

Exploring the Use of Generative Artificial Intelligence to Create Digital Vocational Training Courses for Students in Kenya: A Conceptual Approach

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Abstract

This concept-based paper seeks to identify new methods for content development of Vocational Education and Training (VET) courses in the Global South. Challenges in Sub-Saharan Africa countries include a lack of VET institutions, qualified teachers, and learning resources. In addition, there is a lack of electricity and limited access to internet connections. However, artificial intelligence (AI) can bridge this educational gap. AI is evolving rapidly day by day, including in the field of education. The use of generative AI images and videos, ChatGPT and open educational resources (OER) to create digital vocational training courses in Kenya is explored. Twenty vocational courses were developed to improve education quality, raising awareness of human rights, health, water, wildlife conservation etc., and especially of providing people in rural areas with the necessary knowledge and skills to generate income. The courses are easy to scale up thanks to the ease of changing text, content, avatars, language, subtitles, etc., to be context-relevant. This paper recommends the use of generative AI and OERs as an approach to reform content development which is a cost-effective way of improving students' vocational skills in Global South. Additionally, this concept paper explores two different systems for students to access the digital vocational training content: mobile technology with the internet and a solar-powered tablet with offline content. The purpose of considering different devices is to offer learning opportunities to people in remote areas with a lack of network connectivity, limited internet access, or a lack of electricity.

Keywords: ChatGPT, Generative AI Video, Vocational Skills, Digital Course, Global South

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Introduction

The pandemic had a significant negative impact on students across the world, as schools and universities were shut down due to the Covid-19 outbreak. Pupils and students were sent home, and in developed countries it was still possible to continue with learning online. However, in Sub-Saharan Africa the lack of resources was apparent, and the lockdown widely affected children's and youths' educational future (Hansson, 2021). This resulted in a situation that was a step further away from sustainable goal (SDG) no. 4: "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (United Nations, 2015). The consequences are especially high in Sub-Saharan countries, with their weak educational infrastructure: a lack of formal schools, a lack of qualified teachers, a lack of educational materials, etc. But in a post-pandemic era, can we find new ways to provide education in Africa?

Artificial intelligence (AI) services are developing rapidly, with new applications day by day. AI has huge potential to have an impact in many different areas, including in education to strengthen human capacity. Obviously, there are challenges such as policymaking, legislation, guidelines, copyright, data protection, privacy, ethics, and much more. On the other hand, there are also many opportunities with AI resources. This concept-based paper focus on opportunities with generative AI educational content in the Sub-Saharan African context, and UNESCO (2021) states that AI can provide "leapfrogging" for African countries to improve the capacity of updated education, skills, and training, and thus progress toward SDG 4.

This concept-based paper focuses on the use of AI tools to create vocational learning opportunities in Kenya. More specifically, the research question is to explore how generative AI resources as ChatGPT, AI images and videos can be used to develop content for digital vocational training courses to impact learning for students in Kenya.

Background

Definitions of artificial intelligence (AI) vary, and there is no one single definition of AI. Baker et al. (2021, p. 10) define AI as: "Computers which perform cognitive tasks, usually associated with human minds, particularly learning and problem-solving." This is a broad definition that describes a range of technologies and methods, which is wise, not only because the future of AI is uncertain, but also because there are many AI tools on the market that are evolving day by day.

AI can contribute to education at least in two ways: 1) with assistance and modifications of methods, simulations, and scaffolding of feedback and assessment, and 2) with content production. Baker et al. (2019) describe the innovation of AI as providing a) learner-facing tools; adaptive learning platforms with personalized content and automated feedback, which facilitate collaborative learning, b) teacher-facing tools such as automate marking and plagiarism detection, which facilitate teaching methods and administration, and c) system-facing tools to analyzing data regarding schools' performance.

Thus, AI can provide a shift toward a learner-centered approach which is flexible, providing a variety of choices to make learning useful, exciting, and motivating at one's own pace (Hansson, 2021). This is an important step in order to develop quality in online education. In addition, it is important for future education in Sub-Saharan African countries. Digital

education can provide learning opportunities for those who do not attend school or who lack access to formal schools, those who cannot afford school fees, refugees, marginalized people, disabled people, and those living in isolated communities. Mobile technology is widespread in Sub-Saharan Africa, and there is a growing optimism that AI will be the next wave of technologies to impact people's lives positively (Ade-Ibijola & Okonkwo, 2023). Internet penetration in Sub-Saharan Africa has increased significantly during the last decade (Okolo, et al., 2023), from 10 % to 28 %, but a lack of electricity and poor fiber, mobile mast, and base station infrastructure have prevented more people from gaining internet access. According to the World Bank (2023), 81% of the urban Sub-Sahara African population has access to electricity compared to 30% of the rural population. The African Union (2018) states in its strategic plan that educational technology can be used to provide unreached populations with access to learning. Nevertheless, online learning is still out of reach for large populations on the African continent due to a lack of infrastructure, including electricity (UNESCO, 2019a; UNESCO, 2019b).

AI is still in the early stages of development, and faces several challenges in and for the Global South. These include technical, economic, pedagogical, and social challenges, which must be considered when exploring the use of content development with generative AI for vocational training programs. The technical challenges concern access to an appropriate mobile device, a lack of internet access, network failures, and a lack of power (Hansson & Jobe, 2014). Economic challenges related to the cost of digital devices and the cost of internet access. As Ade-Ibijola and Okonkwo (2023, p. 109) point out: "A good percentage of Africa's population are unconnected and not having access to the internet. Adoption of AI requires adequate availability of wireless network connectivity. In addition, African countries have the world's most expensive broadband." One pedagogical challenge is using advanced digital tools and learning platforms when student and teachers have limited experience of online teaching and limited digital competence. Another pedagogical challenge is moving toward a learner-centered approach, with the purpose of making learning motivating, useful, interesting, and personalized, with active participation in learning, whereas students in Sub-Saharan Africa are more used to a teacher-centered approach with its focus on listening, memorizing, and repeating. Finally, social challenges include a lack of familiarity with and ability to use digital technology (Hansson, 2021). Undoubtedly, digital skills need to be improved, particularly in Sub-Saharan Africa. In addition, UNESCO (2021) says that the use of AI has a gender bias, which must be considered. However, generative AI produced content could transform opportunities for students who don't have access to formal schooling and/or quality education by offering them up to date information and knowledge.

Theoretical Framework

To explore the potential of generative AI for vocational training programs in Kenya, and how course content and its design can be created and analyzed, Shulman's (1986; 1987) framework of knowledge bases for teaching can be used. According to Shulman, knowledge can be divided into several aspects: 1) content knowledge, 2) general pedagogical knowledge – broad principles for organization and strategies of classroom management, 3) curriculum knowledge – teachers' tools, such as materials and programs, 4) pedagogical content knowledge – teachers' professional understanding of the content and teaching methods, 5) knowledge of the learners and their characteristics, 6) educational context knowledge – experience from group work or classrooms, and the character of communities and cultures, and 7) knowledge of educational ends – the purpose and values of teaching, and their historical and philosophical roots (Shulman, 1987).

All of Shulman's categories are relevant, but pedagogical content knowledge is of particular relevance for this paper. As Schulman (1987, p. 8) states: "It represents the blending of content and pedagogy into an understanding on how particular problems, topics, or issues are organized, represented and adopted to the diverse interest and abilities of learners, and presented for instruction."

Method and Approach

This concept-based paper explore the provision of AI powered educational content to less privileged people in Kenya, particularly in rural areas which can be affected by drought, acute poverty, terrorist attacks, cattle rustling, or isolation. Hence, as Shulman (1987) states, educational context knowledge requires an understanding of the community, the culture, and the learners. Achieving an understanding of another culture requires good communication, cooperation, collaboration, and trust (Lennie & Tacchi, 2013; McTaggart, 1997; Whyte, 1991). These criteria are essential for improving and encouraging continuous learning, creating new ideas, and developing thinking and responsiveness to different attitudes and values (Hansson, 2015). This approach is social research, where the researcher intervenes, creates impact, and can contribute to significant differences in practice. However, understanding the local culture, as well as the context and relationships between participants and the context, is highly important in terms of the impact of social change (Lennie & Tacchi, 2013). In order to develop context-relevant vocational training course content, collaboration and trust with tutors and learners are important, as reflected by my more than six years of experience during the past two decades in Kenya, involving educational research projects and a well-established network.

The aim was to produce AI content and create educational design for vocational training courses in Kenya. To do so, we relied on the following sources:

- a) Six Kenyan vocational training tutors from a VET institution in Nairobi. These tutors sent curriculums, course guides, lesson plans, photos, and student instructions via Google documents and videos from their own courses. Additionally, they provided information about vocational training and students' educational backgrounds and life conditions. We also had frequent online conversations to discuss content and course concepts, as well as Shulman's (1987) knowledge aspects, primarily educational context knowledge and knowledge of educational ends.
- b) Our communication with the Kenyan vocational training tutors (a) and their experiences, based also on survey responses from 15 of 45 students in a pilot project, revealed that students are comfortable with video media. The pilot study was conducted by the Kenyan VET institution (a) prior to the production of generative AI videos, thus the video content was produced by the Kenyan tutors. Students in age of 19-33 years could only choose courses in hair dressing, pastry, computer, and entrepreneurship by that time. Findings from a questionnaire revealed they study 2-3 hours per day with use of the tablet. 71 % considered the video content to be appropriate. 29 % stated that they want teacher support because it is difficult to learn practical skills only by themselves. 43 % expressed they want to have a diversity of vocational training courses. In addition, the tutors said that English is the language of instruction, but ideally with Kiswahili subtitles. Other local African languages are not preferred by the students, according to the pilot survey.
- c) The author, who works as a pedagogical content knowledge university educator, and twelve Swedish student teachers in the last year of their teacher training program, with experiences from a field trip to Kenya, produced content and educational design

for the courses based on above input from the Kenyan tutors, together with use of ChatGPT-3.5, generative AI images and videos, and open educational resources (OERs). Thus, the generative AI produced content was checked with the Kenyan tutors teaching material.

- d) The created courses were checked by the Kenyan tutors (a), who suggested changes and amendments which were incorporated. However, the implementation of these courses in practice is still pending.

Findings

The findings are presented based on showing the process of content and design development, including the challenge of access to appropriate digital devices.

Digital Devices

In rural Kenya, there is growing demand for vocational training programs. As mentioned in the background, there is a lack of vocational training schools, especially in rural areas, and a lack of variety of courses due to of a lack of educational resources and few qualified tutors. In addition, there is limited internet access and a lack of electricity. We therefore considered two different systems for the students to choose between, according to their own life conditions. One system enabled students to access the content online via a smartphone, tablet, or computer. Internet data can be offered to the student at a reduced cost (so-called education bundles from the internet provider). The second system is also digital, but the same content is offline. This system uses a tablet powered by a solar panel, and a remote control. The system also includes three bulbs, which are useful in huts at night (see Figure 1). The content can be uploaded with a USB flash drive. The tablet has 32 GB of data storage, so content has to be replaced manually every three months. The tablet can only be used with the remote control – it is only possible to click and select content, and the student is not able to type.



Figure 1: Solar-Powered Tablet, Remote Control, and Bulbs

Course Content and Development of Design

The literacy rate is high in Kenya, at 83%, compared to a Sub-Saharan Africa average of 67% (World Bank, 2023). However, our assumption is that the literacy rate and English language skills will be lower in remote areas, thus our focus is less on text and more on photos, videos, and animations (cartoon characters). Besides the use of suitable devices and their

functionality to scaffold vocational skills, it is important to create a conducive environment that encourages personalized learning, knowledge, skills, and innovation. Given that, and with the two systems in mind, we decided to explore the use of generative AI to develop content and educational design for vocational training courses. Generative AI such as OpenAI ChatGPT (Chat Generative Pre-Trained Transformer) was launched at the end of 2022, and the free version has already had a huge impact on teaching, learning, knowledge production, plagiarism, etc. According to the developer (OpenAI, 2023), the chatbot is capable of generating human-like text based on context and past conversations.

Our communication with the Kenyan vocational tutors revealed subject-specific concepts and context-relevant text material that was entered into the prompt for OpenAI's ChatGPT-3.5. As a first step, we asked the system to create course guides in relation to the national curriculum and its objectives. The second step was to create lessons plans and define terms based on the tutors' lesson plans and the course guide. The third step was to ask the system to give advice on quizzes, exercises, and examinations. The fourth step involved suggesting practical exercises, which is obviously important in vocational training courses. The fifth step was to include challenges and common mistakes that students make during training for a particular course. Lastly, manuscripts were produced for PowerPoints slides and generative AI videos. The text material was therefore created, which is fundamental in order to create generative AI images and videos. There are a wide range of options for producing images, so we selected free versions which use AI to convert text to images. AI video creation is not free, costing about USD 30 per month for a subscription with a limited number of videos. We selected a service that offered opportunities to use different languages including Kiswahili (from 120+ language options), avatars speaking Kenyan English, a wide range of selective avatars (with digital speech but no body language), subtitles, animation, and the option of including YouTube videos in the AI video, with a media library to select images/videos from. Figure 2 shows a screen print of an AI video in the course of pastry cook. Once the text has been inserted and the template, avatar, language, subtitles, and background text have been selected, the system takes about ten minutes to generate a five-minute video. The video can be low or high resolution (4K), at about 100 Mb for a five-minute video.

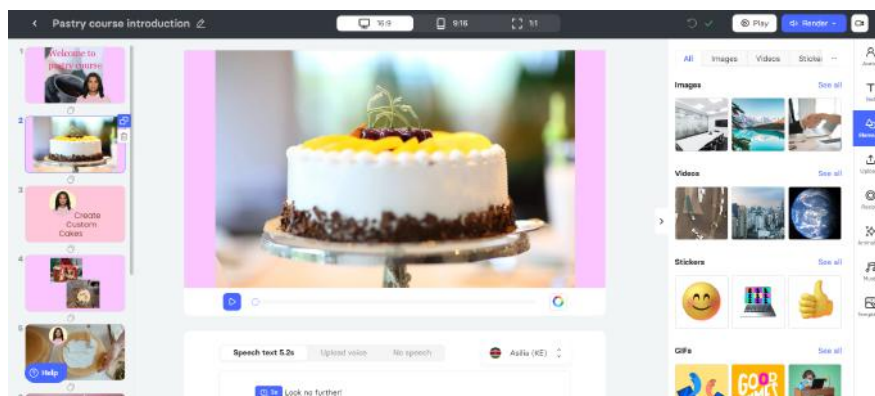


Figure 2: Screen Print of Pastry Course

We also searched for and inserted open educational resources (OERs) in the form of images, learning material, e-books, YouTube videos, etc., into the courses. Within two months, 20 vocational courses has been created, including courses in hairdressing, pastry, computing, plumbing, tailoring, woodwork, poultry, agriculture and entrepreneurship. Information was also produced on health, oral health, water, human rights, biogas use, and wildlife conservation. See Figure 3.

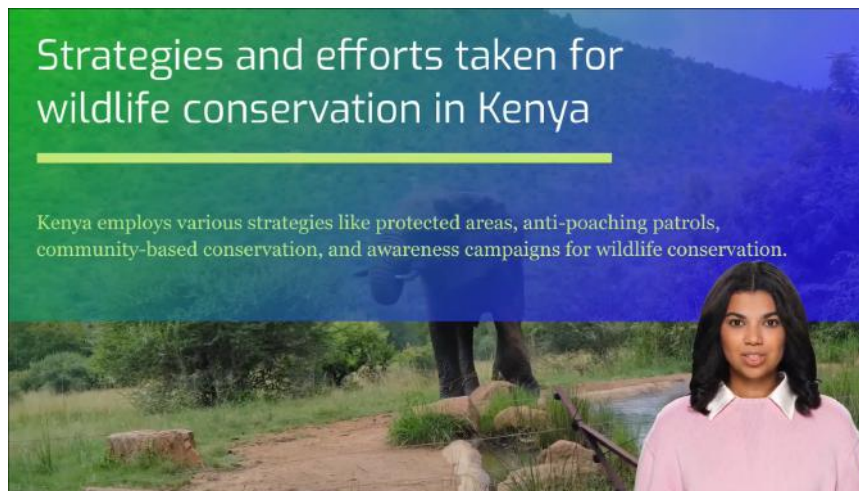


Figure 3: Screen Print on Information of Wildlife Conservation
A Video Is Integrated in the Background of the Generative AI Video

These courses were sent to the Kenyan vocational tutors, who mainly suggested additional content for the lesson plans, but also requested minor changes to the learning methods. These changes were implemented, including updating the AI videos. The generative AI videos are easy to update with new content, or to translate into another language within minutes, and it is thus possible to revise the content later and adapt it using local expertise according to local needs.

Discussion

In VET, online resources are frequently tested to impact learning. However, digital systems that are totally offline are not used, as explored in this paper. Shulman (1987) describes this as knowledge of educational ends and educational context knowledge. Hence, this involves awareness of the purpose of the education, values of teaching, and the local context, including knowledge of the learners and their life conditions. It also involves building digital literacy and vocational skills offline so that knowledge acquisition can be achieved using generative AI and applied to courses in rural areas where electricity and internet access are challenging. According to UNESCO (2019, p. 28): “Recent studies have mapped the obstacles for introducing AI in education in developing countries. The main ones include 1. ICT hardware availability, 2. Electrical availability, 3. Internet reliability, 4. Data costs, 5. Students’ basic ICT skills, 6. Language and 7. Lack of culturally appropriate content.” Thus, there are challenges relating to knowledge, skills, finance, and infrastructure. AU (2018) encourages more affordable access to educational institutions, encourages the use of technology in education, and promotes information skills. Clearly, digital literacy must be strengthened in Sub-Saharan African countries. However, with the use of simple learning systems and video-based skill development courses, including basic computer skills, the next level of digital literacy is approachable for students. In any event, the training must be relevant to the student’s needs and adjusted to the local context. According to Shulman (1987), content knowledge is the subject’s width and depth, and the pedagogical content knowledge aspect of using appropriate teaching methods relates to learners’ pre-understanding, educational level, and educational content, including appropriate language of instruction. This presents challenges for our AI content development and the creation of educational digital design. According to the Kenyan tutors, a diverse group of students can be expected. Learners will usually be aged 18 to 25, but may also be younger or older. Most of them will have finished secondary school, but some will only have attended primary school and then dropped out of school. It is important to reach such learners

with vocational training programs, so they also needed to be considered. In addition, students' language skills will vary. Most of them will have sufficient English skills, but we will likely see students who barely understand English, only Kiswahili.

Our solution to address this complexity was to use generative AI created lesson plans and videos at basic and general level, and at advanced and deeper level, and videos with English-speaking and Kiswahili-speaking avatars. The system enabled us to achieve this in a few minutes. Course content adjustments were made according to the locations where the Kenyan tutors wanted to implement the courses. Thus, for example, a course in tailoring and handicraft for a Massai community in southern Kenya will be different to the same course for communities in Turkana (northern Kenya). It was quick and easy to make these changes using generative AI resources.

Conclusion

However, this paper explores content development and design of vocational courses in Kenya using generative AI. From the findings, conclusions are that digital vocational training programs and additional information are easy to scale up, within both Kenya and other Sub-Saharan African countries, thanks to the ease of changing text, content, avatars, languages, subtitles, etc., in order for the generative AI resources to be context-relevant. Thus, AI offers considerable opportunities for the Global South. Additionally, Baker et al. (2021, p. 5) say: "while there is considerable uncertainty surrounding the future of AI in education, we don't have to sit and wait. There is much that we can do today to shape the future positively."

This concept-based paper explores good practice and proposes that AI-driven digital vocational training programs should be adopted in Kenya. In a limited time, 20 vocational training courses were created in collaboration with Kenyan tutors using generative ChatGPT, and AI images and videos, and are now ready to be implemented. This study recommends the use of generative AI and OERs as an approach to reform VET content development in order to be locally and globally relevant for future workers. This is a cost-effective way of improving students' vocational skills. Since vocational skills are required worldwide, and since content development with generative AI can be carried out in any language, the conclusion is conceptual, generic, and applicable elsewhere. Furthermore, the study examines two different digital systems for the student to access the same digital content: online and offline. The purpose of recommending the use of different digital systems is to offer opportunities to people in remote areas where the internet and electricity are uncommon or unreliable. This is a favorable way forward for SDG 4 in the Global South, and thus represents a way forward for those who are at the last mile.

Limitations

Although the exploration shows promising results, there are also limitations to the study. One limitation is the absence of prior research with a similar focus on digital VETs in the Global South. A more extensive literature review on similar research about vocational training programs would have provided a solid foundation for understanding challenges. Another limitation is that this is an explorative concept study. Even if courses are developed, they still must be implemented and empirically validated by Kenyan students.

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Conflicts of Interest

The author has no competing interests to declare that are relevant to the content of this article.
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