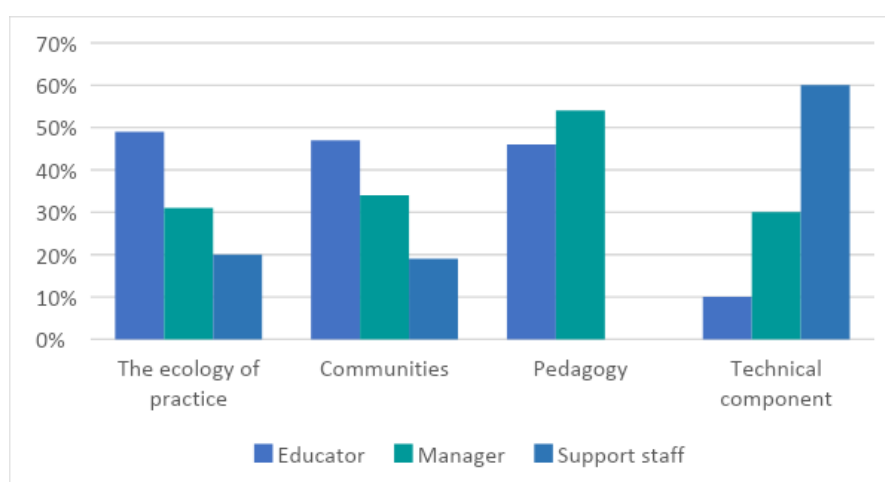


Figure 3. Cited barriers to implementing digital education based on participant roles

3.1.1 The ecology of practice and technical context

The main local and contextual barriers raised related to physical infrastructure and resources, for students and teachers. All groups of participants cited limited internet services, cuts in electricity, inadequate ICT infrastructure, lack of software for learning and teaching (particularly online assessments), and limited e-resources as barriers. Perceived barriers for students were access to appropriate technologies and the internet. For both educators and support staff “class size” was considered a barrier. Support staff stated that university facilities are often overwhelmed when large number of students use them, and they cannot manage student requests. Educators were more concerned about the pedagogical implications of large cohorts particularly in terms of individual interaction.

When teachers’ practices were considered, all participant groups referred to the perceived limited knowledge and skills of teachers to design and deliver TEL. Both educators and managers put more emphasis on this aspect than support staff.

3.1.2 Communities

Most reported barriers related to students’ perception or responses to TEL, although barriers related to teachers and support staff were also noted. Students’ resistance and negative attitudes towards TEL, low motivation/engagement with TEL, and limited digital literacies were the major reported barriers. Again, the groups had different perspectives on these barriers. Managers referred to students’ perceived low/limited digital literacies while educators and support staff highlighted negative attitudes and resistance to acceptance.

Several barriers were attributed to teachers by the three groups. The most cited barrier by educators was teachers’ heavy workload and time constraints to engage meaningfully with TEL or develop and deliver online content. However, managers and support staff believed teachers’ resistance to, and fear of change and their low motivation and willingness, were the main factors to lack of engagement.

A very small number of managers and support staff referred to a third stakeholder group, i.e. professional support staff, stating that one barrier is this group’s limited and ineffective professional support to teaching staff particularly when creating digital content. Some support staff reported uncertainty around how best to support educators, particularly in the creation of interactive content.

3.1.3 Pedagogy

Pedagogical issues were a barrier reported only by educators and managers. Educators found choosing appropriate pedagogy for TEL, the rigidity of existing curriculum and not having a curriculum for open and distance learning challenging. Managers, on the other hand, mainly reported challenges related to teaching practical subjects such as STEM, ineffective facilitation and online assessment.

3.1.4 Technical components

Technical barriers to supporting TEL were mostly reported by support staff and focused largely on tools. A very small number of managers also emphasised lack of appropriate technologies for online examination and attendance monitoring tools. Educators did not report any barriers related to digital technologies.

3.1.5 Wider context of TEL

Managers and a small number of support staff were the only participant groups that highlighted the importance of funding and the scale of investment required. They found limited funding for developing TEL content and programmes and providing internet on campus is a major barrier to implementing and sustaining TEL activities. No educators involved in the study reported lack of funding or policies as a barrier to TEL.

3.2 Proposed solutions to reported barrier to implementation of TEL in low-resourced settings

Participants were asked to propose ways of overcoming barriers they faced in implementing TEL. These were analysed using the Beyond Prototypes model. Results show that the majority of solutions can be provided by changes in the ecology of TEL (51%) and the TEL wider context (27%), i.e. funding and policies. A smaller number of proposed

solutions related to communities (14%), technical components (5%) and pedagogy (3%). The top three solution groups are reported here.

3.2.1 Solutions related to the ecology of practice and technical context

For barriers related to physical infrastructure and resources, particularly those of the internet and power, regional and national co-ordinated action is needed. Participants also suggested telecommunication providers boosting regional networks and back-up internet and electricity supplies. Solutions were proposed for increasing students' access to resources, including loan schemes, institutional and county-level financial support, and student sponsorship.

For teachers' existing practices and limited knowledge and skills to offer TEL, all groups proposed continuous capacity building and training. Managers also suggested more exposure to TEL through conferences, workshops and mentorship programmes. Although "class size" was identified as a barrier by educators and support staff, no solution was proposed.

3.2.1 Solutions related to the wider context: funding and policy

The second largest group of solutions related to funding and policies connected to the wider context. Managers believed many barriers would be removed through increased funding for TEL and university senior management lobbying for enhanced financial support. They also emphasised funding models for students and for departments needs to be re-addressed to capture the cost of technology-supported courses. Educators proposed universities monitor priorities and the use of public funds to enable managers provide essential resources for TEL. They also suggested more investment in university infrastructure and student sponsorships. Support staff proposed similar solutions whilst highlighting the role of government and relevant ministries.

Another proposed solution to address many TEL implementation challenges is the introduction of institutional policies for technology-supported learning and teaching or making TEL part of the university learning policy.

"We could alter University practices and policies, make new policies to support new ways of teaching and learning and to persuade students to engage in online learning. We should allow teaching and learning policies be contributed to by the learners themselves so that an ideal mechanism of delivery is found".
(Support staff, ICT department)

In addition, several participants highlighted the role of government support:

"The government needs to ensure that universities have appropriate and adequate infrastructure in terms of fibre optic cables, bandwidth and other ICT needs. If the government of Kenya must charge universities, the costs should be subsidized otherwise the cost is passed to parents and guardians making education only accessible to a few."
(Manager, DVC Academics, Research & Outreach)

3.2.3 Solutions related to communities

When participants discussed barriers related to communities involved in TEL, three communities of teachers, students and professional services were mentioned. However, to minimise barriers to TEL implementation, results suggest involvement from an additional community stakeholder (institutional managers) is needed. Educators and support staff believed more institutional management involvement in TEL, e.g. advocacy and providing essential resources, could support TEL implementation. Managers did not identify any solution their community could provide.

Proposed solutions to support the teacher community included introducing a reward and incentive system to motivate staff, and providing continuous professional training. While these proposed solutions can address barriers related to attitude and motivation, they will not address the main challenge of time constraints highlighted by participants. Solutions related to the student community mostly focused on raising students' awareness about TEL (e.g. through orientation and sensitisation) and providing access to affordable devices.

4. Discussion and conclusions

This study explored barriers to implementing TEL for higher education in low-resourced settings from the perspectives of educators, managers and support staff. It addressed three gaps: firstly, scholars' poor

understanding of the factors that affect implementation of TEL and educational change in low-resourced contexts (McCowan et al., 2022) and the absence of support staff's perspectives from recent related literature. It also sought to explore potential solutions to minimise identified barriers.

The study shows most barriers and enablers of effective implementation of TEL are related to the ecology in which it is practised, together with the influence of the salient communities. This supports findings of previous studies such as Makokha and Mutisya (2016), Newton et al., (2021) and McCowan et al., (2022). This study adds further insight by considering the views of all implementing stakeholders and the relationships between them. Findings suggest most stakeholders are aware and prioritise barriers related to their role, but have limited awareness of barriers faced by other stakeholders or how others perceived their role in supporting TEL. For example, technical issues were only identified by support staff and managers; educators did not report them. A holistic approach, which engages with a range of stakeholders, can identify different perspectives on similar barriers or solutions. For example, cohort size was viewed as a barrier by both educators and support staff, who outlined different but interconnected aspects. This shows how collaborative working processes to design and implement TEL (Dalton et al., 2019) and opportunities for stakeholder communication and reflection could reduce or remove barriers (McCowan et al., 2022).

Some barriers (e.g. cohort size) were identified without possible solutions. Ensuring that all barriers and solutions proposed by the participants are mapped, then the complexity and multi-stakeholder approach needed is captured but also this method ensures no aspect is overlooked. This approach could also be used to support engagement with various stakeholders, especially those who appear unaware of their potential role in removing barriers from key aspects of their work. For example, educators and support staff emphasised the role of institutional managers in overcoming many barriers. However, managers did not identify themselves as one of the communities that could resolve these difficulties. This may be due to what Neuman (2014) describes as unconscious non-reporting as managers know their role is to remove barriers and assume it is not important to report this work.

Overall, the main implication of these finding is that there are key barriers to implementing TEL which can be more effectively addressed if the perspectives and expertise of all stakeholders are considered, solution(s) associated to different aspects of each barrier are considered within a collaborative working process together with enough time and opportunity for collective reflection.

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