**Beyond indicators: A scoping review of the academic literature related to SDG4 and educational technology**

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**Abstract.** It is now five years since the 2030 Agenda for Sustainable Development was adopted by all UN member states. While education is arguably a key part of unlocking progress towards all the Sustainable Development Goals (SDGs), SDG4 places education squarely on the agenda. There is a wealth of indicator data available to track progress towards SDG4. However, this presents only a partial view, by focusing on measurable outcomes, rather than the processes behind them. This raises a question of how SDG4 is being addressed and reported through academic research. This paper presents the findings of a scoping review, undertaken with a focus on the academic literature linking SDG4 and educational technology. A literature search of three major academic databases yielded 146 records which referred to SDG4. Screening for educational technology topics (broadly defined) narrowed the sample to 18 papers. Papers were categorised according to how they relate to SDG4, methodology, geographic focus, educational context, and use of educational technology. While published academic research explicitly linked educational technology and SDG4 is in its infancy, the field is growing, and gaps are identified for further work in this area.

**Keywords:** SDG4, educational technology, sustainable development, ICT4D.

1. Introduction

### The Sustainable Development Goals were adopted by all UN member states in 2015, and provide a framework for working toward key global challenges with the aim of achieving positive changes on a global scale by 2030 [1]. SDG4 is focused upon education; to “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”, and comprises ten targets. To monitor progress towards achieving SDG4, a range of indicator data are collected and published online [2]. However, while there is an abundance of indicator data, it mainly represents outcomes and only presents limited insight in terms of understanding the processes behind the data [3]. Indicators are arguably too reductionist an approach to accurately reflect ‘quality’ education [4], and qualitative approaches are required in order to fully appreciate the issues surrounding quality education in context [5]. This is clearly a gap which research can fill, and raises a question of the extent to which the SDG4 framework is being addressed through the academic literature.

The second focal point for this inquiry relates to the role of educational technology in this context. Educational technology has long been associated with efforts to increase equitable access to education; and as such, educational technology may have a potential contribution to make towards achieving SDG4. While large-scale indicator data is collected in relation to the use of information technology in education, the data may be unreliable and is not clearly linked to SDG4 [6]. The extent to which educational technology is playing a role in research explicitly aligned with SDG4 remains unexplored. To this end, a scoping review was undertaken in order to examine the landscape of academic research in relation to SDG4 and educational technology.

1. Methods

As a research approach, scoping reviews are related to systematic reviews; both share a rigorous approach to searching and synthesis across the research literature [7]. Scoping reviews differ in that the goal is typically to profile the research landscape around a topic, and identify gaps, rather than evaluate the evidence in relation to a specific, bounded question [8]. Since the scope is focused explicitly on academic literature, searches were carried out on three of the main literature databases (ERIC, Scopus, and Web of Knowledge), and no grey literature was sought. Searches were carried out on 16th February 2020 using the search string (“sustainable development goal 4” OR “SDG4” OR “SDG 4”), across titles, abstracts and keywords. Since SDG4 has few synonyms, while educational technology includes a wide range of topics and terms, the strategy was to search in the first instance for SDG4 and then screen for relevance to educational technology. Drawing on the four stages of the PRISMA framework [9]:

* Identification: 52 records via ERIC; 113 records via Scopus; 93 records via Web of Knowledge. 146 records after duplicates removed.
* Screening: Of the 146 records, six were excluded as false positives, and 12 on the basis of being reports (non-peer reviewed).
* Eligibility: 128 abstracts were considered. 109 were excluded due to a lack of educational technology, and one excluded as it was not peer reviewed.
* Included: 18 papers were eligible for inclusion.

The 18 papers included in the sample had all been published within the past three years; one in 2017, seven in 2018, eight in 2019, and one in 2020. The majority – 13 - are journal papers. Papers were categorised according to five criteria: types of educational technology addressed by the paper; how the link between the paper and SDG4 is made; methodology; geographical focus of the paper; and educational sector involved.

1. Results

In terms of the types of educational technology addressed in the publications, the categories are wide ranging, reflecting the nature of educational technology as an umbrella term. The sample included a mixture of very broad terms (e.g. ‘ICT in Education’, two instances [6, 10]; ‘mobile learning’, three instances [11, 12, 13]) alongside skills (digital literacies [14, 15]), or particular technology (video [16, 17]). The majority of publications focused upon online education, platforms and courses (five publications [18, 19, 20, 21, 22]), and Open Educational Resources (four; [23, 24, 25, 26]).

The link to SDG4 was most frequently made in general terms, stating the overall goal of SDG4 as context for the studies (12 papers). The remaining six make links to specific targets within SDG4. SDG4.7 – ‘Ensure all learners acquire knowledge and skills needed to promote sustainable development’ - was mentioned most frequently (six); two made explicit links to SDG4.C, and one each to SDG4.3, SDG4.4, SDG4.A and SDG4.B. Adult learning was strongly represented in terms of educational context, with the two largest categories accounting for two thirds of the publications in the sample. Within this group, the context for seven publications was explicitly university-focused, while a further five covered other forms of adult education, including professional development and informal lifelong learning. In contrast, only four publications addressed schools or school-aged learners. Three considered education at a whole systems level. In examining the geographical focus of the publications, little overlap between the papers was observed at the level of individual countries, although Africa and Asia were particular focal points.

A range of research methods and approaches were used, although a substantial proportion (eight) of the publications were not empirically-based; two were associated with events at conferences, while six were theoretical, including position papers, proposed frameworks or policy guidelines. Of the empirical papers, two reported secondary analysis of existing data (one GIS data, one systematic review). The majority of empirical papers (eight) drew upon examples of interventions and initiatives. Empirical papers comprised two types. Five were categorized as case studies, which included primarily descriptive examples. Three were classed as evaluations, which had sought to evaluate the impact or efficacy of interventions. The evaluations themselves included qualitative, mixed methods, and quantitative approaches.

1. Conclusions

This paper has presented a scoping review of the academic literature which explicitly aligns educational technology and SDG4. This approach is likely to provide a conservative assessment of the field. By focusing on peer-reviewed, academic publications – a key part of the research focus – it necessarily excludes non-academic research. Furthermore, within the academic literature, conducting literature searches across title, abstracts and keywords excludes publications which mention SDG4 in the body text but not these fields. However, this was necessary to ensure systematic searching, as full text searches are not consistently available. Despite the limitations, there are two main conclusions that can be drawn from the analysis.

First, the body of academic work at present which focuses on SDG4 and educational technology is currently relatively small, although it is an area which appears to be actively growing. The earliest publications in the sample date from 2017, and show progressive increases in subsequent years. However, this is not to say that academic research in educational technology topics of relevance to the SDG4 is not happening; rather, when research is being published, it is rarely framed in these terms. For example, there is substantial work being undertaken on educational technology and topics such as literacy, numeracy, inclusive education and teachers’ professional development, which would clearly elaborate on related indicator data. Such literature would not have been included here simply because studies did not explicitly align with SDG4 when written for publication. This suggests a gap which could be usefully addressed through literature reviews, to map empirical research on relevant applied topics onto the SDG4 framework. There is also scope for the academic literature to engage with the specific targets of SDG4 to a greater extent, as in many cases the link was only in general terms.

Second, within the eighteen papers, there is not an even spread of attention, and suggests contexts which would particularly benefit from further work. The use of descriptive case studies is valuable in terms of illuminating the context behind indicator data, although there is more scope for evaluation and rigour. The range of types of educational technology covered within the sample is limited, and skewed towards internet-based media. Further exploration of technologies which are not heavily reliant on internet connectivity may help to achieve sustainable change. While the academic literature exploring the link between educational technology and SDG4 is emergent and an area for growth, there is more that can be done in the immediate term in order to translate existing research, bridging the gap between indicators and practice.

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