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Curriculum transformation to address the Sustainable Development Goals: A holistic approach for embedding gender in higher education

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Abstract

To better prepare a new generation of practitioners and thought leaders to meet the complex challenges highlighted in the sustainable development goals (SDGs), innovation is needed in the design and delivery of degree programmes. Gender inclusion and diversity are increasingly recognised as key tenets of Education for Sustainable Development. Energy access education in Africa provides an excellent context in which to explore ways of delivering gender inclusive Masters programmes and the curriculum transformations needed to address the dual challenges of SDG7 (energy access) and SDG 5 (gender equality). This paper explores the evolving context of gender mainstreaming in energy access education at Institutions of Higher Learning (IHLs) in Africa, drawing on a desktop study and interviews with 8 African Universities in the Transforming Energy Access Learning Partnership (TEA-LP). The paper calls for the adoption of a more holistic approach to mainstreaming gender in energy access education at IHLs, encompassing curriculum content, teaching methods, learning environments and the broader institutional enabling environment.

Keywords: *University; curriculum development; gender; inequality; pedagogy; teaching environment.*

1. Introduction

In response to the 2030 Agenda for Sustainable Development, Education for Sustainable development (ESD) has gained traction in the international development arena as a way of advancing the sustainable development goals (SDGs). ESD seeks to provide 'the knowledge, skills, attitudes and values' needed to achieve the SDGs (Leicht et al., 2018: 35). Institutions of Higher Learning (IHLs) have a key role in driving EDS in teaching and learning, research and development and within university governance and operations (Nhamo & Mjimba, 2019). Gender equality and the empowerment of women and girls (SDG 5) is needed to effectively respond to the challenges underlying the SDGs. Concurrently, there is an impetus to mainstream gender in IHLs, to advance ESD through equality in the learning environment and excellence in education regardless of gender, social status or ethnicity (Kahamba et al., 2017). The confluence of these interlinked global imperatives provides an opportunity to critically re-think models of higher education to prepare graduates with the skills, competencies and values needed to drive societal change (Michelsen & Wells, 2017).

Education for SDG 7 (universal access to energy) provides an excellent context for exploring the transformations needed to address the energy access challenges on the African continent. Sub-Saharan Africa has the lowest energy access rates, and gender inequality in energy access *and* higher education is stifling progress towards achieving the SDGs. Masters programmes in renewable energy and energy access specialisations can instill in graduates critical skills and competencies required to transform energy access in their countries and beyond (Golba et al., 2015). Furthermore, access to these programmes is critical for improving women's engagement in the energy sector (IRENA, 2019). Gender inclusion and diversity thus underlies comprehensive energy access education because (i) women and men require equal access to education and training in energy; and (ii) curricula need to reflect gender needs of this dynamic sector in content and teaching methods (Pailman et al., 2020). The practice of achieving this remains largely unaddressed. Utilising a case study of the eight African universities that comprise the Transforming Energy Access Learning Partnership (TEA-LP), this study sought to answer the following research questions: *1. How is (energy) academia gendered in Africa? and 2. What transformations are needed to become more responsive to sector needs?* Identifying urgent changes required in *cultures of teaching and learning*, *curriculum content and pedagogy, and institutional enabling environments,* this paper proposes a holistic approach for achieving gender equal ESD for SDG7.

2. Methods

This paper draws on a desktop study and empirical data from 16 semi-structured interviews with course convenors and lecturers (11males, 8 females) from eight African universities in the TEA-LP, conducted during a workshop in February 2020 in Addis Ababa. The TEA-LP

provides support to universities in Kenya, Ethiopia, Nigeria, Lesotho, Malawi, Uganda and Cameroon (with a Pan-African footprint) to develop energy access courses for Master's degree programmes (See: https://tea-lp.org). The interviews, which serve as a baseline and snapshot of individual university contexts, were transcribed, coded and thematically analysed in NVivo 12. Using both inductive and deductive coding techniques, themes explored include: championing gender awareness at a departmental level, gender and course enrolment, gender in the curriculum and pedagogy, gender roles in society and perceptions about energy professions.

3. Findings

While there are many factors that shape energy access education, this paper identifies three key interlinked dimensions to consider in the design and delivery of gender inclusive and responsive Masters programmes. These are: (i) cultures of teaching and learning, (ii) societal perceptions, norms and roles and (iii) curriculum content and pedagogy. Cultures of teaching learning are influenced by broader societal norms and values, which informs curriculum content and the learning experience (Figure 1). Universities are indeed microcosms of society, reflecting societal values, whilst shaping their own institutional identities (Kahamba et al., 2017). These dimensions are discussed below.

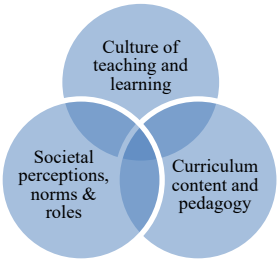

Figure 1: dimensions of energy access education

3.1. Cultures of teaching and learning – a need for multi-disciplinarity and diversity

In energy access education, 'cultures' of teaching and learning can serve as a departure point to explore the factors that shape the gendered experiences of students and staff in university departments. Energy-related Masters programmes are often housed within engineering departments, and students and staff are affected by the prevailing departmental culture.

Despite progress towards gender inclusive education, a 'technical' engineering culture remains prevalent in engineering education, which is often male dominated and lacking diversity (Carberry & Baker, 2017; Ihsen, 2005). This influences notions of 'who engineers are', 'what engineers do' and 'whose knowledge counts' (Godfrey, 2003), which impacts identity, belonging and ability to connect with the degree programmes (Ihsen 2005; Carberry

& Baker, 2017). In response, Ihsen (2005) calls for diversity (e.g. gender, cultural, and socio-economic) and the inclusion of non-technical competencies in engineering education. Crucially, more women pursue engineering specialisations that have a clear social and environmental benefit (Du & Kolmos, 2009), which provides an important entry point into energy access programmes.

While technical competencies remain essential to the design and development of energy technologies and systems, a purely 'technical culture' in departments does not produce the full range of competencies required by energy professionals to respond to SDG 7 (Golba et al., 2015). Energy Masters programmes need to incorporate, amongst other, social, environmental and economic perspectives as well as soft skills (Perdue, 2020). All interviewees emphasised the role of multi-disciplinarity and systems thinking for their degree programmes and advancing energy access. This can also attract students from disciplines outside engineering.

> One of the challenges that we repeatedly face is a lack of a systems thinking approach, people are looking at problems from one dimension, but it has multiple dimensions, and if you able to look at it from multiple dimensions you are able to generate a solution that is relevant and sustainable (SS1, female).

Furthermore, interviewees felt that technology needs to be connected to its broader purpose:

> Energy access and sustainability is basically talking to the consumer and our multi-disciplinary programmes, for example, entrepreneurship and business model(s), project management and finance, we also have community mobilisation, these courses give life to the technical competencies and the ultimate focus is commercialisation, that is what will enhance access and sustainability (BM1, male).

Thus, a joint focus on changing teaching and learning cultures within departments, as well as adopting a systems approach in education that has a clear societal and environmental benefit, can alleviate gender inequality.

3.2. Societal perceptions, norms and roles – navigating gendered expectations of female graduates and accommodating women in IHLs

In addition to the cultures of teaching and learning at departmental level that affect gender equality in energy access education, prevalent societal norms and beliefs about women and men in engineering and energy professions were strongly expressed in the interviews:

> There are lot of people who would be telling you, that's a male career (SSI, female).

> There is a perception that engineering is meant for mainly the male because they deal with machines and heavy equipment…we don't really stress activity women have done in the engineering (RU2, male).

Furthermore, perceptions about domestic roles and expectations affect women in IHLs. Female academic staff and post-graduate students play multiple roles as academics, students and caregivers. While some universities have measures in place to cater for female staff and post-graduate students with young children, university structures often do not fully cater for their practical needs. Several interviewees concurred:

> The ladies who joined the Engineering school are very brilliant in terms of skill…, (they) topped our class and later go on to very brilliant careers…It's not that in terms of ability they are unable, it's just that the societal demands that later come up either when they get married, or as they get into more responsibilities, tend to take them away from the STEM issues. Also, the big demands in terms of travel, fieldwork also take a toll (JS2,male).

> There must be something that is hindering women, maybe from the social perspective.., for instance after undergraduate (studies) women go into many other roles including starting up a family and when you start up a family there are certain things you will not do as a woman, because when the children are there you are expected to give up your career for the family, (more) than the man would be expected (CG1, female).

An urgent change in attitude is needed that recognises the place and contributions women in the energy access sector, as engineers and energy professionals, and is cognizant of women's professional and reproductive burden. Rather women should be fully supported to navigate professional and personal domains and identities during and after their studies. At a practical level, gender-appropriate support is needed to attract female students and enable them to complete their studies. This could include childcare facilities for post-graduate students with young children or suitable accommodation to students with young families, and consideration of their needs in fieldwork and travel commitments.

3.3.Gender mainstreaming in the curriculum and classroom

The curriculum itself is an essential dimension of energy access education, and requires a holistic approach that integrates gender in learning outcomes, content, teaching methods and style, learning environment and assessments (Roberts & Moxham, 1995). Curriculum development must cater for male and female students, interactions between genders, the gendered motivations and experiences of students in their understanding of technology and the ultimate societal impact the curriculum sets to achieve (Ihsen, 2005).

Furthermore curricula need to be revised for gender-biased messages. As Grunberg (2011: 7) argues, curricula are not neutral, but 'always serve as a means of social control, legitimating existing social relations, representing somebody's version of what constitutes important knowledge'. A curriculum can thus either entrench existing gender stereotypes, biases or norms or be used as a tool for transformation. This study found that this gender bias remains prevalent in engineering materials, and one interviewee noted:

> Looking at …the examples you might have, it's very masculine. You have to now develop …your examples with this at the back of your mind. Saying there is a gender aspect involved, how do I show that…it has to be very well thought out in terms of how it's delivered even if it's a male person delivering (JS2, male).

An inclusive curriculum incorporates gender diverse perspectives, which will benefit all students, and users of energy technologies (Mills & Gill, 2009). This could have a greater impact for delivering energy access in an equitable way. Interviewees identified a need for the representation of women and men in the curriculum itself to create sufficient depth of knowledge of energy access challenges:

> They have to be aware of the societies they are going to be engaged with. Engineering is not only a technical aspect, it impacts on society, so whatever society's needs are, those are things that can feed into your curriculum (JS2, male).

> The curriculum should bring out…the gender role in energy access… Those roles should come out clearly in the curriculum (CG1, female).

In addition to curriculum content, it is important to consider the approaches used in the classroom, as teaching methods and representative examples can have a significant impact on gender inclusion and equality within a degree programme. Group activities and problem-based learning (PBL) create interactive learning environments that are connected to context (Mitchell *et al*., 2019; Perdue, 2020). PBL scenarios need to be representative and incorporate technical and non-technical perspectives (e.g. end-user dimensions of energy technologies). Interviewees stressed that students engaged in PBL need tools to work effectively in diverse teams, as gender diverse teams do not automatically lead to gender inclusion.

> The girls are more silent than the boys in answering, but that comes from the cultural issues that we have been talking about, but nowadays, as I told you it's changing so everybody is just answering. Now in my class I point out… anybody that I want to answer (MM2, male).

Learning to work in groups and allowing all students to participate in lectures can result in more well-rounded energy access solutions in the classroom and within real life applications (RU2,male). Another interviewee noted:

> People need to be able to communicate and then in that way work together to develop solutions. ..I think part of that systems thinking, different people think differently, so just allowing people to speak up in class in class or creating an environment for them to speak up (SS1, female).

Thus, in addition to gender inclusive content, teaching methods must engage all students in class discussions, also recognising cultural factors that may hinder female students from actively engaging in predominantly male classrooms.

4. Championing gender inclusive energy access education - where to start?

Where does transformation of energy access education begin? Based on the findings discussed above, this paper proposes transformations: i) in the classroom, ii) at a departmental level and iii) within the energy sector and external programmes.

The classroom itself is an ideal setting for transformations to take root, and lecturers can embrace new and creative ways of engaging students of different genders, learning styles and preferences. Furthermore, interviewees emphasised the need for greater gender awareness in their departments:

> Lecturers… need to appreciate the basics of gender discourse because you cannot force them to recognise gender inequalities unless they themselves appreciate that gender inequality exists (MN1, female).

Finally, the energy sector itself, professional bodies and external programmes have a key function in driving transformation, as interviewees commented. Notably, industry bodies have been instrumental in professional development of female students and graduates (SS1, female). Individual and collaborative efforts that begin in the classroom and are supported by faculty staff, industry and broader programmes are thus invaluable for championing the transformations needed for gender inclusive ESD.

5. Conclusion

This paper challenged the technical engineering culture and societal perceptions about women and men in ‘traditional’ engineering, energy professions and higher education, and has shown how it impacts the teaching and learning environment of energy access education. To respond to SDG 7 effectively, transformations are needed towards an educational model that promotes systems thinking, multi-disciplinarity and diversity, and gender considerations

in all aspects of the curriculum. Masters programmes in energy access, therefore, need to transcend the existing 'technical culture' to provide comprehensive and holistic education, and to appeal to diverse student interests, needs and intrinsic motivations. A more holistic approach to mainstreaming gender in energy access education, within learning environments, curriculum content, and the institutional enabling environment, would contribute to address the gender gap at IHLs and transform how energy access education is designed and delivered. Furthermore, this offers a tangible entry point to deliver programmes for ESD that, in our example, addresses the dual challenge of achieving SDG7 and SDG5.

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