Mramba Mixed Secondary School, Kiabuya Mixed Secondary School, St. Joseph Olando Mixed Secondary School

Strategy Report Homa Bay

Co-funded by the European Union

14.05.2024

Co-funded by the European Union

DEVISE4KE

Strategy report Homa Bay

Content

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INTRODUCTION

The Government of Kenya introduced a new education curriculum, named the Competency Based Curriculum that offers opportunities for practice and specialization at basic levels of education. It integrates practical learning in the education system in the Country. In 2017, the government also changed the country's education system replacing the previous 8-4-4 system with the current 2-6-3-3-3, with 2 years pre-primary, 6 years primary, 3 years junior secondary and 3 years senior secondary and 3-years University education. This new shift places more emphasis on the need to embrace new technology in learning, for which building ICT competencies of the learners and teachers remains a key priority for the government of Kenya. The Devise4Ke project responds, promptly, to this need, by not only investing in the ICT infrastructure support but also addressing the key training gaps and retooling of the teachers and learners to build their competencies in navigating the ICT landscape. The project team has undertaken a thorough ICT needs analysis of the selected schools, a comprehensive analysis of industry requirements in terms of ICT and associated skills of learners processed from schools to the work environment. In understanding these needs and in keeping in tune with the government's educational focus and priorities, this project has proposed solutions to the ICT challenges in learning institutions in Kenya; including installation of photovoltaic equipment that would provide reliable power supply to the ICT equipment that will be installed in the schools. A comprehensive training program to build ICT competencies amongst learners and teachers has also been envisaged.

HOMA BAY

The economy of Homa Bay County, located in western Kenya, is largely based on agriculture, with major crops including maize, beans, sorghum, and sugarcane. Fishing is an important sector in the county, with the main fishing village being Riana. In addition to agriculture and fishing, there are some small and medium-sized enterprises in Homa Bay involved in businesses such as manufacturing, trade, and tourism. There is a growing service sector, including banking and telecommunications, which provides employment opportunities. The government and development organizations are working to improve the business environment and increase investment in the region, with the aim of boosting economic growth and reducing poverty (Kenya National Bureau of Statistics (KNBS), World Bank, Kenya Agricultural and Livestock Research Organization (KALRO)). One of the strategies is to strengthen vocational education and training (VET) and to achieve a stronger connection between schools and industry as there is a mismatch between industry needs and skilled workers. Overall, VET programs in Kenya's secondary schools are seen as a valuable addition to the education system, helping to prepare students for the workforce and support the country's economic growth. In the Draft Technical and Vocational Education and Training (TVET) Policy of the Ministry of Education it is stated clearly that there is a huge need for "Expanding access and equity and improving quality: this policy advocates for development of a national skills strategy with broad participation by stakeholders and aimed at promoting private sector investments, providing scholarships to reward excellence, providing loans and

bursaries to TVET, rehabilitating TVET infrastructure and encouraging secondary schools to offer technical and vocational and industrial education (Ministry of Education Republic of Kenya 2018; Kenya National Qualifications Authority 2018).

The current TVET system in Kenya is largely based on theoretical training. To some extent, less attention is given to assessing competence as required in the workplace. Employers are critical of this historical system because it insufficiently prepares young people for the requirements of employment. Rapid technological advances give rise to innovation and new practices, and any new qualification and training system must consider these. There is increasing unemployment among young Kenyans and the present TVET system is a fragmented qualification system resulting in a poor-quality output unable to respond to employer expectations

Information and Communication Technologies (ICT) have become an indispensable part of the educational system, also in Kenya (https://www.education.go.ke/node/286). ICT must reserve a key place in the improvement of the educational system, to transform it and to be able to provide quality education (Saravanakumar, A. R. 2018). According to UNESCO, ICT can complement, enrich, and transform education for the better. The 2030 Agenda for Sustainable Development, adopted by al United Nations Member States in 2015, provides a common plan to transform the world through 17 Sustainable Development Goals (SDG) for all countries (developed and developing). As the lead United Nations agency for education, UNESCO works to help countries develop policies to use ICT to expand and improve education in accordance with Sustainable Development Goal 4 (SDG 4): “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”. To achieve the Sustainable Development goals, it is necessary to address global challenges because education is a key to escaping poverty. However, for some developing countries such as Kenya, achieving all these goals remains an elusive challenge due to the limited capacity to address the SDGs which may negatively affect their development. Infrastructure is the underlying foundation for a country’s development. Regarding ICT, the Homa Bay County Integrated Development Plan (County Government of Homabay 2018) states that the county enjoys a mobile phone penetration of 85.6% (mobile phone ownership is 54% on average), which means that landline services are practically ended or non-existent.

According to the Infrastructure Consortium for Africa (ICA, 2005), Africa has seen significant growth in ICT, but while mobile phone penetration currently exceeds 60%, the continent lags far behind other developing regions in terms of Internet access and use (3/4 of the population of Africa is disconnected).

It is well-known that ICT has the potential for increasing access to and improving the relevance and quality of Education, opening new challenges (Das, K. 2019)). According to D. Amutha (2020), the major promises of ICT use in developing countries’ educational systems focus on training teachers in new skills and introducing innovative pedagogies into the classrooms, investing on ICT infrastructure for schools and creating networks among educational institutes, improving overall standard of education by reducing the gap in quality of education between schools in urban and rural areas, initiation of smart school with objectives to foster self-paced, self-assessed, and self-directed learning through the

applications of ICTs, and developing ICT policy for education and training. While ICT has been used successfully in many parts of the world, most African countries still face challenges and increased expenditure in education has not necessarily achieved the expected benefits.

Homa Bay developed an ICT Roadmap (2015) as a key strategy to ensure the success of an integrated ICT environment in the county, to create connectivity between systems and improve service delivery. The roadmap presents opportunities and challenges for digital transformation and educational institutions are involved in the process of strategic implementation of ICT. Technology is used to support better service delivery, reduce operating costs, and motivate staff to think more and do more with less. With declining budget allocations to key development sectors such as education, there is a need to turn to ICT for the efficient and low-cost provision of necessary services. ICT service provision in the county is centralized and coordinated by the Department of Blue Economy, Fisheries, Mining and the Digital Economy. The ICT department provides support to other departments. There are only 6 staff members in the ICT department supporting ICT services, which is extremely inadequate. Among the emblematic projects for citizen satisfaction is the Educational Institutions Information and Management Database in position 9 and in position 10 is the E-Library System for Educational Institutions. Among the desired projects for a connected citizen are the Lobby for Incorporation and Development of ICT training in ECDE (Early Childhood Development and Education) Schools and Vocational Training centers; and setting up of community ICT training centers. According to this document, the state of ICT in the sub-counties is very poor – there is no internet access, low ICT knowledge and no ICT staff capacity.

In terms of the teacher computer skills necessary for the DLP, the results of studies such as Kembo, et al., (2019) show that more than half of the teachers in the sample (6,529 teachers and 845 head teachers at public primary schools in the Homa Bay County) have attended general computer literacy courses at learning institutions, where 31% have been trained by the government in DLP. However, the computer skills rating of teachers on a 5-point Likert scale is low and 44% of schools do not have teachers trained in ICT (Kembo, J., Omito, O., Ayere, M., & Ali, A. A. 2019)

CURRENT STATE ANALYSIS OF TECHNICAL INFRASTRUCTURE

In order define a strategy plan for the three participating secondary school offering vocational education and training in Homa Bay, it was necessary to run a side inspection in order to plan and calculate the necessary photovoltaic equipment, which is suitable for the digital transformation of the schools.

Therefore, a dedicated team from Rongo University collaborated with the University of Bremen for a site inspection at three schools in the rural Homa Bay region of Kenya.

Kiabuya Mixed Secondary School

The school is located in Kiabuya village in Gwassi South Location, Suba South Sub-County of Homabay County. It has a total of 311 students, of which 161 are female and 150 are male students. The school has 17 teachers, of which 8 are employed by the government through the Teachers Service Commission (TSC), while 9 are employed by the Board of Management of the school. None of the teachers is a trained ICT teacher; hence the school lacks skilled teaching personnel to support ICT training.

Outside corridors

Corrugated iron roof, wooden roof girder, overhang above the corridor supported by steel girders, brick and cement walls, no electricity

Administration building

Corrugated iron roof, concrete roof girders, overhang above the corridor supported by concrete girders, brick and cement walls, no electricity

Interior of proposed ICT-Room

Bricked and cemented walls, built-in cupboards without doors are suitable for storing equipment after the installation of suitable steel doors.

Outside corridors

Recently built; corrugated iron roof, wooden roof girder, overhang above the corridor supported by steel girders, brick and cement walls, no electricity, north side shady with trees, south, west and east sides without planting

Miramba Mixed Secondary School

The school is located in Miramba village in Gwassi West Location, Suba South Sub-County of Homabay County. It has a total of 167 students, of which 77 are female and 90 are male students. The school has 7 teachers, of which 2 are employed by the government through the Teachers Service Commission (TSC), while 5 are employed by the Board of Management of the school. 5 of the teachers are female while the number of male teachers is 2. One of the teachers is a trained ICT teacher.

Outside corridors

Roof girder, overhang above the corridor supported by steel girders

Chosen ICT Building

No planting of any kind, permanent exposure to sunlight. Bricked and cemented walls, single insulated windows

Outside corridors

Recently builed, bricked and cemented walls, wooden roof girder, corrugated iron roof

Outside corridors

Corrugated iron roof, wooden roof girder, overhang above the corridor supported by steel girders, no electricity

St. joseph Olando Mixed Secondary School

The school is located in Miramba village in Gwassi East Location, Suba South Sub-County of Homabay County. It has a total of 124 students, of which 52 are female and 72 are male students. The school has 10 teachers, of which 5 are employed by the government through the Teachers Service Commission (TSC), while 5 are employed by the Board of Management of the school. 2 of the teachers are female while the number of male teachers is 8. None of the teachers is a trained ICT teacher; hence the school lacks skilled teaching personnel to support ICT training.

Property of St. Joseph

Corrugated iron roof, wooden roof girder, overhang above the corridor supported by steel girders, brick and cement walls, no electricity

Chosen Building for ICT classes

In the middle of the property, nearly no planting, all day sun disposure.

Outside corridors

Corrugated iron roof, wooden roof girder, overhang above the corridor supported by steel girders, no electricity

Interior

Solid door and windows, loose equipment, prone to dust. Requires a steel cabinet for the storage of ICT equipment

Electrical Analysis Report for Solar Panel Installation in Kenya

This chapter provides a comprehensive analysis of the feasibility and desirability of installing solar panels in schools located in Homa Bay County and Rongo University in Kenya. The area under analysis faces significant challenges in terms of reliable and sustainable electricity supply. As a possible solution, the installation of solar panels has been considered due to their ability to generate renewable energy efficiently and sustainably.

To better understand the electricity needs of rural Kenya, a detailed analysis of the expected monthly consumption has been carried out. This analysis considered various factors such as the number of connected devices, consumption, and the number of hours of use of the devices. The results reveal a daily energy demand of about 15.4 kWh/day. Including a safety margin of 20% due to various factors such as weather conditions, orientation of the panels, etc. An average monthly consumption of 407 kWh/month (22 days of consumption).

System sizing

A safety margin (20%) has been calculated considering various factors, such as the efficiency of the solar panels, the storage capacity of the batteries and the local climatic conditions. Although a priori the system can be considered oversized, this strategic approach aims to maximise efficiency and prolong the life of the batteries.

Three power options have been evaluated for the selection of the solar panels: 2.7 kW, 4.5 kW and 6.7 kW. These options have been selected considering both the expected energy demand and the solar power generation capacity of the area.

Expected production

The expected production capacity of each energy option is summarised below, considering that the average hours of sunshine per day in the area is 5.27 hours:

- Option 1: 2.7 kW solar panels. Estimated monthly production (average): 337.23 kWh
- Option 2: 4.5 kW solar panels. Estimated monthly production (average): 562.05 kWh
- Option 3: 6.7 kW solar panels. Estimated monthly production (average): 839.32 kWh

Data source: DATA ACCES VIEWER and PV Watts.

System schematic

A schematic of the proposed system, including the layout of the solar panels, inverter, storage batteries and control and monitoring devices, is attached. This design aims to maximise solar energy collection and ensure a stable and reliable electricity supply for the rural community.

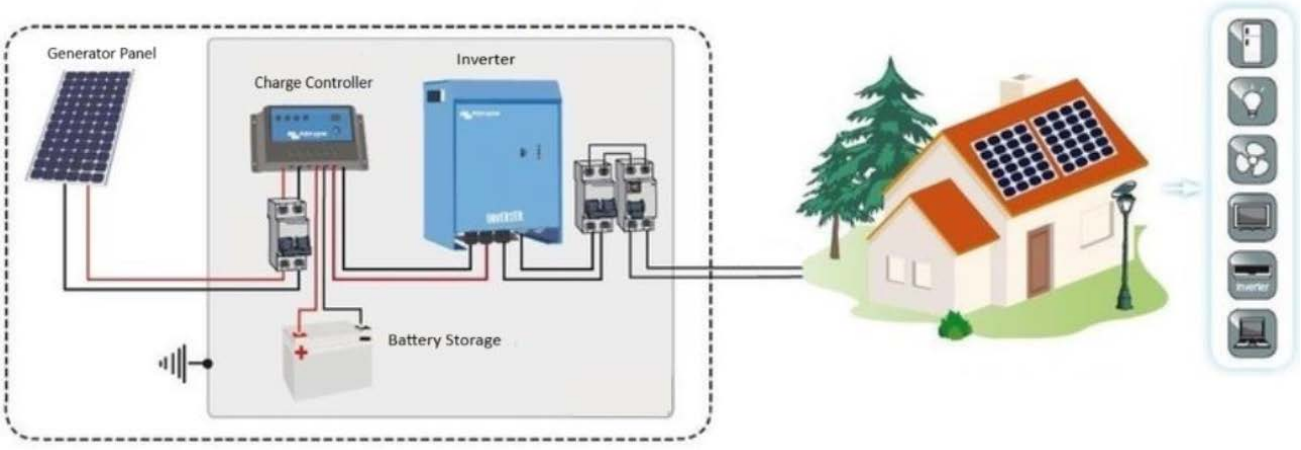


Figure 1: Proposed photovoltaic systems for secondary schools

Choice justification

Considering the data collected and the analysis carried out, the 6.7 kW solar panel option is recommended. Although this option may seem oversized, its additional capacity will allow a more direct use of solar energy and less dependence on batteries, which will significantly extend their lifetime. In addition, this option ensures adequate energy production to meet the needs of the community, both present and future. The installation of solar panels in rural Kenya represents an effective and sustainable solution to address current energy challenges. The analysis conducted supports the selection of the 6.7 kW solar panel option, which will offer significant advantages in terms of energy efficiency and durability of the system.

Recommendations

It is recommended to proceed with the implementation of the 6.7 kW solar panel system according to the proposed specifications and design. In addition, it is suggested to continuously monitor the performance of the system and make the necessary adjustments to ensure optimal long-term operation.

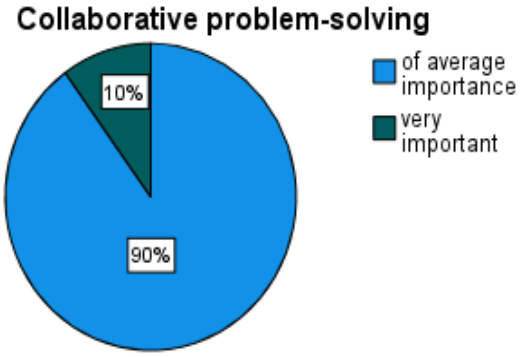
NEED ANALYSIS OF INDUSTRY IN HOMA BAY

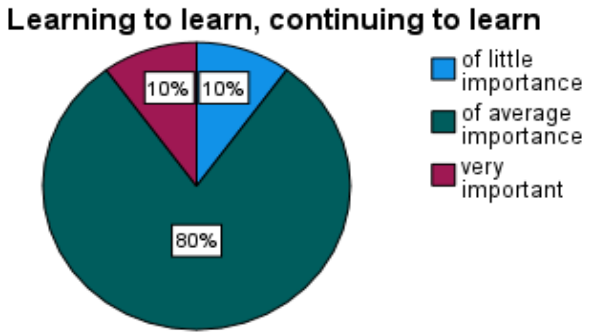
The team conducted a needs analysis on ten (10) industries in Homabay County. The analysis covered such areas as transversal skills as well as the professional and digital competence of employees. The results of the analysis are provided in Part A, B and C.

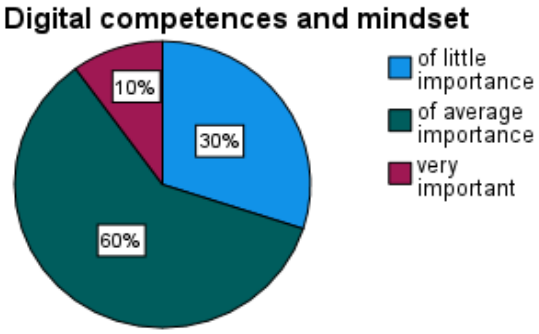
PART A: Focus on the Transversal skills of employees

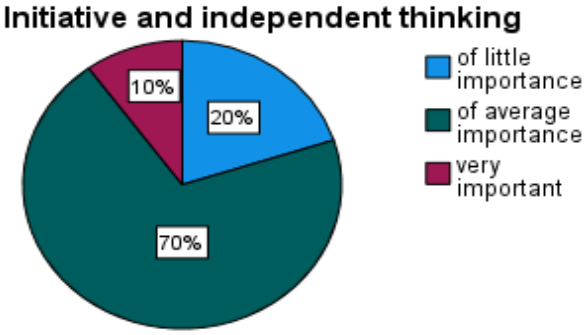
The analysis involved the assessment of transversal skills required by the companies. These skills had the following characteristics, transferable across domains, geographies, work and life contexts; typically relate to social and interpersonal relations; essential tools in any context of significant and accelerated change; can be observed, evidenced and developed, whereas developing values such as integrity in adults and changing ingrained character traits is extremely difficult; and are learned through experience and development and cannot be easily taught, except through highly interactive learning processes (Whittemore 2018, page 9). In this section, the respondents were required to rate the importance of these skills in a scale of 1 to 4 where 1 is Not important and 4 is very important.

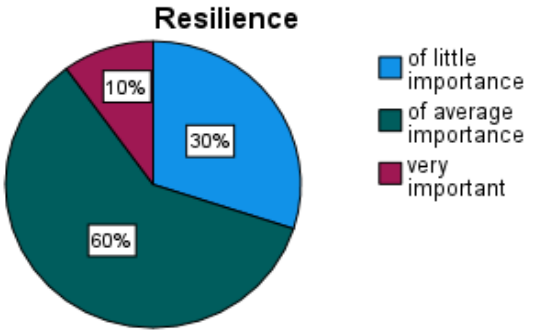
The results of the analysis are shown below:

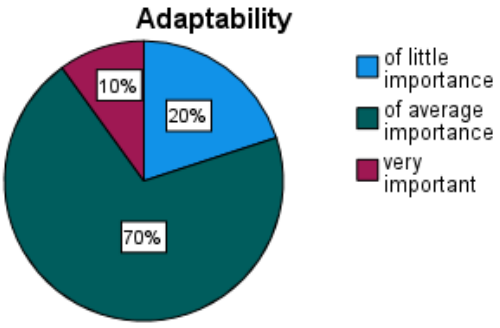


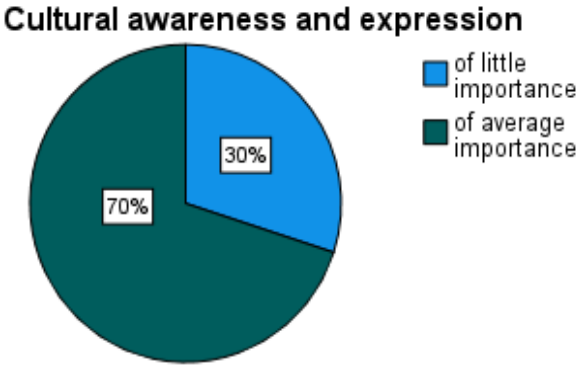












The analysis presented above suggests that, on average, the majority of respondents regarded the importance of the transversal skills as either average or very important signifying their need for improved performance of the institutions.

PART B: Areas of Special Interest to Companies

The survey highlighted the competencies and skills of employees. It covers current competencies and skills in demand, future skills needs, training and development approaches, challenges in human resource development, impact of digital transformation, and the role of educational institutions.

Key competencies highlighted include problem-solving, communication, cultural awareness, adaptability, and digital skills. Gaps observed include technological skills, funding, time constraints, and resistance to change. Approaches to training employees identified by the companies include onboarding, mentorships, on-the-job training, and partnerships with corporate trainers. Identifiable challenges faced in developing competencies included costs, lack of resources, and difficulty adapting older employees to new systems.

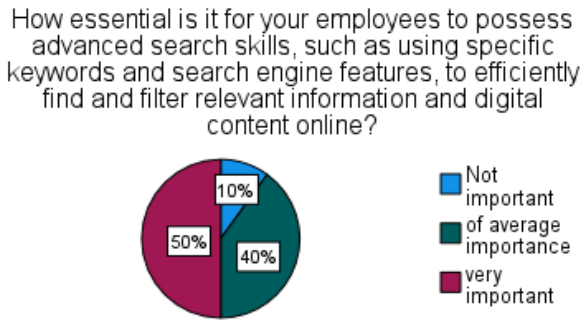
The digital transformation has brought positive impacts like improved visibility and communication as well as negative ones like equipment and skills becoming obsolete. Organizations are trying to support development of digital competencies through allocating budgets, workshops, and participating in online courses. Recommendations for educational institutions covered teaching market relevant content through internships, career counseling, and practical digital skills development.

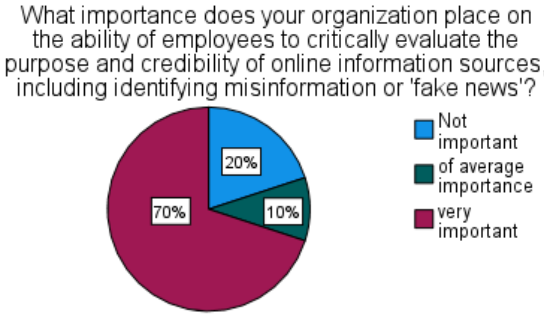
Part C: Focus on digital competences (DigiComp)

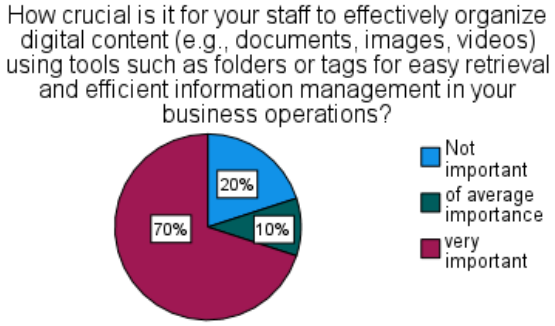
The analysis involved evaluation of digital competencies required by different organizations. The respondents were required to rate the importance of these competences on a scale of 1 to 4 where 1 is not important and 4 is very important. The results were grouped in 5 categories as shown below:

Information and Data Literacy

This competency involves effectively finding, evaluating, and managing information and digital content. It encompasses skills in browsing, searching, filtering, evaluating the credibility and purpose of digital information, and organizing digital content efficiently. On average, the respondents rated this competency as very important. The results of the analysis are provided in the figures below:

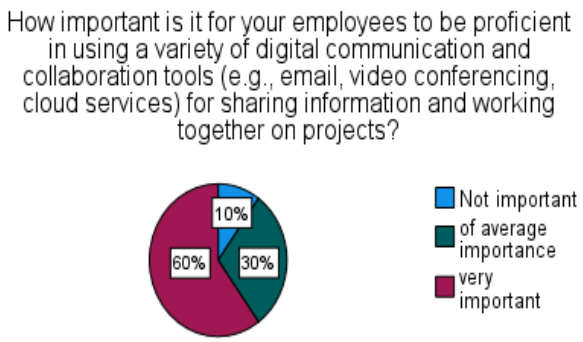


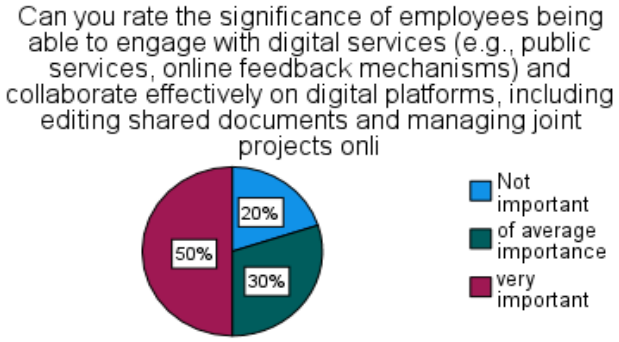


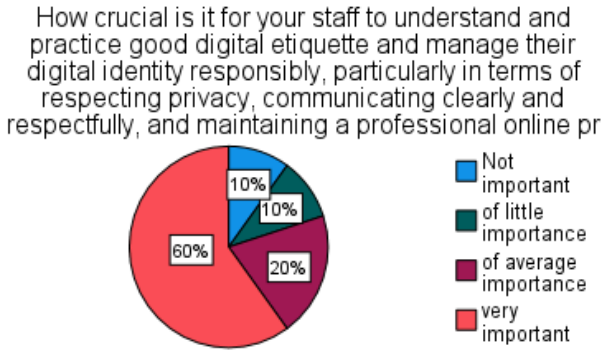


Communication and Collaboration

This competency involves the effective use of digital technologies for communication, sharing, engaging with society, collaborating, observing digital etiquette (netiquette), and managing one's digital identity and presence. It covers skills in using various communication tools and services, sharing and collaborating on digital content, engaging in digital citizenship, and understanding the importance of netiquette and digital identity management. On average, the respondents rated this competency as very important. The results are presented in the following charts.

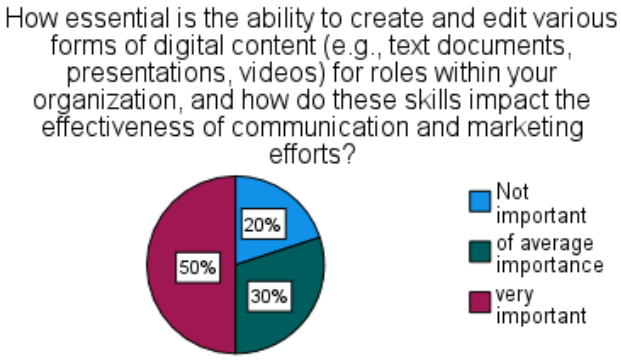


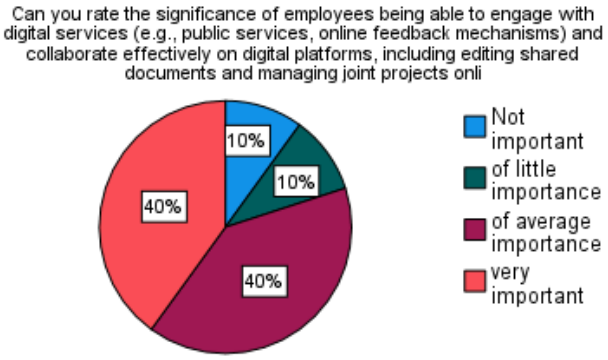


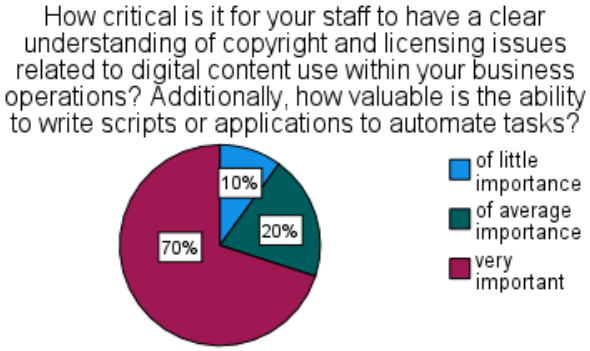


Digital content creation

This competency involves the ability to create, edit, integrate, and re-elaborate digital content, as well as understanding copyright and licenses, and programming for task automation. It encompasses skills from basic content creation, such as documents and presentations, to more complex activities like video production, content modification with regard for legal and ethical considerations, understanding licensing issues, and developing simple software solutions. The respondents, on average, rated this competency as being very important and the results are presented in the following charts.

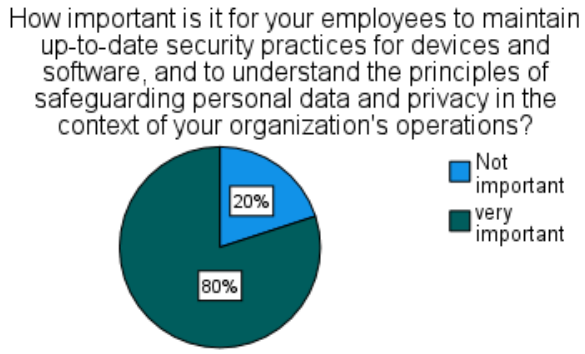


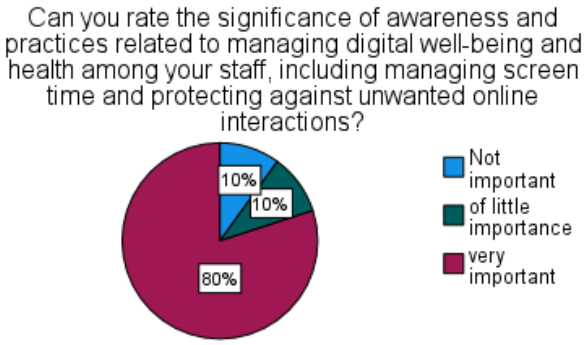


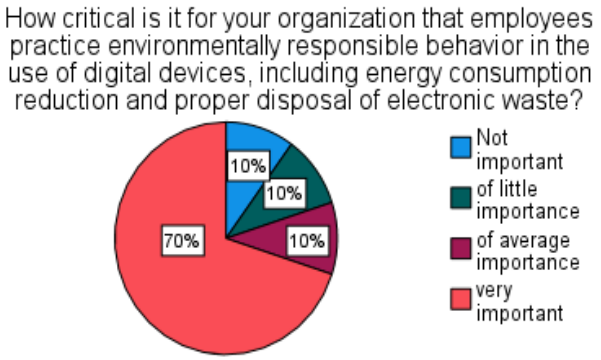


Safety

This competency encompasses the skills and knowledge required to ensure the protection of devices, personal data, privacy, health, well-being, and the environment in the digital world. It includes maintaining software and devices, understanding and mitigating safety risks associated with internet-connected devices, managing digital footprints and privacy, ensuring digital well-being, and promoting environmentally responsible use of technology. The respondents rated this competency as being very important to organizations. The results are presented in the following charts.



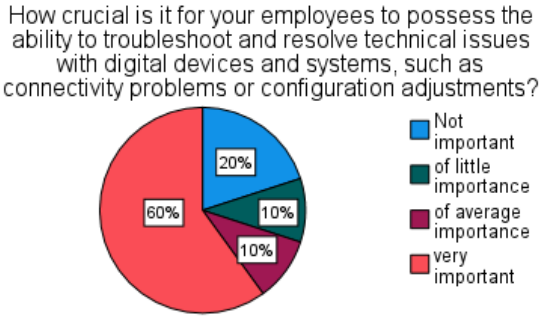


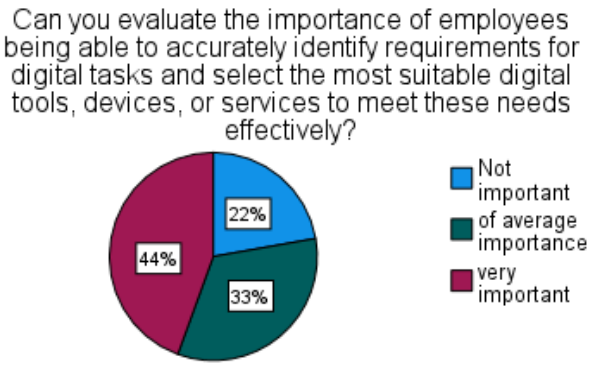


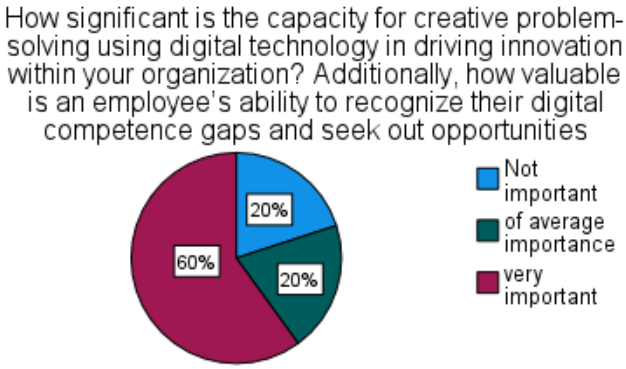
Problem solving

This competency involves the ability to identify, diagnose, and solve technical problems using digital tools and resources. It includes understanding the functionalities of digital devices, selecting appropriate technological solutions for specific tasks, employing digital technology

creatively to innovate, and recognizing as well as addressing digital competence gaps. This competency was rated mostly as very important as presented in the following charts.







The analysis presented above suggests that, on average, the majority of respondents regarded the digital competences as either of average importance to very important signifying their need for improved performance of the institutions.

1. Overview of Digital Literacy in the Homa Bay Region

Based on questionnaires completed by teachers and students in Homa Bay, contrasted with feedback received from companies on what digital skills they see as important, on a scale of 1 (no knowledge) to 4 (fully mastered), we have the following summarised results:

Teachers' Survey

Section A. Private Use of Mobile Devices and Computers

Almost all of the teachers surveyed had a smart phone and/or tablet, or access to one within their family. The most common uses of these devices was to make phone calls, chat on WhatsApp or Facebook, and to search for information using search engines such as Google Chrome. The average time spent on a computer per week was 7 hours.

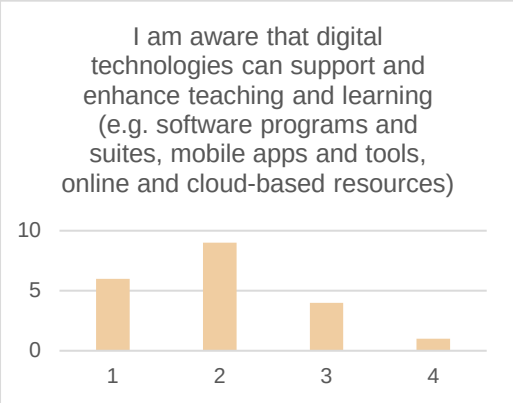
Section B. Digital Competences

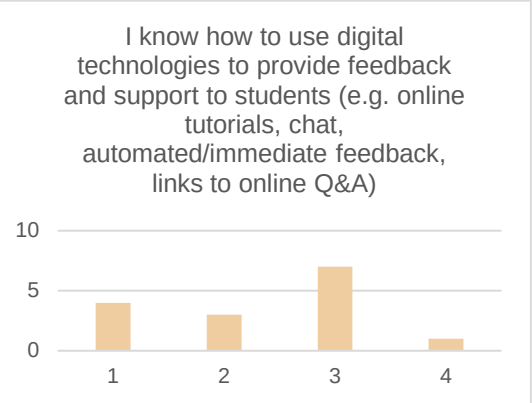
These were surveyed in line with the DigiComp framework headings.

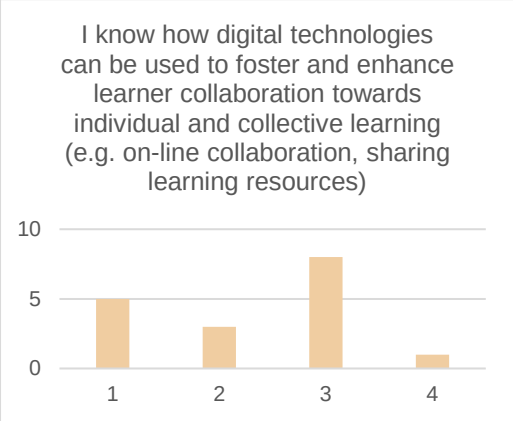
Information and Digital Literacy	Most respondents were fairly competent in this field, with the only areas of weakness being the ability to distinguish between fake news and the ability to organise information for future retrieval.
Communication and Collaboration	While some teachers felt confident and competent in this area, many others were unsure of how to do more beyond sending basic emails.
Digital Content Creation	Again, a few teachers demonstrated competence but the vast majority did not know or have the confidence to perform tasks in this category.
Safety	This category was also a weak area for respondents.
Problem-Solving	Beyond the basic, most teachers were not confident or competent in this category

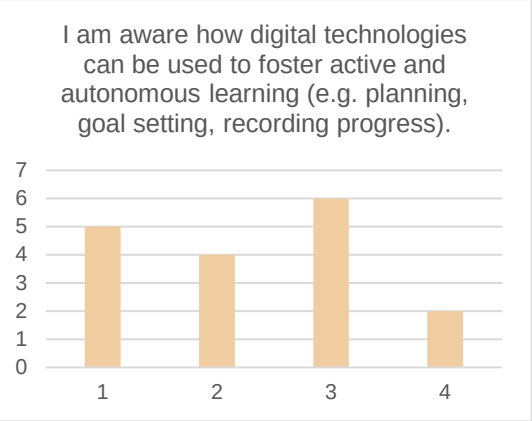
Section C. ICT in Teaching

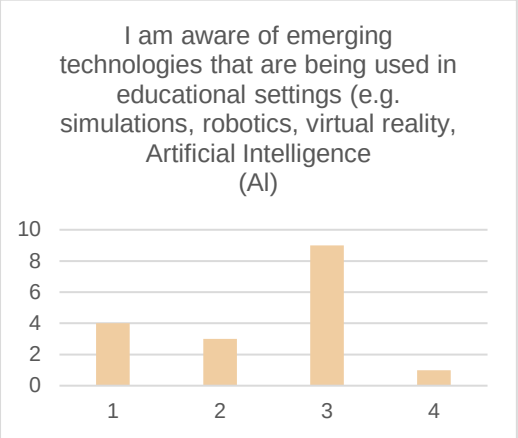
A. Teaching and Learning



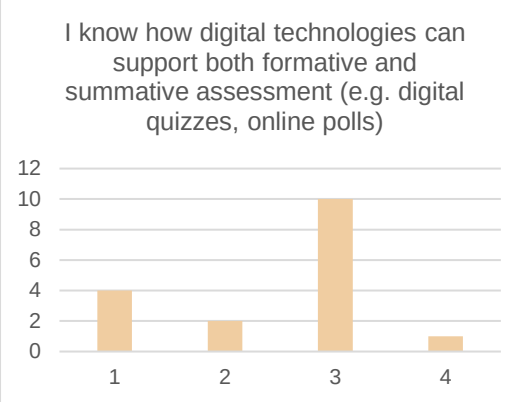


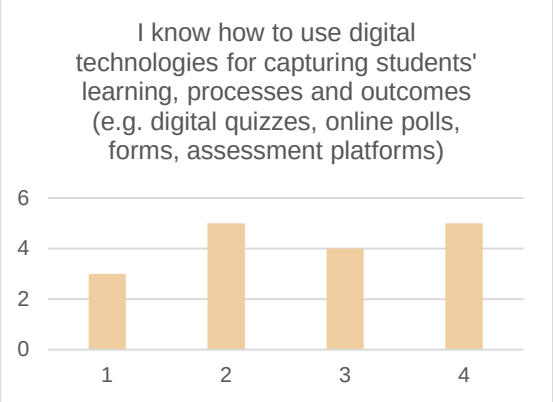


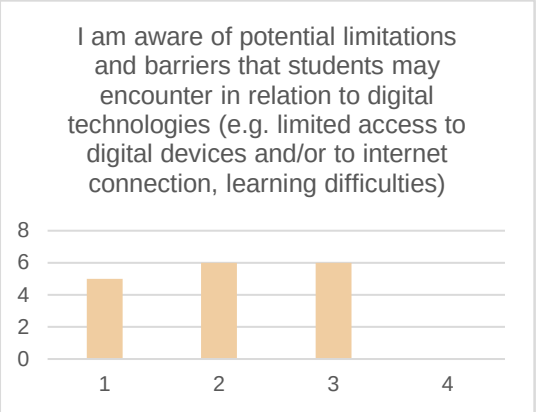


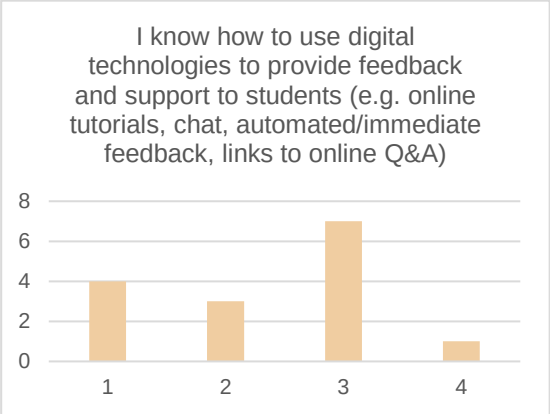


B. Assessment

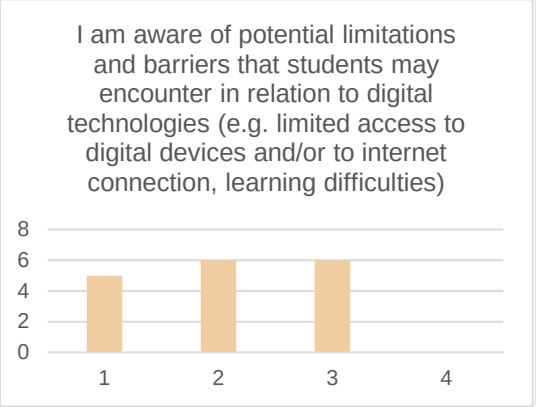


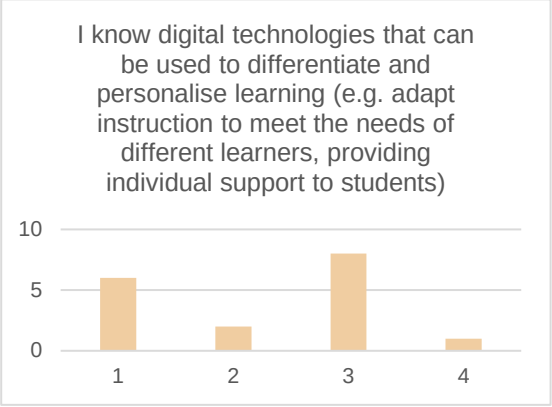


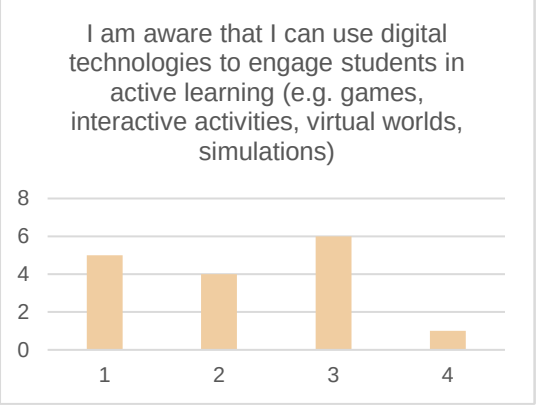


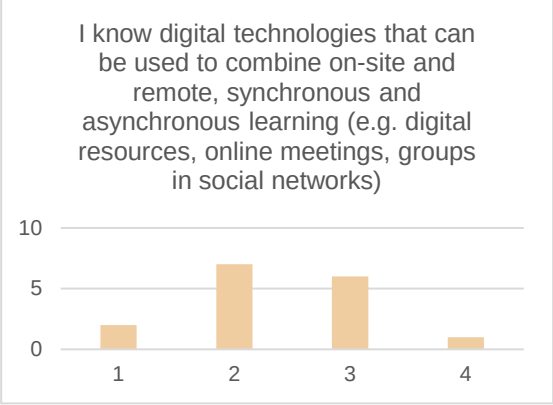


C. Empowering Learners

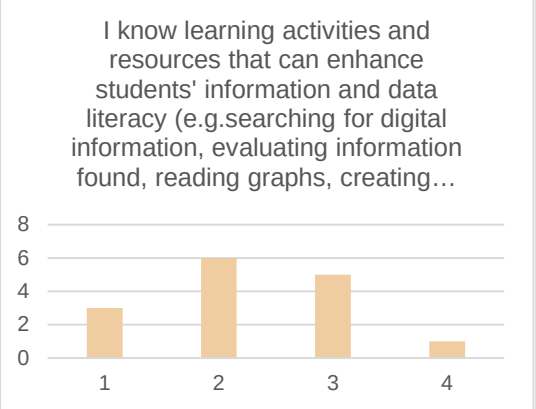


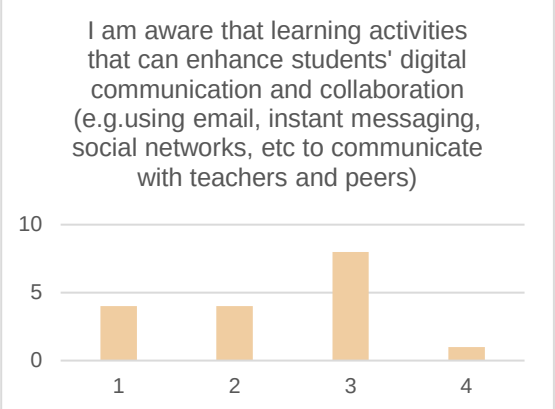


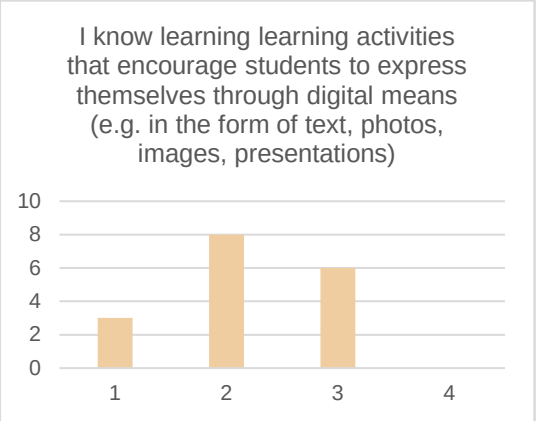


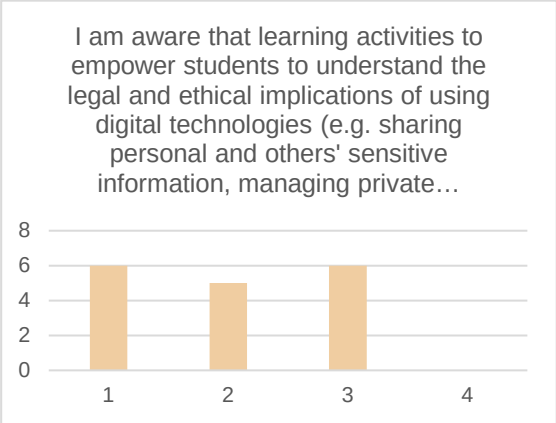


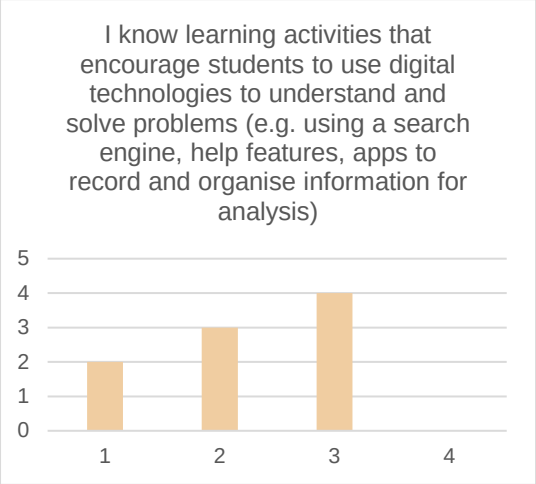
D. Facilitating Learners' Digital Competence











Students' Survey

Many students do not have access to smart or low-energy devices. They have low or no competence in all of the DigiComp Framework areas.

Companies' Survey

Contrasting this with the feedback from companies, it is clear to see that companies expect their employees to be digitally competent, whereas their own employees see this as mainly of average importance, including even 21st century skills such as problem-solving, taking initiative, and adaptability.

There is a clear mismatch of expectations between employers and employees, and a mindset among employees that digital competencies are 'nice-to-have' rather than 'must-have'. Challenges faced by employers to develop such competencies in their staff include financial costs, lack of resources, and difficulties in adapting employees to new systems.

2. A Digital Teaching and Learning Strategy for Homa Bay

Rationale

Based on the survey results in section 1, we can see that the citizens of Homa Bay are not fully ready to embrace the digital age. However, the DEVISE4KE project will hopefully go a long way towards bridging the digital divide.

To enable digital transformation, several things need to happen. Teachers and students:

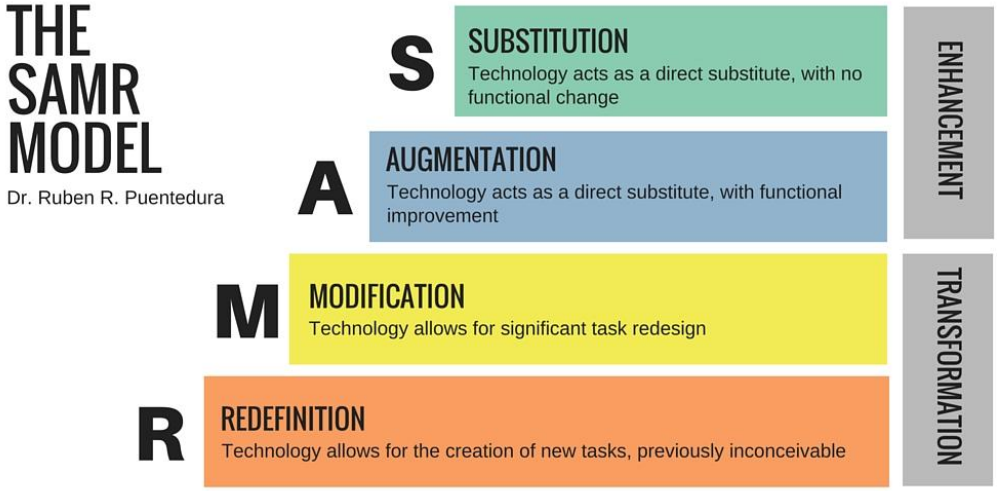
- need to understand why it is important for and relevant to them;
- must learn to use technology and then create with it to achieve clear outcomes.

Of course, this can only happen when the appropriate technology is in place, with the means to power it. These aspects are covered by other Work Packages of the DEVISE4KE project.

Frameworks to inform on the strategy

There are various frameworks and models that can help to integrate technology into learning and lessons. We will look at some common ones:

a) SAMR: Substitution, Augmentation, Modification and Redefinition Model



The SAMR model helps educators think critically about how technology can transform teaching and learning, from merely substituting traditional methods to completely redefining the educational experience. It was developed by Dr. Ruben Puentedura and comprises four levels, which are:

Substitution: Here technology is used as a direct substitute for traditional tools or methods, without functional change. *E.g. replacing a paper-based worksheet with a digital version. The task stays the same, but the medium is different*.

Augmentation: Technology still acts as a substitute, but there's some added functionality or improvement in efficiency. *E.g. using a word processor instead of a typewriter, where features like spell-check, copy-paste, or text formatting provide an enhanced experience*.

Modification: Here, technology enables significant task redesign. It allows changes in how students engage with the content or with each other. *E.g. using collaborative tools like Google Docs for group projects, where students can work together in real-time from different locations*.

Redefinition: At the highest level, technology facilitates the creation of entirely new tasks that were previously inconceivable. *E.g. projects where students collaborate with peers from other countries, create multimedia presentations, or even design their own apps to solve real-world problems*.

NOTE: The SAMR model does not require users to reach the top level for every task. Each level has its own purpose. Which level teachers strive to achieve depends on the learning outcome of the task and the reasons for integrating the technology.

b) TPACK: Technology, Pedagogy and Content Knowledge Model

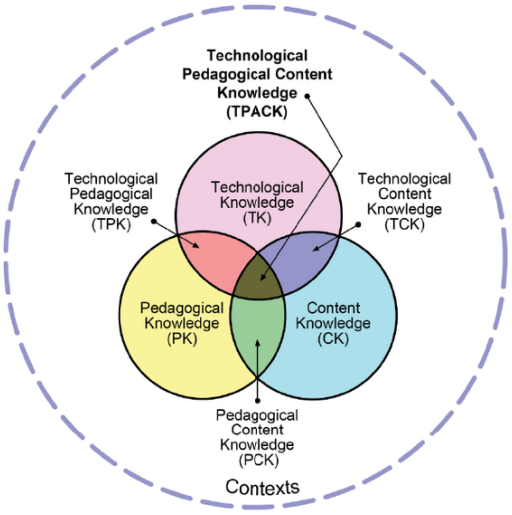


Figure 2: TPACK describes teachers' knowledge about content, pedagogy and technology and the overlaps between these types of knowledge that are necessary for teaching in any context. Reproduced by permission of the publisher, ©2012 by tpack.org

The TPACK model is a framework that helps teachers understand the key elements of effective technology integration in education. It comprises:

Content Knowledge (CK): This refers to the teacher's understanding of the subject matter they are teaching. For example, a math teacher needs a strong grasp of algebra or geometry.

Pedagogical Knowledge (PK): This is about the teacher's skills in teaching methods and educational practices. A teacher with solid pedagogical knowledge knows how to manage a classroom, design lesson plans, and assess students' learning.

Technological Knowledge (TK): This involves the ability to use technology tools effectively. For example, understanding how to operate a projector, create a presentation, or use educational software.

TPACK looks at the intersection of these three types of knowledge:

Technological Content Knowledge (TCK): This is where technology and content meet. It's about understanding how technology can be used to teach specific subject matter. For example, a science teacher might use simulations to explain complex scientific concepts.

Technological Pedagogical Knowledge (TPK): This explores how technology affects teaching methods. It includes using technology to engage students or facilitate collaboration, like using online platforms for group work.

Pedagogical Content Knowledge (PCK): This focuses on the best ways to teach specific content. For example, a history teacher might use storytelling techniques to make historical events more engaging.

Technological Pedagogical Content Knowledge (TPACK): This is the sweet spot where all three types of knowledge overlap. It involves understanding how to use technology to teach specific content in a way that enhances learning. For instance, an English teacher might use multimedia presentations to bring literature to life, incorporating visuals, sound, and interactive elements.

In summary, the TPACK model guides teachers to integrate technology in ways that support both the subject matter and effective teaching methods, creating a richer learning experience for students.

c) DigiComp: Digital Competence Framework for Citizens

Figure 3: The DigComp Framework (Council Recommendation on Key Competences for Lifelong Learning, 2018)

This framework asserts that digital competence involves the "confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It is defined as a combination of knowledge, skills and attitudes."

The DEVISE4KE project was based on this framework on the understanding that digital competency can be built up through 5 areas (or dimensions) which are:

1. **Information and Data Literacy**
   To articulate information needs, to locate and retrieve digital data, information and content. To judge the relevance of the source and its content. To store, manage, and organise digital data, information and content.

2. **Communication and Collaboration**
   To interact, communicate and collaborate through digital technologies while being aware of cultural and generational diversity. To participate in society through public and private digital services and participatory citizenship. To manage one's digital presence, identity and reputation.

3. **Digital Content Creation**
   To create and edit digital content. To improve and integrate information and content into an existing body of knowledge while understanding how copyright and licences are to be applied. To know how to give understandable instructions for a computer system.

4. **Safety**
   To protect devices, content, personal data and privacy in digital environments. To protect physical and psychological health, and to be aware of digital technologies for social well-being and social inclusion. To be aware of the environmental impact of digital technologies and their use.

5. **Problem-Solving**
   To identify needs and problems, and to resolve conceptual problems and problem situations in digital environments. To use digital tools to innovate processes and products. To keep up-to-date with the digital evolution.

This would be the starting point for both teachers and students on the DEVISE4KE project.

d) DigCompEdu: Digital Competence Framework for Educators

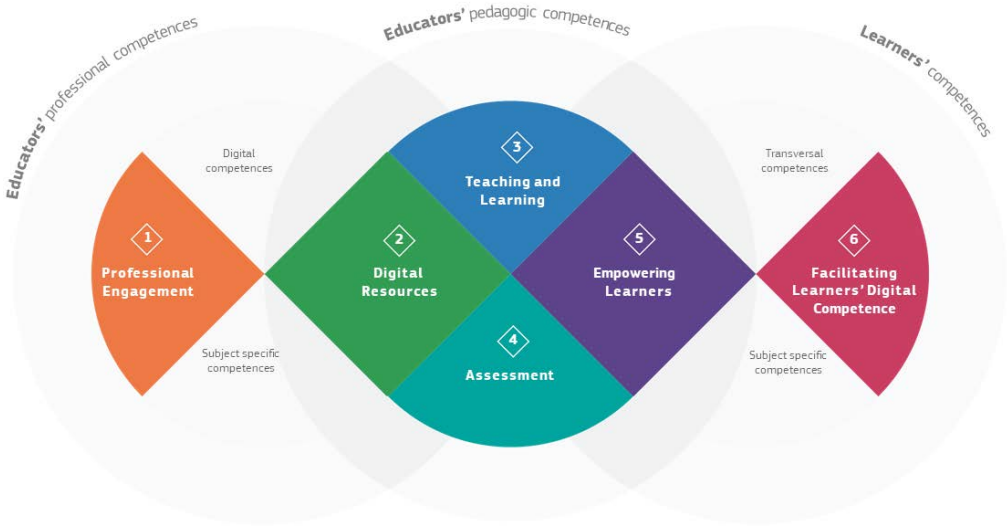


Figure 4: The DigCompEdu framework focuses on 6 main areas to empower teachers and learners to maximise their use of technology in learning. Reproduced courtesy of the EU Science Hub (https://publications.jrc.ec.europa.eu/repository/handle/JRC107466)

Following on from DigiComp, the European DigCompEdu framework is a set of guidelines designed to help educators understand and improve their digital skills in teaching and learning. Its structure helps educators evaluate their use of technology in education and find ways to enhance it. There are six main areas:

Professional Engagement: This area focuses on how educators use technology for professional activities, like communication with colleagues or professional development. For example, a teacher might join online teaching communities to share resources and discuss best practices.

Digital Resources: This involves creating, sharing, and adapting digital materials for teaching. For example, an educator might design interactive presentations or share lesson plans via an online platform.

Teaching and Learning: This area is about integrating technology into the learning process. It includes using digital tools to enhance teaching methods and engage students. For instance, a teacher could use online quizzes to assess student understanding or educational videos to explain complex topics.

Assessment: This area covers how educators use technology to assess students' progress and understanding. An example might be using online forms for quizzes or software that provides instant feedback to students.

Empowering Learners: This focuses on how technology can give students more control over their learning. For example, a teacher might use learning management systems to let students track their own progress or digital platforms that allow personalized learning paths.

Facilitating Learners' Digital Competence: This is about helping students develop their own digital skills. An example could be teaching students how to use search engines effectively, create digital presentations, or understand online safety and privacy.

In summary, the DigCompEdu framework helps educators identify ways to use technology to improve their teaching practices, engage students, assess learning, and promote digital competence in students.

Recommendation:

While the DigCompEdu framework is probably best-suited for teacher development, based on all the factors and survey results, the recommended approach is the more basic **DigComp framework**.

It is nicely-defined in all its areas since teachers themselves need to transform their own mindsets about technology and its use in schools before they can be expected to produce content for their students.

For each Competence Area defined in the DigiComp framework, we expect teachers to first improve their own individual skills before going on to train their students.

3. Strategy for Learning, and then Teaching

Using the DigComp Framework

The Digital Competence (DigComp) Framework provides a common language to identify and describe five areas of digital competence (*see Figure 5*).

The first 3 areas focus on competences that can be applied to specific uses and activities. The last 2 are transversal in nature for any digital activity.

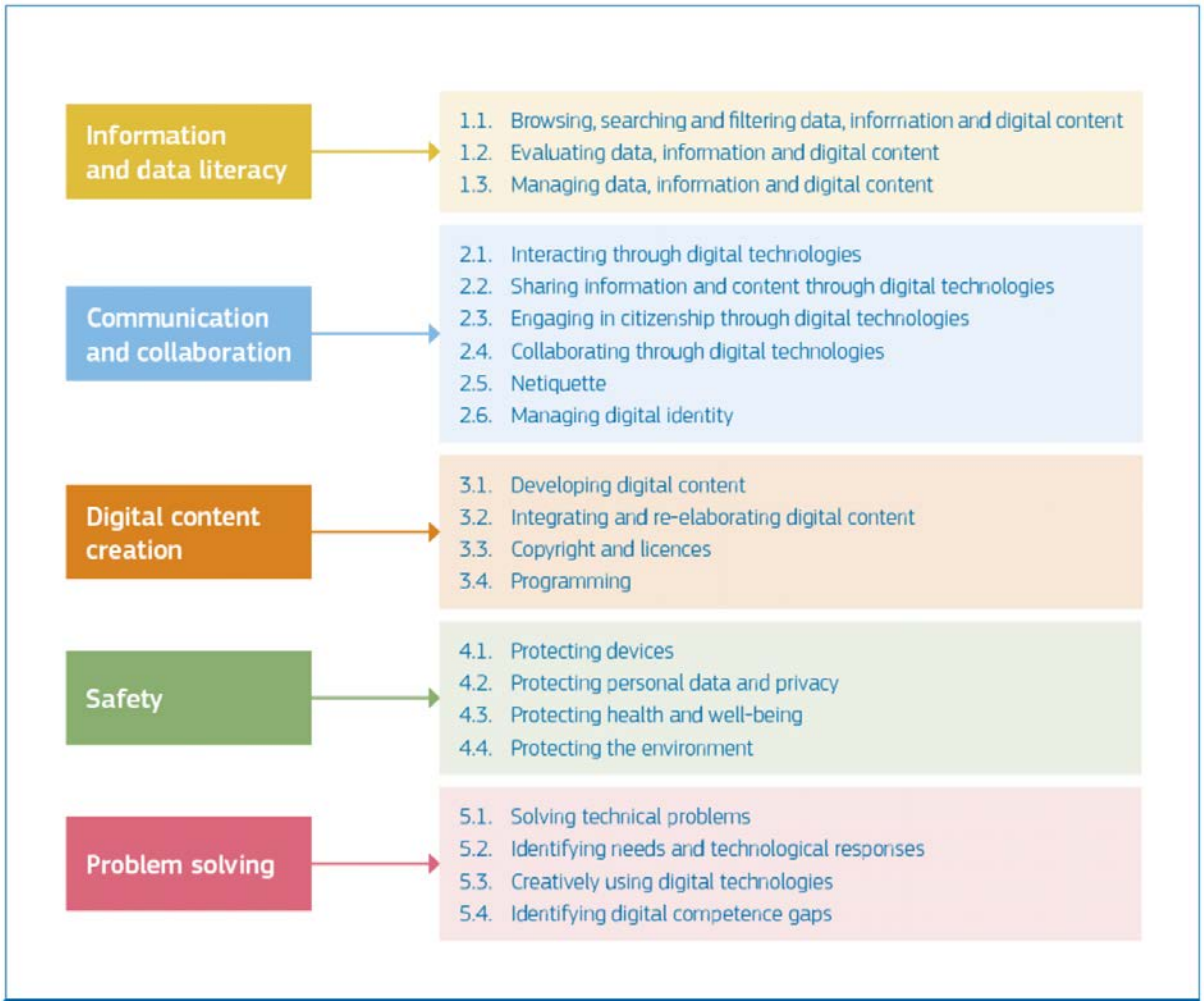


Figure 5: The DigComp framework has 5 key areas in which to gain digital competence. Reproduced courtesy of the EU Science Hub (https://joint-research-centre.ec.europa.eu/digcomp/digcomp-framework_en)

Each Competence Area is split into competences (e.g. Competence Area #1 is Information and Data Literacy, which is split into 3 competences (1.1, 1.2 and 1.3).

How competent an individual is is measured through proficiency levels ranging from ***Foundation*** to ***Intermediate*** to ***Advanced*** and finally, ***Specialised***.

DEVISE4KE Participant Development

Individual Learning

Before starting with the LTTA activity in Bremen in WP4, T4.4, teachers must do some online courses in order to have a common ICT-knowledge they can build on. Therefore, teachers of DEVISE4KE will participate in the following activities in order to reach a competence level in each area **between Intermediate and/or Advanced** until 31.12.2024.

Suggested Steps:

Step	Explanation	Where/How
1. Test Yourself	Test yourself against the DigComp competences (up to Advanced Level).	EU Digital Skills & Jobs Platform https://digital-skills-jobs.europa.eu/
2. Detailed Review of Competences	Download the DigComp Framework. Use it to check in which areas you have competences on level 4. If you find you are unable to do so, continue with Step 3 until you can tick off each competence at proficiency Level 4.	JRC Publications Repository https://publications.jrc.ec.europa.eu/repository/bitstream/JRC128415/JRC128415_01.pdf
3. Complete Some Short Courses	Learn or familiarise yourself with common software and internet tools by doing free short courses.	EU Digital Skills & Jobs Platform https://digital-skills-jobs.europa.eu/en/opportunities/training Google Online Courses https://grow.google/intl/europe/courses-and-tools/
4. Performance Challenges	- Many of the short courses will have self-evaluation or automated evaluation features. - You can also set yourself performance or challenge tests.	Google Educator Level 1 https://edu.google.com/intl/ALL_uk/for-educators/certification-programs/product-expertise/
You are now ready to begin developing courses for your students!		

Teacher Development

This requires you to apply your knowledge of DigComp skills with your expertise as a teacher.

Suggested Steps:

Step	Explanation	Where/How
1. Begin LWTs	Familiarise yourself with Learning and Work Tasks (LWTs) – what does it feel like to undertake this (as a student), and to design this (as a teacher).	T3.1 LWT1 "Installation of Photovoltaic Systems" T4.1 LWT2 "Design of Learning and Work Tasks" T4.2 LWT3 "Entrepreneurship in the ICT/IT Sector" T4.3 LWT4 "Using Low-Energy Devices for Teaching"
2. Digital Teaching Workshops	These are masterclasses in how to create innovative, interactive and engaging lessons for students.	T4.4 Digital Teaching LTTAs
3. Train-the-Trainer Opportunites	Those who have learnt from T4.4 will then go on to train other colleagues on what they have learnt.	Organise further in-house training events for colleagues and staff unable to attend the digital teaching workshops.
4. Create Own LWT	Based on own experience, teachers will develop a LWT for their class/school on a relevant topic. There should be scope for hands-on performance-based work.	This will be reviewed by DEVISE4KE partners. Finished LWTs will be presented to students who will do an evaluation at the end.
5. Run LWT	The LWT should be disseminated to students for feedback on issues such as ease of use, content relevance and difficulty, objectives versus outcomes, etc.	Data can be gathered to improve the LWT and its functions.
You are now a Course Developer on DigComp skills!		

4. Further DEVISE4KE Technological Considerations

Teaching digital skills in Homa Bay will involve some unique challenges, especially the lack of electricity and technological equipment. Using low-energy devices like solar-powered laptops, tablets, or even mobile phones means that there are some important considerations to ensure effective and sustainable learning:

1. Energy Sources and Infrastructure:

There must be a reliable source of power. The DEVISE4KE project will help install solar panels to generate sustainable and renewable photovoltaic energy. Low-energy devices that can operate on minimal power, such as tablets will be used.

2. Connectivity and Network:

Assess the availability of internet connectivity. If it's limited, the project must consider offline resources and content preloaded onto devices. It may be possible to use local networks (like Wi-Fi or Bluetooth) to share resources among devices if broader internet access isn't possible.

3. Durability, Portability and Accessibility:

Devices should be durable and can withstand harsher conditions or frequent transportation. Portable and lightweight devices might be necessary for ease of movement and transportation, and devices should be accessible to all students (distribution and sharing are important).

4. User-Friendly Interfaces:

Devices should have simple and intuitive interfaces, especially for learners new to technology. Training and support must be provided to help users become comfortable with the devices.

5. Software and Content:

The DEVISE4KE should consider using only open-source or free educational software to minimise costs. It is important also to choose software and content that can work offline or with limited connectivity.

6. Training and Support:

Adequate training must be provided for educators and learners on how to use the devices effectively. A support system for technical issues, involving local technicians or volunteers, could be created.

7. Sustainability and Maintenance:

Plan for maintenance and repairs, ensuring that Kenyan partners have spare parts or technical support available. Consider also the environmental impact and plan for proper disposal or recycling of devices when they reach end-of-life.

8. Community Involvement:

It is vital to engage the local community in the project for support and sustainability. Where possible, it is recommended that local stakeholders be involved in decision-making and planning for the use of technology in education.

9. Monitoring and Evaluation:

Based on the work done by European partners, local schools should set up mechanisms to monitor the impact of using low-energy devices on learning outcomes including regularly collecting feedback from teachers and students.

SOURCES

1. Kenya National Qualifications Authority (2018): Technical and vocational education and training (tvet)policy. https://www.knqa.go.ke/wp content/uploads/2018/10/first_final_draft_tivet_policy.pdf. last visited 15.01.2024

2. Ministry of Education Republic of Kenya (2018): Competency Based Education and Training Policy Framework. https://www.education.go.ke/node/229. last visited 09.05.2024

3. (https://www.education.go.ke/sites/default/files/2022-05/COMPETENCY-BASED-EDUCATION-AND-TRAINING-CBET-POLICY-FRAMEWORK1.pdf).

4. (Saravanakumar, A. R. (2018): Role of ICT on Enhancing Quality of
5. Education. International Journal of Innovative Science and Research Technology, 3(12), 717-719).

6. County Government of Homabay, (2018): County Integrated Development Plan 2018 – 2022)

7. (Das, K. (2019): The role and impact of ICT in improving the quality of education: An overview.
8. International Journal of Innovative Studies in Sociology and Humanities, 4(6), 97-103)

9. Homa Bay developed an ICT Roadmap (2015)

10. (Kembo, J., Omito, O., Ayere, M., & Ali, A. A. (2019): Teachers' Computer Capacity in Public
11. Primary Schools in Homa Bay County, Kenya: The Case of the Digital Literacy Programme).

12. Google for Education: Educator Level Certifications. https://edu.google.com/intl/ALL_uk/for-educators/certification-programs/product-expertise/. Last visited 15.05.2024.

13. Digital Skills & Jobs Platform: Digital Skills Assessment. https://digital-skills-jobs.europa.eu/en/digital-skills-assessment-next-steps. Last visited 14.05.2024.

14. Vuorikari, R., Kluzer, S. and Punie, Y., DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes, EUR 31006 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-48882-8, doi:10.2760/115376, JRC128415.

15. Bush, K., Cormier, M. And Anthony, G. (2022): A Rubric for Selecting Active Learning Technologies. Educause Review. https://er.educause.edu/articles/2022/4/a-rubric-for-selecting-active-learning-technologies. Last visited on 12.05.2024.

16. Tpack.org (2012): TPACK Explained. http://tpack.org/. Last visited on 14.05.2024.

17. Punie, Y., editor(s), Redecker, C., European Framework for the Digital Competence of Educators: DigCompEdu , EUR 28775 EN, Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-73718-3 (print),978-92-79-73494-6 (pdf), doi:10.2760/178382 (print),10.2760/159770 (online), JRC107466.