OpenSTEM Africa

EMBEDDING THE USE OF ICT ACROSS YOUR DEPARTMENT

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Ministry of Education

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Ghana Education Service, and the expert SHS science teachers, for their expertise in producing materials that are rooted in the Ghanaian school context, accessible and useful to learners and teachers.
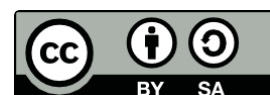
For information on OpenSTEM Africa see: www.open.ac.uk/ido

OPITO for their generous support, which has made OpenSTEM Africa and the development of the Virtual Laboratory and these materials possible.

Contents

OpenSTEM Africa: Ghana

The overarching aim of OpenSTEM Africa, Ghana, is to make a contribution to Government of Ghana/Ministry of Education policy to the effective teaching of practical science.
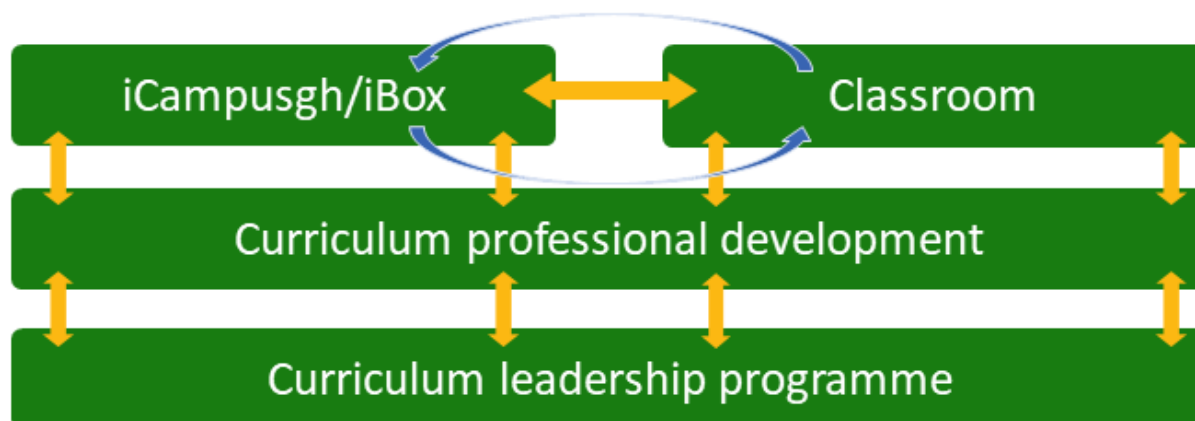
Effected by:

1. **Virtual Lab:** onscreen interactive science instruments using real data and with examples of science lessons, to improve the experiential teaching and learning of science in Senior High Schools, helping develop girls' and boys' practical science study skills, and building on the iCampusgh/iBox model developed by CENDLOS.

Underpinned by:

2. **Continuous Professional Development (CPD) for science teachers:** which develops confidence, skills and strategies to enable improved teaching and learning in the sciences, with a particular focus on ICT-based practical sciences, and which supports them in meeting the aspirations of the SHS elective science curriculum (Physics, Chemistry and Biology).

Embedded in Senior High Schools through:

3. **Curriculum Leadership Programme:** for Heads of Department/Heads of Subject, which enables them to effectively implement short- and long-term strategies to improve teaching and learning in the sciences, with a particular focus on ICT based practical science in their school.

The school-based professional development and leadership programmes will help more teachers use ICT-based science resources more and more effectively, with more learners. The support for school leaders' facilitates the development of a sustainable community of practice in science within the school, led by the Head of Department/Head of Subject and with the support of the Headmaster/Headmistress, in line with National Teaching Council Guidelines.

Curriculum leadership programme

This curriculum leadership programme is designed by experienced Senior High School Heads of Science, and SHS curriculum and Science Resource Centre developers, representing a wide range of Senior High Schools in Ghana. They are working with representatives from the Ministry of Education, from CENDLOS, from GES, from the University of Ghana and from Open University (UK) on OpenSTEM Africa (Ghana).

Improving teaching and learning in the sciences at SHS level is part of the Government of Ghana *Education Strategic Plan (2018–30)* to enable increasing numbers of SHS students to specialise in the sciences at tertiary level and then move into STEM careers. Government of Ghana policy points to the importance of in-service training for teachers for acquiring new skills and keeping abreast of new developments. The National Teacher Standards for Ghana (MoE/NTC) set out the importance of teachers continuing to learn as they teach and the importance of the school as the location of that learning. Ghanaian research suggests that continuous professional development (CPD) taking place within the school is more motivating, more coherent, more sustainable and likely to be more effective in the long term. This is the "growth approach" in which teachers are given the opportunity to try new opinions, gain new perspectives, and extend their professional capabilities in order to understand and find solutions to problems in their individual schools" (Asare et al., 2012).

The role of Head of Department is key to enabling this kind of teacher development to thrive. Heads of Science, or Heads of Physics/Biology/Chemistry already take responsibility for the professional practice of the teachers in the department. This programme is to enable these leaders to organise individual and group support to those teachers, to share their own expertise in the sciences, to lead on the development of skills among their teachers) with a particular focus on ICT-based teaching and learning) and to lead on building a community of practice among science teachers in the school.

Your role as a Head of Department in transforming STEM education

As a Head of Department, you are a middle leader and your role is a combination of leadership, management, administration and teaching. Your leadership role requires you to focus on your own expertise and that of your colleagues, with a commitment to continuing professional development (CPD) for all. You must pay attention to everyone's professional and personal growth, with respect to teaching and learning.

In your classroom

As a subject expert, you are expected to model exemplary practice in your own teaching and learning. In the classroom, you are continuously developing your capacity to make lessons exciting, engaging and ultimately make science interesting for your students. The range of materials created to support the OpenSTEM Africa programme will provide key resources for you and your staff.

In your school

As Head of Department, you have the management responsibility of observing others teach and providing critical and constructive feedback on aspects of their work. This is a great opportunity to influence practice by drawing your colleagues' attention to good practices in STEM teaching and learning. This may be through formally organised professional development sessions for a group of teachers, or through one-to-one interactions with colleagues.

The aim of the OpenSTEM Africa CPD programme is to support the development of a "community of practice". As you will know, the National Teachers' Standards for Ghana place community of practice as within the domain of teachers 'professional values and attitudes' and give the following definition:

> *"A group of teachers who share a concern or passion for the teaching profession and learn how to do it better as they interact regularly."*
>
> (NTC 2017, pp. 51)

The community needs to be a safe space in which science teachers feel supported and enthusiastic about developing their practice, in order to improve learning. In a "community of practice", learning is seen as a joint enterprise of negotiation and reflection, taking place through mutual engagement in practice, with all participants being valued equally (Wenger, 1998). The conditions required for a 'community of practice' are:

- engagement in action (which will come through the activities in the CPD units),
- shared knowledge (which will come through discussion, and reflection on practice),
- interpersonal relations based on mutual respect and support.

Your leadership role is to create the conditions for a community of practice to develop. You will be a facilitator and supporter, rather than inspector and monitor. This programme is designed to develop your skills in this area, with other units including *Designing and implementing CPD programmes in your school*, *Coaching your science teachers* and *Being an effective Head of Department* (https://www.open.edu/openlearncreate/HOD_units).

Beyond the school

As a "critically reflective practitioner" (NTC 2017 pp. 16) it is important to recognise your science department as more than an administrative unit within a school. Your department should be conceived as community that involve practitioners who can have great influence on teaching and learning in the school and beyond. So, connecting with STEM educators beyond your school boundaries, and with employers and advocacy groups, is a great way to extend opportunities for you staff and students. This could involve school visits to STEM employers, inviting guest teachers from other schools, inviting STEM role models from business and public life into school to talk to students, STEM career days, science fair or STEM project exhibitions etc. Your role here is to make learning and teaching of STEM-based subjects very relevant and practical for your students.

Embedding ICT in your department

Introduction

This unit has been created to assist you as a middle leader (HoD/HoS) to embed ICT effectively in your department in line with government policy, as set out in the Government of Ghana's *ICT in Education* policy:

"The Government of Ghana will continue to develop and deploy the utilization of relevant ICT within the Educational Sector to transform the education system with the view to transform and improve the lives of our people.

It is the Government's desire that through the deployment of ICT in education, the culture and practice of traditional memory-based learning will be transformed to education that stimulates critical thinking, creativity, collaboration and communication necessary to meet the challenges of the 21st century."

(Ministry of Education, 2015)

As a HoD/HoS, you are the first supervisor of the curriculum and require the knowledge, skills and values to monitor the full implementation of government policies and standards and to continuously develop the professional practice of every teacher who works with you.

By the end of this unit, you will have learned the relevant skills to:

- audit the ICT skills and expertise among teachers in your department and the ICT facilities available at your school
- develop, with the support of your Headmaster/Headmistress, the Head of ICT and all other Heads of Department, a plan on how to both consolidate and to expand the uses of ICT in your departments
- agree with your Headmaster/Headmistress and the Head of ICT priorities for new ICT hardware in the school and how this might be funded
- agree with your teachers at subject and departmental level ways of developing specific skills for individual teachers, including agreeing who in the department or within the school will lead/facilitate the development of specific ICT skills
- agree an individual plan and timeline with each of the teachers in your department on the development of their use of ICT
- work with the teachers in your department through the OpenSTEM Africa 'ICT in the Curriculum' unit.

During your work on this unit, you are encouraged to make notes – just for your own use so that you collect together your thoughts and plans in one place. You could do this in a notebook or on a computer or laptop. You may be working through this unit alone or as a

HoD group; either way it is good to discuss your learning with your peers to help foreground some of the ideas you will be introduced to. This can be done in an organised way or on a more informal basis, but it is good to model the practice of collaborative learning as it forms part of the OpenSTEM Africa learning strategy.

Linking technology, skills and learning in the school

The relationship between technology, skills and learning is constantly evolving because aspects of our social behaviours and lifestyle in the last half century have become increasingly dependent on technology. The frequent use of technology in the household, workplace and community has meant that we need to quickly learn new digital technology skills for work and/or social interaction.

Even though the use of technology in Ghanaian second-cycle schools is quite limited compared to some countries in Europe, Asia and North America, the importance of technology has been recognised as an enabler in the learning process. Government policies such as the MoE's 2015 *ICT in Education* policy and the MoE's 2018 *Education Strategic Plan* are designed to provide nationwide approaches to developing the use of ICT in schools and in school departments. Nevertheless, both policies recognise that improving ICT infrastructure in schools and the skills of teachers in using ICT is a process which will take time and continuous practice for teachers to be comfortable with the use of ICT in schools.

Schools and school departments play a vital role in ensuring that the use of existing computer hardware is maximised and that current expertise in ICT among teachers is encouraged, supported and shared. Most importantly, school leaders can ensure that the use of ICT is consistently underpinned by excellent pedagogy and that using ICT supports better teaching and learning.

Activity 1: Linking technology to learning and skills

As the HoD or HoS, explore with your teacher colleagues how technology can help achieve the following educational outcomes for students, and can help you and colleagues develop new approaches to teaching. The purpose of this exercise is to encourage you to focus on the educational benefits of technology rather than on the technology itself.

Uses of technology:

- Consider the ways you and your colleagues currently use technology such as smartphones, tablets and laptops outside schools. In what ways could this unconscious expertise help to develop the use of technology for learning?

Education/learning outcomes for students:

- learn the basics about computers: turning it on, file management, creating documents and presentations
- learn how to search the internet, find information and store it for future use
- learn how to send email messages and engage with social media.
- see ICT-based learning as integral to their learning, progress, and assessment.

Educational/development outcomes for staff:

- develop more participatory approaches in their lessons
- see themselves as facilitators of learning, guiding and supporting students on their learning journey
- access educational software such as simulations
- access resources that will enliven their lessons, such as YouTube videos, film clips, news reports or photographs
- embed ICT into their teaching.

The *National Teachers Standards for Ghana* draw our attention to the teacher's role in ensuring that they harness the potential of ICTs to enhance their students' teaching and learning experiences (inside and outside the classroom).

National Teachers' Standards for Ghana

The Standards are divided into three main domains, each with its own sub-divisions:

Professional Values and Attitudes

- Professional Development
- Community of Practice

Professional Knowledge

- Knowledge of Educational Frameworks and Curriculum
- Knowledge of Learners

Professional Practice

- Managing the Learning Environment
- Teaching and Learning
- Assessment

These three domains and aspects encompass what teachers should value, know and do, and intersect with one another … as illustrated in the Venn diagram where the synthesis of the three domains represents a competence or competences.

Figure 1 Venn diagram showing the interaction between the three main competencies within the National Teachers' Standards for Ghana

Reflection point

Consider:

- national priorities for ICT
- the needs of your own school at this moment in time
- interests and enthusiasms raised by the teachers in your department.

Based on your reflection on Activity 1, what kinds of ICT-focused professional development would help the teachers in your department? Are there ways of addressing national priorities while also meeting some of the most specific needs of your own school and the most urgent needs of your own department?

ICT teacher skills audit /ICT school facilities audit

The first stage of developing and embedding the use of ICT in your department is to conduct a training and development needs analysis or ICT CPD audit and a review of the technology that is available to teachers in your department.

Carrying out a learning audit means systematically identifying and evaluating the specific needs of teachers and learners. This audit (also called a needs analysis or needs assessment) will differentiate between the current situation with respect to teaching and learning and the desired outcomes. It determines the evidence about the current situation (including expertise and good practices) and shows the aspects that would benefit from improvement. There may be several needs which arise from your analysis, however, making a priority list will help you to determine the order in which you need to address them.

Activity 2 provides some suggestions that could help you gather the necessary evidence in your ICT skills audit. Activity 3 provides suggestions that will help you gather evidence about the range of technology available in your department.

Activity 2: Carrying out a departmental ICT skills audit

Ask yourself the following questions:

- What is the current situation in my department with respect to how ICT is currently used in individual lessons, in student classwork and homework (assessment), and in practical lessons? Is ICT used as widely as it could be? Is it used as effectively as it could be? Could more teachers use ICT in their teaching? In what ways could each individual teacher make more use of ICT-based teaching?
- Where is/are the outstanding practice(s) in my department? Who are the experts in particular aspects of ICT-based teaching? What is the evidence to support this?
- What kinds of support does each teacher in my department need to build skills confidence, self-efficacy and expectations of success in using ICT? Where do I get evidence to support this?
- How can I prioritise the professional development needs which I've identified?

For example, you could:

- workshop the above questions at a departmental staff meeting, perhaps by asking staff to brainstorm their ICT professional development needs and expertise
- give a simple questionnaire to learners and teachers
- interview learners/teachers (you may want to focus on teachers if your school does not already have a system to receive feedback from students)
- use lesson observations to look at question techniques, lesson introduction, class control, extent of engagement of learners, etc.
- do consider gender perspectives – e.g., do male students get more access to computers? Is it assumed that male students will better understand the technical aspects of ICT?
- assess schemes of work, lesson notes, etc.
- look at student school-based assessment, including presentations, group reports, projects, etc.

Activity 3 provides some suggestions that could help you gather the necessary evidence in your departmental and school technology audit.

Activity 3: Carrying out a departmental and school technology audit

Ask yourself the following questions:

- What is the current situation in my department with respect to ICT hardware (ie computers, laptops, tablets, smartphones, projectors, speakers) which are owned by the school and available to teachers?
- What is the current situation in my department with respect to any computers, laptops, tablets, smartphones, projectors, speakers which are owned by individual teachers and which they use or could use in their own lessons?
- What is the school's current level of access to the internet or to a school intranet?
- What software is already available to staff and students? What new software could help improve ICT-based teaching and learning?
- What is the current availability of facilities, e.g. the ICT lab for ICT-based science classes or any other rooms available to be used as ICT lab?
- What are the possibilities of the teacher organising ICT-based science lessons in a classroom using, for example, a laptop and projector?
- What could be done by school leaders (HoDs/Headmistress/Headmaster) to increase the amount of/access to the currently available technology?
- What safeguards would need to be put in place to ensure the safety and continued working order of ICT equipment while also ensuring easy access and sustainability?

For example, you could:

- workshop the above questions at a departmental staff meeting
- interview learners/teachers on their skills and attitudes to ICT (you may want to focus on teachers if your school does not already have a system to receive feedback from students)
- explore with the Head of ICT what flexibility/availability there might be in the use of the ICT lab (during free periods, or before/after school, for example)
- workshop the above questions with the other HoDs in your school to ascertain the level of concern/support across all departments in the school
- work with the Headmistress/Headmaster and all school departments to develop new school guidelines on increasing the use of ICT
- engage the support of your Headmistress/Headmaster and the School Management Committee in funding for new ICT equipment – e.g. a projector which can be borrowed for a lesson and connected to a teacher's laptop, new software loaded onto one or two computers, a data bundle for improved internet access, or a solar panel to ensure continuous electricity supply.

Why a school-based approach to embedding ICT in your department?

Your role in supporting national policies and priorities with the support of your Headmaster/Headmistress is to both act as role-model in your values and practices and to use your leadership position and skills to maximise the value of each member of your department. So in terms of ICT in your school, then whatever the number of computers, the size of the ICT lab, the current expertise of your teachers, the interests and enthusiasms of your students, you know that there are plans you can make and actions you can take to improve and to develop ICT-based teaching and learning in your department.

Whilst you have lots of opportunities to champion ICT-based teaching and learning in your school through your role as Head of Department or Head of Subject, the full support of your Headmistress/Headmaster is also crucial to ensuring the success of ICT across your school's curriculum.

To ensure you have buy-in from all stakeholders, your school-based approach should:

- be underpinned by robust evidence and expertise
- include collaboration and expert challenge
- have a clear focus on improving and evaluating student outcomes
- be sustained over time.

As middle leaders and Heads of Department, you have a significant role to play in the design and implementation of all programmes that will support and enhance teaching and learning practices in your school.

Reflection point

Review the ways ICT has traditionally been used in schools in Ghana.

- Has it always been underpinned by evidence?
- Is it built on collaboration and expert challenge?
- Does it focus on improving and evaluating student outcomes?
- Has it been embedded in schools' development plans to ensure its sustainability.

Buabeng-Andoh (2019), for example, suggests that in second-cycle schools in Ghana, teachers' confidence, self-efficacy and expectations of success are key to their integrating ICT into their teaching.

The provision of computers, networks, internet access and technical support are obviously important, but Buabeng-Andoh (2019) and Buabeng-Andoh and Yidana (2015) suggest that continued follow-up to any training, alongside school-level leadership support is a stronger determinant of teachers' integration of ICT into their teaching.

> *"Computer-based teaching is context dependent, such as curriculum context, or the organizational setup in schools; therefore they do not lie under the control of teachers. Rather, they are determined by school management and educational policy frameworks. Studies that have looked at the factors that contribute to successful educational change have found that the projects receiving the principal's (or head of institution's) support were more likely to succeed, because the principal's involvement indicates that the project is being taken seriously, and it helps in acquiring both material resources and psychological support."*
>
> (Mereku and Mereku 2015, pp.5)

Leadership example 1: Mr Esi and Madam Tetteh's approaches to ICT

After observing teachers in his department as part of a comprehensive ICT skills audit, Mr Tsatsu noted there were two teachers who were outliers in terms of integrating ICT into teaching and learning.

One, Mr Esi was not using ICT at all during his lessons. When Mr Tsatsu asked him why this was, Mr Esi revealed he does not believe in integrating technology into his teaching or that or ICT can transform learning. He was also of the view that it wastes time and can be very disruptive during lessons.

The other teacher, Madam Tetteh, regularly and effectively uses ICT to engage her students. She brings her laptop into school when the ICT lab is not available and sets it up in her classroom with the school projector so she can share curriculum content she has prepared at home. She even sometimes passes round her smartphone to the class with a lesson-related image from the internet to illustrate a teaching point. Because some of the students in her class have access to the internet at home, she also makes them responsible for researching online for groupwork presentations.

If you were the HoD in this situation, how would you help Mr Esi to change his perceptions of technology so he can begin to use ICT in his lessons? How could you use the expertise demonstrated by Madam Tetteh to support her colleagues?

Designing a learning plan for ICT skills development for science teachers

Professional development that aims to change teachers' practice is most effective when it includes collaborative activities with a focus on the intended student outcomes. In particular, effective professional development:

- builds-in peer support for problem solving
- includes focused discussion about practice and supporting groups of students with similar needs
- challenges existing practice by raising expectations and bringing in new perspectives
- includes support from someone in a coaching and/or mentoring role (you!) to provide modelling and challenge.

Although the ICT package may include one-off/discrete sessions, the learning gains from these one-off events should contribute to the overall learning package over a sustained period.

A particular focus for developing the ICT skills of your science teachers over a sustained period is the OpenSTEM Africa CPD for teachers unit 'Using ICT to support learning'

This unit contains multiple activities which you can organise within your department to support your teachers.

Activities include:

- **What technology do you use?** – asking teachers to brainstorm the ICT they use expertly in their social lives
- **Using ICT to transform learning** – asking teachers with your guidance to rethink a lesson plan using ICT
- **Analyse examples of 2 teachers using ICT** – asking 2 teachers to describe their use of ICT in a lesson, and with your guidance then ask them and others in your department to make judgements on how well the two teachers used ICT and what next steps each could take to improve upon their ICT use.
- **Developing ideas** – asking teachers to try out ICT in a lesson activity with you observing as HoD and any other mentor in the department who uses ICT in teaching and then discussing with them how well it went and what their next steps could be in developing their ICT expertise.

The specific activities above are just examples. The whole OpenSTEM Africa CPD for teachers unit *Using ICT to support learning* is for you to work through with the teachers in your department and will help to provide sustained development in using ICT in teaching and learning.
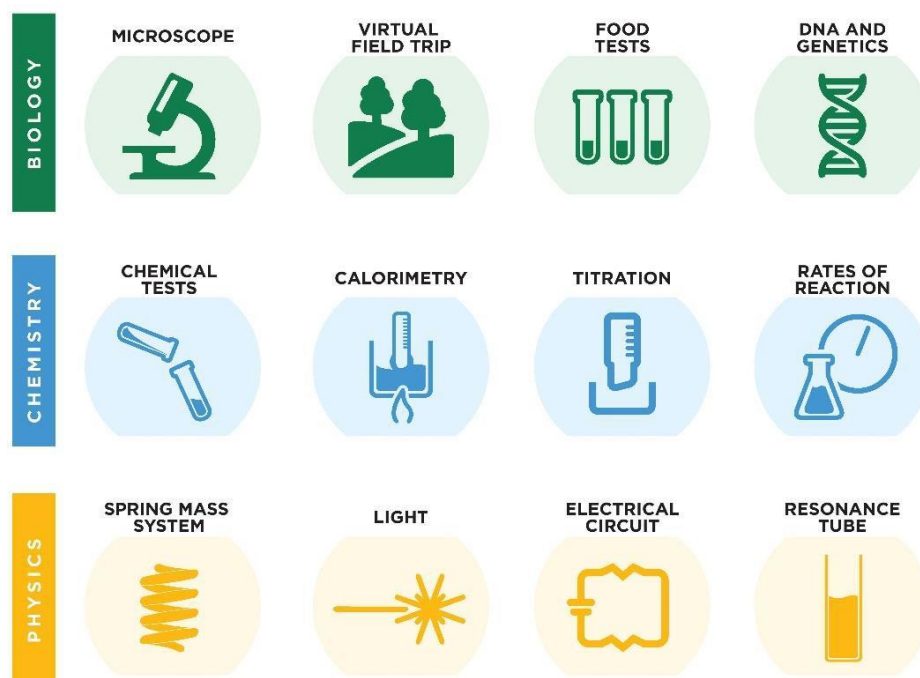
OpenSTEM Africa Virtual Lab

Figure 2 OpenSTEM Africa Virtual Lab apps

Your role is to encourage the teachers within your Department to use the Virtual Lab to support their professional learning by understanding how to use this technology in their classrooms to underpin student learning. It is helpful to divide the approaches needed to train teachers in ICT into the four categories listed below:

- **Developing key ICT skills:** Some of your teachers may need help with some basic skills such as using a mouse or opening, saving and closing documents. Your challenge is to give them the confidence they need to see the use of ICT as something that will help them in their work to help with efficiency and credibility.
- **Using ICT to develop pedagogical skills:** ICT in schools can support some of the participatory approaches to learning promoted It can support moves from learning by rote to acquiring more complex skills such as problem solving, questioning, organising, evaluating and generating knowledge. ICT can also support inclusion ensuring that marginalised groups have access to materials and resources (MoE, 2015). ICT can facilitate the use of short videos and simulations, which can stimulate discussion; students can create their own presentations and can collaborate with and communicate with students in other parts of the world. As both teachers and students become more expert, students will develop their self-esteem. If you are deciding what technology to buy for your school, a major consideration will be to what extent the technology helps teachers to improve their teaching and their students' learning.
- **Using ICT to support subject learning:** ICT can be used to support specific areas of the curriculum. Videos, simulations, interactive experiments can all enrich the teaching of science. Access to the internet gives students the opportunity to undertake their own research and learn about topics that interest them in depth, further developing their self-esteem. It can really support students to learn at their own pace.

- **Using ICT to support professional learning:** ICT can be used to support teachers' professional learning. You could encourage teachers to work together to find and adapt Open Educational Resources (OERs) for use in their classrooms. They could work in pairs to film each other in the classroom and then discuss the films with a view to improving their teaching. Teachers with gaps in their subject knowledge will find a huge number of resources on the internet to help them, including quizzes, simulations and sample test papers with answers. Access to the internet will also provide them with the opportunity to communicate with other teachers through networks, and to develop the ICT skills highlighted earlier in this unit.

(Adapted from Steketee, 2005)

A reminder that the OpenSTEM Africa Virtual Lab gives the teachers in your department an opportunity to organise practicals and experiments with their classes, even when laboratories, equipment or reagents are not available. Your teachers – and ideally their students as well – will need access to computers, or a laptop and projector if the teacher is using the Virtual Lab for a demonstration to the class. More importantly, as part of their ICT skills development, your teachers will want to develop their understanding and skills in this kind of ICT-based teaching.

Do remember that there are introductory videos to explain how to use each app in the Virtual Lab. There are also exemplar lessons to give examples of how the apps can be integrated into a lesson.

Other resources to support embedding ICT

Beyond the OpenSTEM Africa and iCampusgh teaching and learning materials (TLMs), there are a host of other free resources available on a number of internet repositories and learning platforms. These resources include open educational resources (OERs) and massive open online courses (MOOCs), which are explained below.

Harnessing free open educational resources (OERs)

Open educational resources (OERs) are growing in popularity as practitioners see the benefits of sharing resources openly and freely. The term is used to describe teaching, learning, and research resources that are available in the public domain or have been released under an intellectual property (IP) licence that permits their use or re-purposing by others.

Some of the key characteristics are:

Accessibility: They are generally free and available for public use via internet portals and websites. They are created under a Creative Commons (CC) licence, which in most cases allows free use and repurposing as long as it is not for resale. For poorer nations, where the cost of producing quality learning materials has a significant impact on budgets, OERs present a huge opportunity for academic staff and students alike. Ensuring that all OERs are accessible to people with learning disabilities and/or difficulties remains a challenge, however.

Content: Unlike other free-to-view and free-to-use websites (YouTube, etc.), OER websites will always have educational content. These come in the form of audio, video, still images, text and any form of publishable artefact that the producer deems fit for the purposes of teaching and learning in any subject/discipline.

Cost: It costs nothing to publish OERs, as there are several repositories willing to take academic material for publication. However, the cost of production varies from country to country and the amount of content required. For the purposes of this paper, the cost of production is estimated as the time required for the academic to produce the material.

Licences: Although OERs are offered in the public domain free of charge, they are often released under certain licences. The most accommodating licence is designated as CC-*BY* (Attribution). This licence lets others distribute, remix, tweak and build upon your work, even commercially, as long as they credit you for the original creation. There are other forms of licensing that place some level of restriction on the re-use and commercialisation of the artefacts. See http://creativecommons.org/licenses/ for further details on licensing.

Example OER websites for upper secondary/tertiary teaching and learning:

- OpenLearn from The Open University
- OER Africa from SAIDE
- High school Biology | Science | Khan Academy
- High school Chemistry beta | Science | Khan Academy
- High school Physics | Science | Khan Academy
- Browse – PhET Interactive Simulations (colorado.edu)

Introducing staff to free massive open online courses (MOOCs)

MOOC platforms offer a range of short courses and are increasingly becoming social learning spaces for professional development for many professionals. These platforms can offer teachers the opportunity to learn with practitioners all over the world through discussions, group activities, webinars, asynchronous forums, etc. The social learning pedagogy behind MOOC platforms means teachers can benefit from the diverse and wide-ranging social contact and interaction that collaboration and peer learning offers.

MOOC platforms are further defined below:

	Massive: Courses are hosted on platforms that allow several (thousands) of people to enroll and learn together.
	Open: Courses are descried as 'open' because there are no entry requirements or prerequisite qualifications. Although most of these courses are free, some platforms charge low cost fees for assessment and academic credits.
	Online: Courses are fully online and offer participants the opportunity to interact and learn with people from all around the world.
	Course: Although they are free, MOOCs are designed as a course with various elements that make online learning a rich and engaging experience.

Examples of MOOC platforms:

- FutureLearn
- Coursera
- edX
- Udacity
- Cognitive Class
- iversity

Examples of MOOCs for teachers:

- Professional Development for Early Career Teachers
  https://www.futurelearn.com/courses/early-career-teachers
- Professional Development for Teachers Courses
  https://www.futurelearn.com/courses/categories/teaching-courses/professional-development-for-teachers

Summary

This unit has provided some insights and guidance to middle leaders (HoD/HoS) on how to effectively lead and support the wider take-up of ICT in their schools, including harnessing the support of their Headmistress/Headmaster and working with other HoDs to provide school-based responses to the challenges of infrastructure and access. It has also provided guidelines on how to conduct an ICT needs analysis and given you some ideas on how to provide sustained support to the teachers in your departments for developing expertise in ICT. It has also given some suggestions on how to link to the OpenSTEM Africa teacher CPD units, in particular the 'Using ICT to support learning' unit.

A full list of the Head of Department units can be found at:
https://www.open.edu/openlearncreate/HOD_units

A full list of the CPD units can be found at:
https://www.open.edu/openlearncreate/CPD_units

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Appendix A: Linking technology and learning

Educational/learning outcome for students	How can technology help? What technology would be needed?
Students learn the basics about computers: turning it on, file management, creating documents and presentations.	
Students learn how to search the internet, find information and store it for future use.	
Students learn how to send email messages and engage with social media.	
Students learn how to access and make effective use o	
Educational/development outcome for staff	**How can technology help?** **What technology would be needed?**
Teachers develop more participatory approaches in their lessons.	
Teachers see themselves as facilitators of learning, guiding and supporting students on their learning journey.	
Teachers see themselves as learners, keen to take control of their own professional development.	

Teachers have access to resources that will enliven their lessons, such as YouTube videos, film clips, news reports or photographs.	
Teachers have access to educational software, such as simulations.	

Appendix B: Carrying out a departmental and school technology audit

In the classroom	Comments
What is the current situation in my department with respect to how ICT is currently used in individual lessons, in student classwork and homework, in practical lessons? Is ICT used as widely as it could be? Is it used equally by male and female students? Is it used as effectively as it could be? Could more teachers use ICT in their teaching? In what ways could each individual teacher make more use of ICT-based teaching?	
Where is/are the outstanding practice(s) in my department? Who are the experts in particular aspects of ICT-based teaching? What is the evidence to support this?	
What kinds of support does each teacher in my department need to build skills confidence, self-efficacy and expectations of success in using ICT? Where do I get evidence to support this? Could I organise a short, confidential survey – and consider the data from different perspectives? e.g. age, gender, qualifications….	
How can I prioritise the professional development needs which have been identified?	

In the department	Comments
What is the current situation in my department with respect to ICT hardware (i.e. computers, laptops,	

tablets, smartphones, projectors, speakers) which are owned by the school and available to teachers?	
What is the current situation in my department with respect to computers, laptops, tablets, smartphones, projectors, speakers which are owned by individual teachers and which they use or could use in their own lessons?	
What is the school's level of access to the internet – or to a school intranet?	
What software is already available to staff and students? What new software could help improve ICT-based teaching and learning?	
What is the current availability of facilities like the ICT lab for ICT-based science classes?	
What are the possibilities of the teacher organising ICT-based science lessons in a classroom, using, e.g. a laptop and projector?	

What could be done by school leaders (HoDs/Headmistress/Headmaster) to improve or increase the amount of/access to the technology?	

What safeguards would need to be in place to ensure the safety and continued working order of ICT equipment, while also ensuring easy access and sustainability?	

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