

TCT 201: INSTRUCTIONAL TECHNOLOGY

Topic: Integration of Technology in Teaching and Learning

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Technology Integration in Education

- *“Classrooms enhanced by technology provide support and structure to students who need scaffolding and enrichment to students who thrive on challenge. The result is a learning environment that is task-centered and predictable, in which students understand what’s expected of them and how to succeed.” - <http://www.learnnc.org/lp/editions/every-learner/6776>*

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Objectives

- At the end of the lecture the learner should be able to:
 1. Explain technology integration in teaching and learning
 2. Describe the learning theories that inform technology integration in teaching and learning
 3. Explain the models that guide in technology integration in teaching and learning
 4. Explain the challenges faced in schools to integrate ICT in teaching and learning
 5. Explain the effort by the government of Kenya to support integration of Technology/ICT in teaching and learning

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Technology Integration and Learning Theory

- Learning process happens all the time formally or informally, directly or indirectly
- Learning theories describe the way learners are receive information, arrange and retain the information in memory
- Learning theories are very important for instructional designers in order to help them create an effective, efficient and appealing instruction design.
- Learning theories help the instructional designers to select the best technology to infuse or integrate in the teaching and learning processes

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Technology Integration in Education

- **Technology integration** is the use of technology tools in general content areas in education in order to allow students to apply technology skills to learning and problem-solving
- It involves infusion of technology as a tool to enhance the learning

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Technology Integration and Learning Theory

- Common learning theories that support technology integration in teaching and learning include:
 - Constructivism Theory
 - Cognitive Information Processing Theory
 - Schema Theory
 - Cognitive Load Theory
 - Situated Learning Theory
 - Gagné’s Theory of Instruction
 - Social learning theory, etc.
- In this lesson, we will focus on Constructivism theory and technology integration in education

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Technology Integration and Constructivism theory

- The Constructivism theory emphasizes that good and real learning information is not based on what the instructors says or the learners heard even the information is repeated over and over.
- In addition, the constructivism theory emphasize that the learners construct and built the information inside their mind based on their experiences and prior knowledge.
- Even more, this constructing for the information influences the learners' environment, society and language.

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Technology Integration and Constructivism theory

- He is developed the Zone of Proximal Development (ZPD) model which defines the range of tasks that a child can perform with the help and guidance of others but cannot yet perform independently (without help)

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Technology Integration and Constructivism theory

- The proponents of constructivism theory are
- a) John Dewey (1859- 1952) – He believed that:**
- Construction and learning of new things can not happen if learners do not have old related experience in order to complete the learning process.
 - Learners learn better in groups because human nature is social, so when they working together they build their knowledge.
 - Teachers should give the learners opportunities to collaborate and work through directed activities to build their learning knowledge.

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Technology Integration and Constructivism theory

- c) Jean Piaget (1896 - 1980) – He believed that:**
- Learners need to construct their knowledge through experiences
 - He described how new information can be shaped in learner's brains and it includes three types of processes, which are assimilation, accommodation, and equilibration.
 - In **assimilation**, the learners integrate new information or experiences in their own thoughts.

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Technology Integration and Constructivism theory

- b) Lev Vygotsky (1896-1934) – He believed that:**
- students learn effectively in social groups which is affected by culture, language and knowledge. He developed social constructivism theory
 - Human learn by actively being involved in the learning process but not through memorizing
 - He developed a model for learning which makes the teachers very active so as to lead the learners to discover and build their knowledge based on their thoughts

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Technology Integration and Constructivism theory

- Accommodation** is when the learners change old schema to another in order to include new information or experience
 - Equilibration is high mental development process, which include assimilation and accommodation.
- NB:** This process happened when learners' mind needs to adopt more deeply to conditioning experiences or information that causes modification of previous schemas in learners' brain.

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Technology Integration and Constructivism theory

- Benefits of constructivism theory are:
 - The knowledge that learners construct and build are able to transfer from sitting to another or information that the learner learned in one class will be able to use it in other class, for example, learn circular shape in class can transfer to another setting like wheels' car.
 - Working in groups make the learners develop their skills in order to express their needs
 - Develop prior knowledge and experience of the learners

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Technology Integration and Constructivism theory

- To achieve this, teachers should learn how to integrate technology in teaching and learning
- Instructional designers and teachers should consider the constructivism theory as an approach when designing or selecting a technology to integrate in teaching and learning.

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Technology Integration and Constructivism theory

- Learners can transfer skills and knowledge they build to their real world.
- The learners can collaborate with teachers, friends, family and society
- Constructivism theory helps the learner solve their problems
- Learners construct their knowledge so they actually own their information.

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Models of Technology Integration in Teaching & Learning

- There are various models that guide in integrating technology in teaching and learning.
- The popular models are:
 - a) The SAMR model
 - b) The TPACK model

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Technology Integration and Constructivism theory

- Teachers should therefore:
 - Work with students to build the knowledge but not reproduce the knowledge
 - Ensure building and construction of knowledge must be in individual through discussions, cooperation and social experience
 - Teachers should emphasis on high thinking skills and problem solving
 - Ensure learners are active and responsible about what they learn.

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a) The SAMR model

- The SAMR Model is a framework created by Dr. Ruben Puentedura
- The SAMR Model describes technology integration through four levels defined as follows:
 - i. **Substitution:** Technology is used as a direct substitute for what you might do already, with no functional change e.g. if you are teaching a government lesson on the Constitution, you might use an electronic or web-based version of the document instead of a hard copy. Students might also answer questions about the Constitution using a Microsoft Word instead of filling out a worksheet.

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a) The SAMR model

ii. **Augmentation:** Technology is a direct substitute, but there is functional improvement over what you did without the technology. In other words, you ask yourself if the technology increases or augments/enhances a student's productivity and potential in some way.

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a) The SAMR model

NB: While the first intuitive step for using any new classroom tool is to substitute it for what you already do, the goal for a teacher in a one-to-one classroom is to move beyond the substitution and augmentation levels (Enhancement) and toward the modification and redefinition levels (Transformation).

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a) The SAMR model

iii. **Modification:** Technology allows you to significantly redesign the task. Instead of replacement or enhancement, this is an actual change to the design of the lesson and its learning outcome. The key question here—does the technology significantly alter the task?

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a) The SAMR model

Source: <https://www.schoology.com/blog/samr-model-practical-guide-edtech-integration>

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a) The SAMR model

iv. **Redefinition:** Technology allows you to do what was previously not possible. In this case, you ask yourself if the technology tools allow educators to redefine a traditional task in a way that would not be possible without the technology

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a) The SAMR model

- **SAMR Strengths**
 - It is easy to follow steps that provide great examples of how to scaffold the integration of technology into teaching and learning.
 - Instructors can choose the level of integration that they want for their classes, i.e. “dip” their toes in using first two enhancement steps, or continue into the “deep” in of the pool through the transformation steps.

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a) The SAMR model

- **SMAR Weaknesses**
 - The course or lesson content may not be enhanced if instructor does not do due diligence in their planning or testing of the technology
 - It does not put teachers technology pedagogical knowledge into consideration

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b) The TPACK Model

- This framework attempts to capture some of the essential qualities of knowledge required by instructors to integrate technology in education.
- In this model:
 - Technology is the instructional media/device the employs to support teaching e.g. Television, ICT, etc
 - Content is the subject matter e.g. B/studies, Geography, Mathematics, CRE, etc
 - Pedagogy is the how or the methodology to be used to deliver the content e.g. lecture method, Experiment, discovery, CAI, etc

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b) The TPACK Model

- TPACK stands for **Technological, Pedagogical, and Content Knowledge**
- It a modification of **Lee Shulman’s (1986) Pedagogy Content Knowledge (PCK) Model** by Mishra & Koehler in 2006
- According to **Lee Shulman’s PCK model**, learners need teachers who have knowledge of the subject matter (Content) and can teach the subject clearly and effectively (Pedagogy). He advocated that training of teacher should emphasize on the two bodies of knowledge, however, he did not put into consideration the technology factor.

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b) The TPACK Model

- This triad of knowledge is represented in the diagram below:

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b) The TPACK Model

- Technological Pedagogical Content Knowledge (TPCK) was introduced as a theoretical framework for understanding teacher knowledge required for effective technology integration (Mishra & Koehler, 2006)
- It states that for effective integration of technology in teaching, the teacher should possess the bodies of knowledge: Technology, Pedagogy and Content Knowledge – hence TPACK
- It explains the interaction between these three bodies of knowledge as they relate to teaching in a technology enhanced learning environment.

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b) The TPACK Model

TPACK Framework adapted from Koehler and Mishra (2013)

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b) The TPACK Model

- Technological content knowledge (TCK) describes the teachers' understanding of how the content (subject matter) can be delivered using technology appropriate to the content/subject and the learning environment.
- Technological Pedagogical Knowledge (TPK) explains the teachers' understanding of the new pedagogical affordances and constraints introduced by the technology and how that may influence the teaching and learning experience. TPK also explains how technology can appropriately be employed alongside pedagogies relevant to the subject

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Edger Dale's Cone of Experience

- The Cone of Experience is a visual model, a pictorial device that presents bands of experience arranged according to degree of abstraction and not degree of difficulty
- This model incorporates several theories related to instructional design and learning processes
- Dale's cone of experience is a tool to help instructors make decisions about resources and activities.
- This was introduced by Edgar Dale(1946) in his textbook on audio visual methods in teaching

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b) The TPACK Model

- Pedagogical content knowledge (PCK) is concerned with the knowledge of pedagogy or instructional technique that is applicable to teaching a specific content.
- The TPACK model therefore determines effective teaching using technology (e.g. ICT), pedagogical techniques that use the technology constructively to teach content and knowledge of the content taught.

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Edger Dale's Cone of Experience

- Edgar Dale's cone categorizes learning experiences into three modes: inactive (i.e., learning by doing), iconic (i.e., learning through observation), and symbolic experience (i.e., learning through abstraction).

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b) The TPACK Model

- **Assignment**
 - Visit this site for more details about TPACK model https://www.youtube.com/watch?v=FagVSQJZELY&list=UUyiLyAMZj_Y8QWdlpZHAgDQ
 - QS: Discuss the strengths and weaknesses of the TPACK model advanced by Punya Mishra & Matthew Koehler in 2006.

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Edger Dale's Cone of Experience

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Edger Dale's Cone of Experience

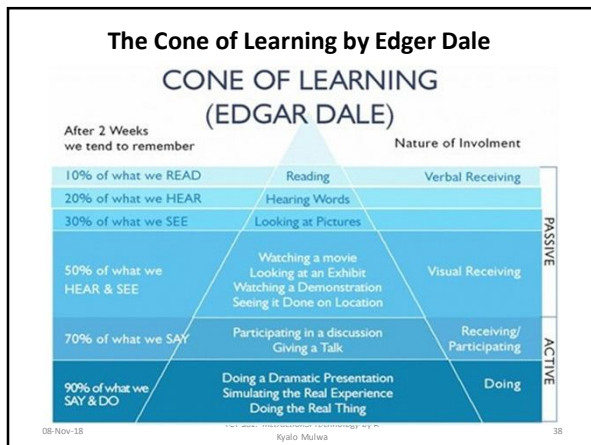
- During the 1960s, Edgar Dale theorized that learners retain more information by what they “do” as opposed to what is “heard”, “read” or “observed”. His research led to the development of the Cone of Experience.
- Today, this “learning by doing” has become known as “experiential learning” or “action learning”.

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The Cone of Learning by Edger Dale

- He suggested that when teachers when choosing an instructional method it is important to remember that involving students in the process strengthens knowledge retention
- Therefore, one has to use a learning resource that engages the learner effectively
- Dale’s cone of experience guides teachers in selecting instructional technology to use for effective teaching and learning

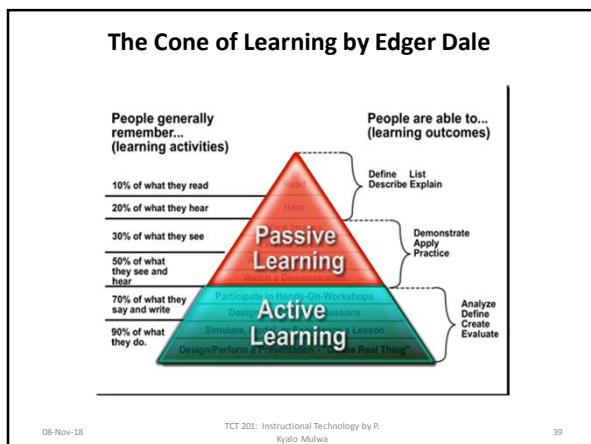
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Criteria for Selecting Instructional Technology/media

- Instructional method
- Type of learning task (objectives)
- Subject matter and required student performance
- Learner characteristics (learning style, skills)
- Target population – location, size
- Teachers’ attitudes/preferences, skills etc.
- Physical attributes of the media (sensory channels)
- Teaching space, lighting, facilities (physical environment)
- Practical constraints – economic (money) and administrative issues, time , what’s available

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Integration of ICT in Teaching and Learning

- ICT stands for Information Communication Technology.
- It generally relates to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information (Toomey, 2001)

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Examples of ICTs

- Radio
- Television
- Cell phones
- Computers
- Video
- Scanners
- Camera

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Levels of ICT Integration

Lesson

topic

curriculum

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What is ICT Integration in Teaching & Learning

- ICT integration is broadly defined as a process of using any ICT (including information resources on the web, multimedia programs in CD-ROMs, learning objects, or other tools) to enhance student learning (Williams, 2003).
- ICT integration in teaching can be defined as the infusion of ICTs in teaching and learning.

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Example of ICT integrated Lesson

Breathing system

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Traditional Teaching without ICTs

- Teacher centeredness
- Lack of collaboration
- Minimal demonstrations and illustrations
- Only mention of technology

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The emphasis

- The drawing may be further enhanced by an animated diagram showing a detailed breathing system.
- Click the following link to view the animation

<http://argosymedical.com/Respiratory/samples/animations/Respiration/index.html>

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Effective ICT integration requires the following

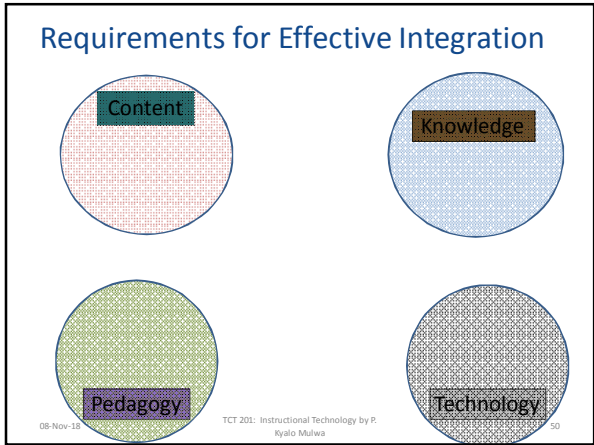
- Requirements for effective ICT integration in teaching are:
 - a) Good mastery of subject content
 - b) Well grounded pedagogical knowledge
 - c) Technological literacy
- All these have to be blended seamlessly for effective use of ICT in the classroom

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Benefits of ICT Integration

- Helps to explain difficult and abstract concepts
- Motivates learners and creates interest in learning
- Enhances learner participation
- Enhances collaborative learning among learners
- Enhances quality of teaching
- Stimulate learner’s interest in learning
- Supports any time and any where learning
- Promotes creative & critical thinking
- Helps learners to participate in content generation

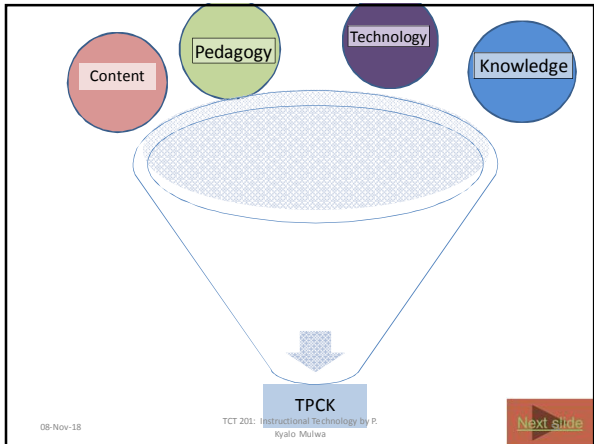
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INTEGRATED ICT ACTIVITES AND TOOLS

- The following activities and tools are part of ICT integration in teaching and learning:
 - 1) **Net Meeting** – done in a networked environment
 - 2) **Websites** – HTML/PDF (white Papers) learning material with appropriate links to other sites.
 - 3) **Web quest** – link to learning e-materials in e-libraries

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INTEGRATED ICT ACTIVITES AND TOOLS

- 4) **CD-ROM based learning** – tutorial with unit exercises for self assessment and course coverage evaluation
- 5) **Smart boards** – may exclude use of chalk board, white boards etc.
- 6) **Multi-media equipment** – mixing images and sound
- 7) **Digital cameras** – can be used for real time discussions

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INTEGRATED ICT ACTIVITIES AND TOOLS

- 8) **Broadcast material** - helps to reach as many learners as possible
- 9) **Devices** e.g. hearing devices – can be used to facilitate communication with students/teachers with special needs
- 10) **Internet based** – enhances research to support teaching and learning
- 11) **Electronic toys** – helps develop spatial and awareness and psychomotor skills

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TEACHERS AS ICT INTEGRATORS

- b) **Make a simple start** – with very simple ICT projects in your class e.g. like projecting class notes on a screen or computing students average grades. Only projects where you can solve the problems will be a success. Later on with more experience, your project can become more complex
- c) **Make combinations:** ICT projects are not necessarily extra lessons in your curriculum. Think about combinations with your normal lessons. This with time will give you better control of the project and hence increase the chance of success.

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Requirements for Successful Pedagogical Frameworks

- Awareness of the available ICT resources that will contribute to the learning process
- Ability to use a variety of ICT resources in a number of contexts
- Curriculum expertise
- Depth of knowledge of the use of ICT
- Ability to challenge understanding, thinking & reflection, and
- Ability to organise and manage a class to suit a variety of contexts and opportunities.

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TEACHERS AS ICT INTEGRATORS

- d) **Focus on didactic** – not technical – make sure that the use of ICT serves a didactical goal. Computers must not be used in the classroom just because they are available. They should be used to improve the learning process.
- e) **Role of the teacher changes** – be aware that the roles of a teacher shifts from those of an instructor to those of a mentor, coach, guide and motivator.

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TEACHERS AS ICT INTEGRATORS

- Teachers will play the central role in implementing ICT integration in education although they require thorough orientation in order to take lead of the idea they will need technical training. To do this, here are six principles they can apply:
- a) **Do not be afraid** – computers might look difficult to learn but any one can learn and master them. Any teacher can find ways to use ICT in the classroom, as long as they make sure they can cope with it. Computers should not be viewed as a threat to the teacher's job security but as a aid in executing the teachers duties.

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TEACHERS AS ICT INTEGRATORS

- f) **You are a learner too** – a teacher is a learner too. Everyday, he/she will find new information as well especially when computers and the Internet is involved. Do not be afraid to admit to your pupils that you too have to learn.

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CHALLENGES OF INTEGRATING ICT IN EDUCATION

- a) Insufficient trained ICT integrators
- b) Lack infrastructure and ICT integration
- c) Negative attitude towards integration of ICT by teacher and education managers
- d) ICT illiteracy and lack of awareness
- e) Lack funds
- f) E-waste management
- g) Political interference and insecurity

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GoK's effort in Supporting ICT Integration in Education

- b) Development and implementation of the National policy documents such as:
 - ICT policy
 - National ICT Strategy for Education and Training (2006),
 - Kenya Vision 2030
 - Kenya constitution 2010
 - Education Act 2013
 - Sessional paper no.14 of 2012
 - National ICT master plan.

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CHALLENGES OF INTEGRATING ICT IN EDUCATION

- h) Unavailability of enough digital content
- i) Cost of ICT still high
- j) Fear of moral degradation
- k) Fast changes in technology and the cost of shelving technology

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GoK's effort in Supporting ICT Integration in Education

- c) Laying down relevant infrastructure
 - Rural Electrification programme
 - Fiber infrastructure extend to all schools
- d) Launch of the Digital Learning Programme (DLP) named DigiSchool – One Laptop per Child (OLPC) project
- e) Curriculum review to introduce ICT as a core course in teacher training colleges
- f) Providing financial support to educational institutions to procure ICT equipment

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GoK's effort in Supporting ICT Integration in Education

- a) Adoption of recommendations on technology use in education by various education commissions e.g. The Kamunge Commission, Gachathi Commission, Koech Commission

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GoK's effort in Supporting ICT Integration in Education

- g) Tax incentives on importation of ICT equipment – from time to time
- h) Adopting use of Educational Management of Information Systems at the Ministry level, SAGAs, etc
- i) Development of digital curriculum through KICD

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Self Reflection Questions

1. Explain the recommendations on integration of technology education in Kenya by the various education commissions since independence
2. Explain the SAMR model and its applications in integrating technology in teaching and learning. Use a diagram.
3. Describe the TPACK model and explain its applications in integrating technology in teaching and learning. Use a diagram.
4. Explain the challenges faced in schools to integrate ICT in teaching and learning
5. Explain the effort by the government of Kenya to support integration of Technology/ICT in teaching and learning

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