Working Group Proposal: Computing Education in Africa

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ABSTRACT

This ITiCSE Working Group (WG) has two goals: first, to increase awareness of computing education research in the African countries, and second, to create and strengthen connections between computing education researchers in African countries and those in the larger computing education research community.

To achieve these goals, the WG will focus on two tasks: writing a literature review of publications related to computing education in African countries and building a set of contextually relevant materials – introductory programming examples and assignments at university level – designed for students in African countries. The final report will include an overview of past computing education research related to Africa, a current project (the new course materials), and suggestions for future work.

CCS CONCEPTS

• **Social and professional topics** → **Computing education**.

KEYWORDS

Africa; computing education

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1 INTRODUCTION

Computing education in Africa has its roots in the mid-20th century when a few African universities began offering courses in computer science [4]. These programs initially focused on hardware and software fundamentals. The last two decades have witnessed notable growth in CS education across Africa, with an emphasis on programming, algorithm design, and data science. Governments and institutions have recognized the importance of CS education, leading to the establishment of numerous CS departments and programs [15]. Organizations like the African Union (AU), associations such as the South African Computer Lecturers' Association (SACLA) and initiatives such as the African Institute for Mathematical Sciences (AIMS) have played pivotal roles in promoting CS education [16]. Nevertheless, recent bibliometric analyses suggest that Africa is under-represented in SIGCSE venues [8, 12].

CS education in African countries and those outside of Africa have many common challenges, including insufficient infrastructure, a shortage of qualified CS educators, and limited financial resources [18]. On the other hand, there are positive stories as well. While some argue that gender imbalance persists in African CS education, with fewer females participating in CS programs [13], there is evidence that in Mauritius, the gender ratio is better than

that in the United States [2]. Rwanda's government has prioritized CS education, making it a core subject in primary and secondary schools [20]. Ethiopia is working to expand CS education to reach rural areas [14]. Efforts are being made to develop innovative teaching methods, including online courses, coding boot camps, and blended learning models [5]. Tech companies are investing in CS education programs, offering internships, and supporting the development of practical skills among students [7]. African researchers are increasingly contributing to the field of CS education (e.g., [2, 3, 9–11, 15, 17, 19]).

2 PROPOSED METHODOLOGY

This working group has two goals: first, to increase awareness of computing education research in African countries, as described in empirical studies and experience reports, and second, to create and strengthen the connections between computing education researchers in Africa and those outside of Africa.

The goal of increasing awareness of computing education research in the African countries will be addressed by both of the WG's tasks. First, we will survey past research literature, focusing on two research questions: [RQ1] What are the key trends and challenges in computing education in African countries, as reported in the research literature? and [RQ2] How do these trends and challenges compare to those generally discussed in the literature outside of Africa? We will search the ACM Digital Library, IEEE Xplore, Scopus, and Google Scholar for empirical research and experience papers describing computing education in any of the 54 African countries, at primary, secondary, tertiary, or post-graduate levels, published in English. Identified studies will be screened and the resulting dataset examined to uncover recurring patterns, themes, focal points, and gaps in the literature, against the background of any locally adopted CS curricula.

For the second task, we will develop introductory course materials that are contextually relevant in Africa. We will identify a short list of possible introductory programming topics to be covered, using the CS2023 programming principles as a reference point [1], research the development of contextually relevant educational materials, both in African countries and more generally (e.g., [6]), and then develop some sample materials.

The WG goal of strengthening connections between researchers will be addressed by the WG itself. Participation will make and strengthen connections among the WG members and indirectly connect them to participants in other WGs, past and present [12].

3 EXPECTED DELIVERABLES

Our intended outcomes include, first, a comprehensive report that will highlight critical findings from a literature review of past English-language experience reports and empirical research related to computing education in the 54 African countries, and second, a set of materials on introductory programming topics designed to be contextually relevant to students in one or more African countries. Due to the WG's time constraints, these materials won't be fully tested and validated, but we will offer them as a starting point for further investigation.

Finally, we will include suggestions for future work. For example, one next step might be to investigate research published in non-English-language venues.

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