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Teaching Digital Skills as a Competence for 21st Century in Developing Countries-Kepler Case Study

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Abstract

Navigating today's workplace environment requires being competent in digital skills as the world we live in is technology-driven. Digital skills have become a must-have in all careers to become successful in the workplace. Developing countries are still struggling to adopt digital skills that are of essence in today's workplace requirement. This paper used current data for teaching ICT skills at Kepler College in an effort to contribute to effective teaching strategies to equip today's learners with digital skills. It dug deeper using a holistic approach to fully understand factors contributing to effective skills mastery and connected dots to different indicators affecting teaching digital skills. It investigated effective strategies to improve the digital competence of learners. It contributes to effective teaching strategies and provides inputs to educators, governments, and other policymakers working toward achieving the SDG of creating global digital literate communities on how to effectively incorporate digital skills competence in the curriculum.

Keywords: *Teaching, Digital Skills, Competence, 21st Century, Developing Countries.*

Introduction

The 21st century is marked by the rapid development of technology and the increasing reliance on digital tools in all aspects of life. As a result, digital skills have become a vital competence for individuals to succeed in the modern world. Teaching digital skills has become an essential part of education, as it equips learners with the necessary knowledge and abilities to navigate the ever-changing digital landscape and effectively use technology for personal and professional growth. Digital skills include a wide range of abilities, from basic computer literacy to advanced programming and data analysis. Basic digital skills also include the ability to use a computer, navigate the internet, digital communication, media literacy and use common software applications such as word processors, presentations, and spreadsheets.

Teaching digital skills as a competence for the 21st century involves integrating technology into the curriculum to provide learners with hands-on experience with digital tools. One of the primary benefits of teaching digital skills is its crucial role in coaxing to prepare learners for the workforce as many jobs today require some level of digital literacy—not to mention that the demand for workers with advanced digital skills is projected to continue to grow. Teaching digital skills also promotes digital citizenship, which is the responsible use of technology and online resources.

Literature Review

Inferred by multiple instances, education was in many aspects the solid foundation for change movements and ideas. In Plato's *Politeia*, education is deemed so important for the amelioration of individuals, society, and culture. In early Christian times and the late Roman Empire, education was regarded as the '*voice of God*' and the voice of mission henceforth; in the Middle Ages it also became a springboard for countless movements of heterodoxy. After the Protestant Reformation at the dawn of the 16th century, education was deemed a cause of personal salvation and 'inner' belief (Androne, 2014, p. xx).

The history of modern education can be traced back to the 18th and 19th centuries as the organization of schools was very similar to that of today. Contrary to their parallels in Ancient Greece and Ancient Rome, the primary intent of these schools was to augment the literacy of the 'common people' to a level apt for life as a factory worker. In the 21st-century developed world, little has changed in terms of educational methods with the exception of the constant quest of teaching digital skills, especially after the COVID-19 pandemic.

One study by Warschauer and Matuchniak found that digital literacy is critical for success in the modern world and that there is a significant digital divide between those who possess digital skills and those who do not. The study also found that digital skills are essential for access to information and for participation in the global economy (Warschauer & Matuchniak, 2010, p. xx).

Another study by Kirschner and De Bruyckere emphasized the importance of teaching digital skills in a way that is relevant and meaningful to learners. The authors argued that simply providing access to technology is not enough; educators must also teach learners how to effectively use these tools to achieve their goals (Kirschner & De Bruyckere, 2017, p. xx).

A review by a group of researchers highlighted the need for digital skills to be integrated into education at all levels, from primary to tertiary education. The review found that digital skills are essential for employability and that employers increasingly expect job candidates to possess these skills (Kee et al., 2023, p. xx).

The report by IFC and World Bank Group on the demand for digital skills in Sub-Saharan Africa focus on Five-Country Study: Côte d'Ivoire, Kenya, Mozambique, Nigeria, and Rwanda, shows that "while the importance of digital skills has been recognized, there has been less of a focus—particularly in emerging markets—on the scale of demand for these skills, and the models that can be used to teach them"(IFC & World Bank Group, 2021).

In a study by Ertmer et al, the authors found that teachers play a critical role in teaching digital skills and that professional development opportunities are essential for teachers to effectively integrate technology into the curriculum (Ertmer et al., 2012, p. xx).

Another study found that digital skills are not evenly distributed across different demographic groups and that factors such as socioeconomic status and gender can impact access to technology and digital literacy(Hargittai, 2010, p. xx). The study emphasized the importance of addressing these inequalities in order to ensure that all learners have access to the skills they need to succeed in the modern world.

Nonetheless, research that tackles digital skills amongst 21st students in developing countries remains scarce. It is in this line that by reflecting on the practices and skills from developing countries, mainly East Africa, our case study will be an epicenter of assessment of how digital skills should be taught as a competence in the 21st century.

Methodology

After reviewing the existing data, it was crucial for the authors to take a case study of one of higher learning institutions, Kepler College located in Kigali - Rwanda. For the purpose of understanding the situation of teaching digital skills as a competence is, authors have used questionnaires-Google Form surveys that allowed participants to share their experiences. Surveys were two-sided, one focusing on learners-students and another one for teachers, teaching assistants and curriculum designers all to gain insights from both sides. The research employed both quantitative and qualitative studies to investigate the perceptions of teaching digital skills as a competence for the 21st century in developing countries from students, teachers, and curriculum designers.

The survey questions solely based on literature review carried out to dig deeper into the situation and the research objectives. The surveys were administered to Kepler students, teachers, teaching assistants, and curriculum designers. Using online surveys helped to reach a high number of respondents. Responses were graphed, tabulated, and calculated the percentages to examine the perceptions of students, teachers, teaching assistants, and designers on teaching digital skills and their variations. Moreover, the research explored the correlation between the reported variables to explore and identify patterns which served as the foundation for the recommendation.

Analysis

For better understanding of the case study, Kepler College is based in Rwanda. Since 2013, Kepler is known to be reinventing higher education and creating pathways for vulnerable African youth to access 21st Century opportunities. Kepler has positioned itself to provide its students with upskill programs that allow students to address barriers along the pipeline while at and after Kepler.

1. Demographics

a. Gender

The analysis of participants' gender is a crucial aspect of our study, which focuses on teaching digital skills as a competence for the 21st century, particularly in developing countries. In today's technology-driven world, being competent in digital skills is essential for success in various careers and navigating the rapidly changing workplace environment. However, developing countries often need help in adopting and incorporating digital skills into their educational systems, resulting in a lack of skills and contributing to unemployment.

In our study, we analyzed the gender distribution among the 37 participants. The results revealed that 48.6% (18 individuals) identified as male, while 51.4% (19 individuals) identified as female. These numbers indicate a relatively equal distribution of gender among the participants, with slightly more female participants than male participants.

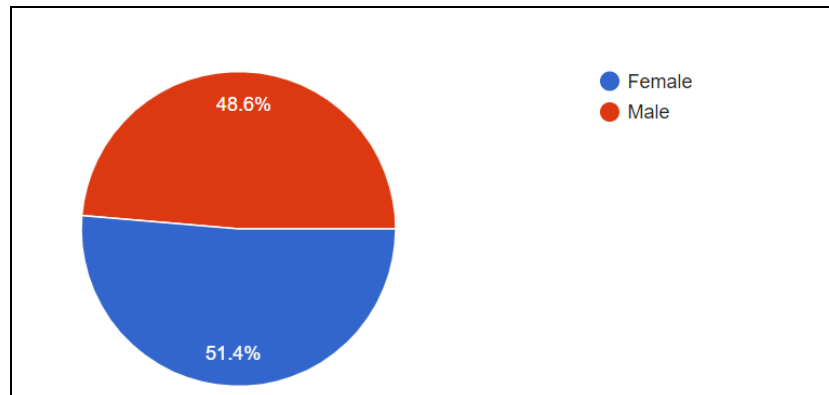


Figure No1: Gender

b. Age

The study conducted reveals that out of the total 37 participants, the majority fall within the age range of 21-25, accounting for 62.2% (23 individuals) of the sample. The second most represented age range is 16-20, with 29.7% (11 individuals) of the participants. The age range of 26-30 is the least represented, with only 8.1% (3 individuals) of the participants falling into this category.

Table No 1: Percentages

Age Range	Frequency	Percentage	Valid Percentage	Cumulative Percentage
16-20	11	29.73%	29.73%	29.73%
21-25	23	62.16%	62.16%	91.89%
26-30	3	8.11%	8.11%	100.00%
Total	37	100.00%	100.00%	

Results

By diving into findings to explore and learn more from numbers and responses, we explored data from both students and teachers to to light a mosaic of insights of teaching digital skills as a competence for the 21st century in developing countries. The first section of findings uncover the students' side while the second presents findings from teachers, teaching assistants, and curriculum designers.

A. Students Findings

From data analysis, it is evident that many students agree with having a high level of confidence in acquiring ICT skills which means that they can fully express and leverage the skills covered in various areas. This positive trend ensures self-efficacy and positive learning and makes students adaptable based on their contexts and scenarios of where to apply digital skills. Though data shed light mostly on strongly agreeing and agreeing from the four variables evaluated, we cannot neglect a few students who disagreed with the statements. This shows that digital skills are important for students to succeed in their academic life and contribute to mastery and applicability of these highly demanded skills to become successful in this volatile technological-driven world.

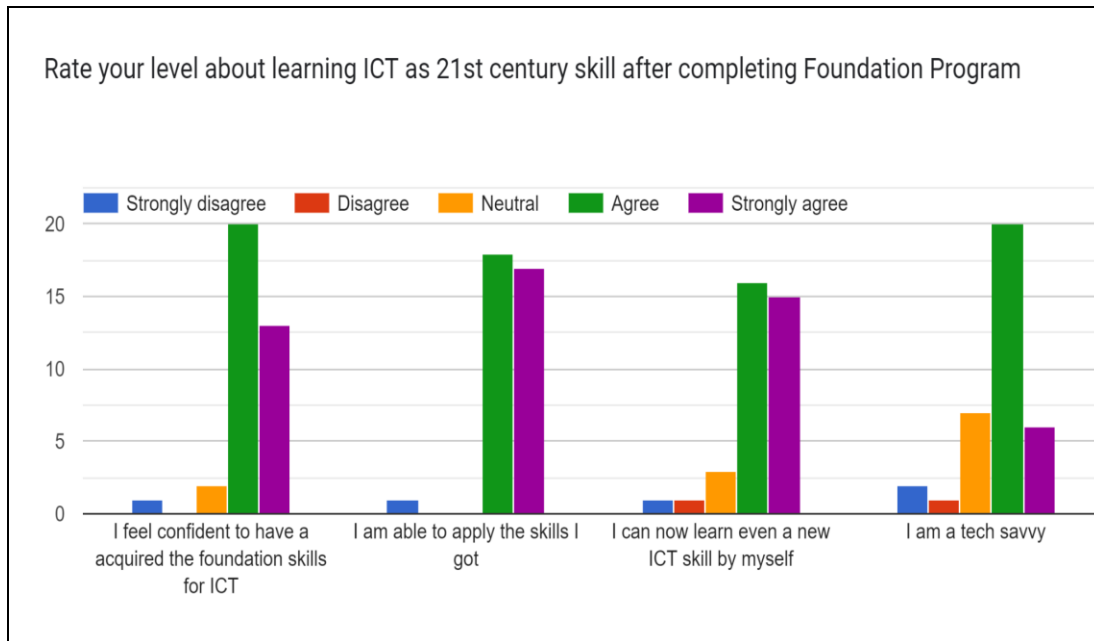


Figure No 2: Responses

Data from this graph presents key insights in mastering digital skills for Kepler students as the respondents. Respondents noted individual practices and diversified learning materials as key contributors to digital skills acquisition and mastery with 83.8% and 81.1% respectively. Among other crucial contributors noted include support from teachers, assessments, workplace scenarios, and feedback from the instructors. All these items proved valuable findings of items that helped students master the skills using developing countries as a reference.

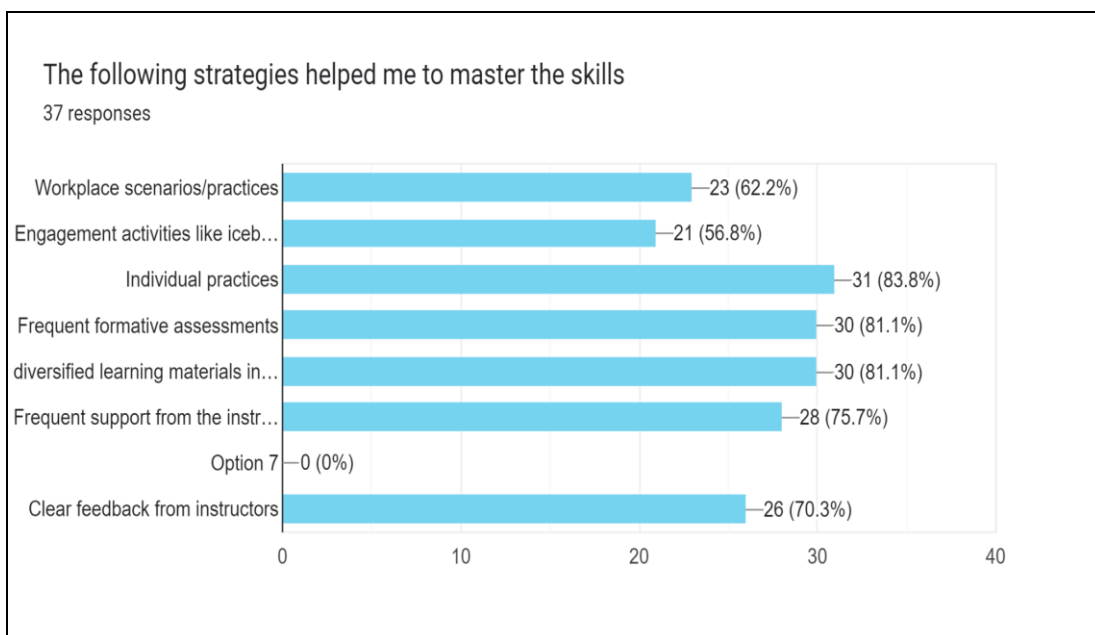


Figure No 3: Responses

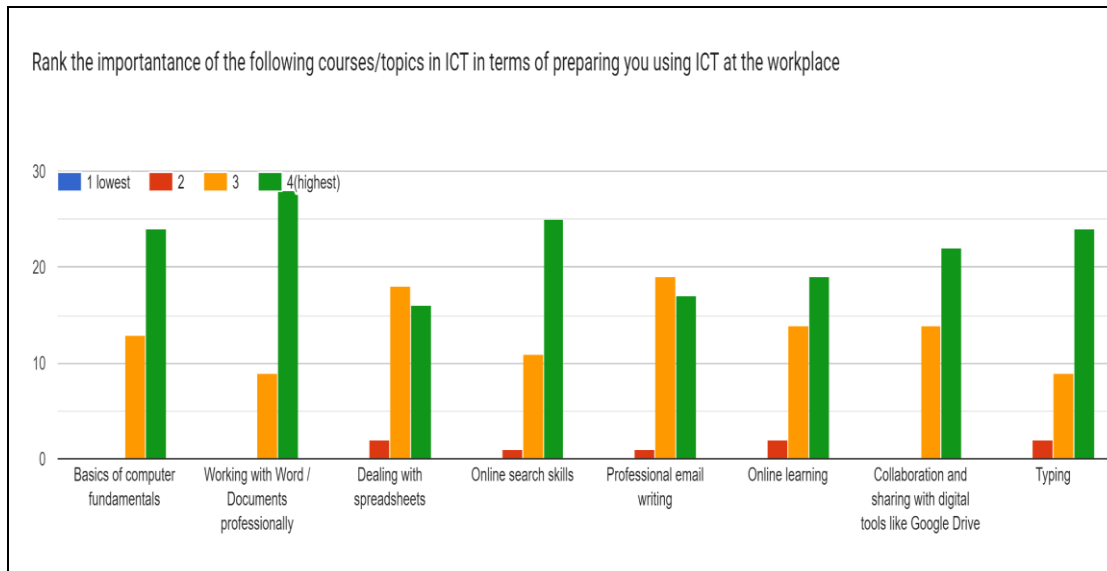


Figure No 4: Responses

Students in Foundation Program come without any background knowledge in ICT. They spend the first 6 months acquiring various knowledge from computer fundamentals, working with spreadsheets, docs, online search, email writing, typing faster, collaboration, etc. Students were asked to rank the knowledge they learned in connection to the workplace. The analysis showed that working with documents professionally is the most used tool as they need it in both their academic and professional life everyday. Typing faster also speeds up their delivery, and analysis delved into how collaboration using Drive and spreadsheets to manipulate formulas is a key skill they find relevant to the workplace. This shows that acquiring digital competencies is key to being successful both academically and at the workplace as exemplified in this research. It shows how these skills are pivotal in preparing students for workplace success and shed light on the digital skills needed to be taught first for success.

B. Teachers, Teaching Assistants, and Curriculum Designers findings

The research was two-dimensional. It also considered perspectives from teachers and curriculum designers.

Table No 2: Role of Respondents

What's your role	What's your role?
Curriculum Designer	5.56%
Learning Assistant	27.78%
Teacher	66.67%
Grand Total	100.00%

A bigger number of respondents were teachers who are involved in daily activities of teaching digital skills. This shows that teachers are put at the forefront of teaching and learning, ensuring that they are enough and keeping students ratio in the classroom helping skills acquisition.

The research assessed digital skills familiarity from the teachers perspective.

Table No 3: Digital Skills Familiarity

Familiarity with Digital Skills What's your role	Familiarity with Digital Skills			Grand Total
	3	4	5	
Curriculum Designer		100.00%		100.00%
Learning Assistant	20.00%	60.00%	20.00%	100.00%
Teacher	16.67%	66.67%	16.67%	100.00%
Grand Total	16.67%	66.67%	16.67%	100.00%

Respondents were asked to rate their familiarity with digital skills on a 5 point likert scale where one was the lowest and 5 the highest. The results revealed important patterns regarding how teachers are familiar with digital skills showing high proficiency from 3 to 5 showing how teachers are competent by showing notable familiarity. However, we cannot conclude on the curriculum designers considering that a few number participated in the research. Generally, there is a positive trend showing that teachers and designers are familiar with digital skills helping them as a competence for the 21st century.

To identify if there is a need for professional development sessions, we asked respondents if they have received any formal training to easily integrate and teach digital skills as a competence for the 21st century.

Table No 4: Formal Training

What's your role	Have you received any formal training in teaching digital skills?			Grand Total
	NA	No	Yes	
Curriculum Designer			100.00%	100.00%
Learning Assistant		80.00%	20.00%	100.00%
Teacher	8.33%	25.00%	66.67%	100.00%
Grand Total	5.56%	38.89%	55.56%	100.00%

The findings showed that a majority of teachers are ready with the right training helping them to navigate the digital landscape and equip students with the right skills. Though the number of learning assistants and curriculum designers was low, data shows they also need to constantly be equipped with digital skills integration professional development sessions and this underscore how right training is a key in teaching digital skills.

Table No 4: Digital Skills-Related Lessons

What's your role	How engaged do you find students in digital skills-related lessons?			Grand Total
	3	4	5	
Curriculum Designer		100.00%		100.00%
Learning Assistant	20.00%	60.00%	20.00%	100.00%
Teacher	16.67%	58.33%	25.00%	100.00%
Grand Total	16.67%	61.11%	22.22%	100.00%

The research went further and explored further how students are engaged in digital skills-related lessons from the teachers perspective to evaluate how it prepares them for the workforce. Data reveals that there is a need for improvement mainly from teachers perspective as to engage students and prepare them for the workforce. There is a need for a robust curriculum with innovative engagement strategies driving high rates of digital skills acquisition.

Table No 5: Integration of Digital Skills in Curriculum

COUNTA of Integration of Digital Skills in Curriculum	Excellent	Good	Poor	Grand Total
What's your role				
Curriculum Designer	100.00%			100.00%
Learning Assistant		100.00%		100.00%
Teacher	41.67%	50.00%	8.33%	100.00%
Grand Total	33.33%	61.11%	5.56%	100.00%

Further more, the research explored how digital skills prepares learners for 21st century workplace or job-readiness from teachers and designers perspectives as the key drivers.

Table No 6: Respondents Role

What's your role	How well do you think the current curriculum prepares students for the demands of the 21st-century workforce?			Grand Total
	Effective	Moderately Effective	Very Effective	
Curriculum Designer			100.00%	100.00%
Learning Assistant	40.00%	40.00%	20.00%	100.00%
Teacher	41.67%	25.00%	33.33%	100.00%
Grand Total	38.89%	27.78%	33.33%	100.00%

Data from this question shows intriguing insights. Curriculum designers showed a high level of effectiveness in ensuring that the current curriculum prepares students for the demands of the 21st-century workforce. Though all ratings show that they are effective, the difference from effective and moderately effective underscores how there is still a room for improvement to ensure that the current curriculum is regularly updated to match the workforce trends and prepare students for success.

To easily understand if teachers and designers understand digital skills integration in the curriculum, we asked respondents their insights to help us know their opinions and understand digital skills integration opinions comprehensively. Notably, data show that they all rated integration to be crucial by either excellent and good. However, 8.33% of respondents said that digital skills integration in the curriculum is still poor in their context and this cannot be neglected. It shows that there is still work that needs to be done to achieve desired outcomes to enhance digital skills integration in the curriculum framework.

Qualitatively, respondents shed light on the strategies they use to enhance digital skills acquisition as a competence for the 21st century. Teachers, curriculum designers and learning assistants reflected on some of their best practices to show multifaceted approaches. Some of the highlight approaches include using interactive online platforms enhancing collaboration and real-time collaboration but also pushing students to learn on their own. They also highlighted using project based learning and real-world scenarios to connect learning with the outside environment and giving them a room to apply digital skills learned in their deliverables.

Discussion

Challenges section presents multifaceted struggles faced by designers, teachers, and teaching assistants when teaching digital skills as a competence for 21st century skills in developing countries with Kepler in Rwanda as a case study. These discussed challenges pose a weighty in ensuring stellar digital skills teaching and learning success. Also, these challenges recommend a context-based approach when addressing the challenges faced. What worked in Rwanda won't be the same in Somalia. Each region with its own needs and every curriculum needs to be contextualized considering the environment, nature, agenda, resources, and skills in order to bridge the gap in teaching digital skills.

Challenges Identified from Teachers Perspectives

Diversity in Academic Background

The respondent faces the challenge of diverse academic backgrounds among students which means that they are often faced with the difficulty of catering to students with different digital literacy levels which can hinder progress. However, the respondents also view this as an opportunity to better support students in their learning journey. *"A challenge I face while integrating digital skills into my teaching is a different academic background for students which is also an opportunity for me as a teacher because it allows me to better support students."* and another one said *"I would say the challenge I face in integrating digital skills in my teaching is when the students have low confidence, mostly because of their academic background, in terms of using digital skills. This is a challenge as it hinders some students' progress however, I believe with time those students can improve and be better in terms of using digital skills."*

Internet Connectivity and Technical Issue

It has been reported that there is shortage of basic resources, particularly a reliable and fast internet connection which in turn leads to time consumption that reduces student engagement and teaching effectiveness. Despite the efforts made by the institution and government, the internet is still a challenge for those who use it on a daily basis. One respondent said this *"A challenge that I faced was a lack of basic resources while teaching, for instance, I often struggled to find a strong and faster Internet connection while teaching. This results in time consumption while trying to connect which reduces the engagement of students and the effectiveness of teaching."*

Continuous Learning Requirement

The main challenge of the respondents was the constant need for learning due to the ever evolving nature of technology and digital skills. Because of this they find themselves needing additional training and tools more often than they could keep up with. Additionally, it reported that it becomes challenging to integrate new elements into teaching due to difficulties in adapting to new digital trends. One teaching assistant said *"The specific challenge would be the need of continuously learning since technology is evolving so as a learning assistant you are in need of keeping yourself updated on every trend of the digital skills"*

Insufficient Time and Structure for Practical Exercises

It was identified that due to the nature of some modules/courses duration and structure, it becomes hard to allocate enough time for practical exercises which limit the acquisition of essential skills and internalization of the skills learned that will be useful to the job market.

Over Reliance on AI by Students and Plagiarism Detection

Though AI has been an added resource for students to use while learning, it has become a concern for teachers that they have started seeing some students rely heavily on it which in turn limits their ability to think creatively to solve problems independently. This leads to another challenge for teachers because they are yet to keep up with different learning platforms that would allow them to detect student plagiarism.

Recommendations for improving the Integration of Digital Skills in Curriculum

After comprehensive data analysis from students, teachers, teaching assistants, and designers, we shed light on key action steps needed to ensure successful teaching digital skills as a competence needed to become successful in the 21st century. They pave the way for continuous and collaborative approaches to future-ready digital skills teaching in this digital age of the 21st century.

Conduct a Comprehensive Digital Skills Assessment

As identified, students and teachers are to come with different academic backgrounds and digital literacy levels so in order to make sure that there is homogeneity in the level of digital literacy, there should be an assessment of the current digital skills of both students and teachers to identify the gaps and areas for improvements. This assessment will serve as a baseline for curriculum development. This will be crucial as it will leave room for creating personalized learning paths that can accommodate different levels and learning preferences. Additionally, it will allow the inclusion of adaptive learning technologies that adjust the difficulty of content based on individual students/teacher performance.

Embed Digital Skills Across Disciplines

After identifying the gaps and areas of improvement particularly for students, it is recommended that digital skills should be integrated seamlessly into existing courses across disciplines rather than only creating additional standalone digital skills courses. This will foster interdisciplinary connections and help students see first hand the real-world applicability of digital skills. Additionally, this will increase students' confidence in using digital skills and leading to increased engagement and participation. *"Map out where digital skills can be integrated within the existing curriculum."*

Professional Development Opportunities

To make sure that both teachers and students are able to keep up with digital trends, it is crucial to offer access to specialized online resources such as online courses, workshops, webinars, guest lecturers and tutorials that focus on specific digital skills since class time will not exhaust every necessary skill or have enough practice time. This will ensure that teachers and students can independently explore and expand their knowledge beyond the classroom. As one of the respondents said *"Not assuming instructors are able to use the different digital tools, then organize workshops from simple to complex needed skills."* and *"For improving the integration of digital skills in curriculum, I would recommend that they provide professional development opportunities for teachers. I believe this can help teachers grow and be able to also support students effectively, they would also be able to learn different strategies they can use for engaging students in digital skills and they can also learn how to tackle different challenges they might face."*

Industry Collaboration and integration of feedback for dynamic curriculum

Starting from curriculum design, it is important to collaborate with industry professionals to ensure that it reflects current industry needs and trends. Additionally, there should be specified curriculum updating time to make sure that there is incorporation of new trends but also the existing resources have not yet become

absolute. This requires continuous feedback collection and integration into the curriculum. Hence, the need to implement a robust system for evaluating the effectiveness of digital skills integration.

Mentorship

Create an environment that facilitates peer mentoring programs such as student to student, teacher to student and students to alumni and etc programs to enhance the learning experience by offering guidance and support.

Conclusion

While technology has transformed nearly every aspect of work and life, many education systems still struggle to provide students with digital skills necessary for full participation and success in and after school. This article explored the important and ever-evolving need for teaching digital skills as a key competence in the 21st century, with a focus on developing countries using a case study of Kepler College in Rwanda.

The research findings presented demonstrate that students recognize the value of digital skills and are eager to build their digital literacy skills. Furthermore, teachers are committed to integrating technology in the classroom. However, substantial challenges remain regarding student preparation, infrastructure, curriculum development and teacher support.

To overcome these barriers, a multidimensional approach is required. Assessments of student and teacher digital proficiency can inform the design of customized lesson plans, and digital skills should be embedded across disciplines rather than being offered as standalone courses. Simultaneously, ongoing teacher professional development opportunities will enable educators to continuously adapt to new tools and methodologies and collaboration within the education field will ensure curriculum meets real-world needs. This study provided insights from a developing world context on the steps and long-term investments required to adequately prepare youth for the demand of the 21st century workforce. Further research can support the replication of permission models and best practices within and across developing nations. With the proper vision, effective collaboration and commitment, developing countries can equip their citizens with the digital skills needed to fully address the challenges and access the possibilities the Information Age presents.

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