Offline - Online Information and Communication Technology (ICT) Teaching and Learning Strategy in the Age of COVID-19 and Beyond

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Abstract

The #FeesMustFall Movement in 2016 and the 2017-2019 closure of campuses by South African university students have had an adverse impact on teaching and learning. The recent COVID-19 outbreak is another timely reminder of how global pandemics can fundamentally affect schooling and higher education institutions. One of the first responses by Nelson Mandela University in the face of COVID-19 was to encourage lecturers to switch to online teaching as different approaches to teaching and learning are imperative in this environment. In the South African context, access to Information and Communication Technology (ICT), which includes devices and continuous online internet connectivity, is problematic due to unequal access. Thus, in this chapter, we propose a strategy that does not require the sole utilisation of e-learning platforms. Therefore, we also posit the off-line design of an artefact that can be shared by all students as part of their learning experiences. We do not necessarily disagree with utilising e-learning platforms or social media tools. However, we argue for the utilisation of ICT tools that promote meaningful learning, steering away from lecturers simply lecturing online through videos and the completion of online tests. We propose a more constructivist-constructionist student-centred approach. In addition, we

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believe that the zero-rated data cost for access to institutional online platforms during COVID-19 assists to make our proposed project-based strategy a viable alternative to supplement existing online learning strategies. Our proposal requires a mind-shift, i.e. a shift in learning 'from' ICT tools and 'from' the lecturer, to learning 'with' and 'through' ICT tools (Jonassen, Myers & McKillop 1996). This is embedded in a 'learning-as-design' or 'knowledge-as-design' paradigm, where students simultaneously become the learners, creators and directors of content as knowledge. We posit, that when students become the designers of ICT artefacts, they gain various cognitive and design skills, which resonate with the critical outcomes as envisaged by the national curriculum policies, as well as the 4C model – collaboration, communication, critical thinking and creativity (American Association of Colleges of Teacher Education, 2010) and the 21st-Century Skills related to the Fourth Industrial Revolution (Butler-Adam 2018; Reaves 2019). The purpose of this chapter is to demonstrate how PowerPoint (in traditional and alternative modes) and Moodle could be used synchronously (online by more than one student) and asynchronously (offline by students) utilising a learning-as-design approach. This brings the students and lecturer(s) together, to enable epistemological access which could provide meaningful and deeper learning. Project-Based Learning (PBL) is central in our proposed framework. However, the loops are not identical.

Keywords: Constructionism, constructivism, deep learning, higher-order thinking, ICT, knowledge as design, meaningful learning, project-based learning.

1 Introduction

The sudden arrival of COVID-19 has had a devastating effect on societies worldwide on a scale seldom seen before. This disease has brought the wheels of the world economy to a virtual standstill. It has disrupted millions of lives across the planet and left a trail of death in its wake. As a result, the short- and long-term consequences will affect every facet of our lives long after it has gone. It is against this background that higher education institutions and schools worldwide have to rethink how teaching and learning will be conducted in future. This is a moment to pause, think, reflect and assess our options and act in the light of this historic event. If we could respond to

COVID-19 with foresight and innovation, we would be well placed for other disruptive events in the future, as well as issues such as climate change.

What should our curricular response be to this pandemic, visited upon us with such rapidity? Perhaps this is the trigger that was needed to rethink and reimagine our curriculum, traditional methods of teaching and learning as historically practised for centuries and reflected on by curriculum theorists and philosophers.

How can we reach the other side of this crisis better prepared, with responsive and well-thought through curricular plans and innovative modes of delivery? COVID-19 has exposed the limitations of the traditional teaching and learning model utilised by universities globally, that rely on face-to-face interaction. The physical and social distancing required during this period to slow down the infection rate has rendered traditional lecturing obsolete. Many universities are making contingency plans to manage the effects of this pandemic and how best to rescue the academic year. It appears that in many instances, Zooming has become the new face or 'pedazoom' of the traditional lecturing model. While many universities state that they have moved to online learning, it appears that what has happened is emergency remote teaching (Hodges, Moore, Lockee, Trust & Bond 2020). One has to distinguish between the two, as designing a real online learning module cannot happen overnight and requires detailed planning months before an online learning module is ready for implementation (Hodges *et al.* 2020). Emergency remote teaching refers to changing the on-campus face-to-face approach, as a result of a crisis such as the COVID-19 pandemic, to an online approach, by teaching remotely through utilising ICT tools to deliver instruction as before. Once the crisis has subsided, there will most probably be a switch to the original format (Hodges *et al.* 2020).

It is against this background that we propose a delivery mode that requires some form of online access, but not online in its totality, as we are aware of all the pitfalls and dangers in an unequal society such as South Africa. Our version of an online teaching approach is one that takes the notion of pedagogical rigour seriously and one whose objective is to bring about meaningful learning encounters and not simply exchanging face-to-face teaching with online teaching. At the same time, the aim of our strategy is not to be a substitute for online learning, but one that can be an integral part of it. We also suggest that this strategy as an activity, could also be utilised post-COVID-19 in traditional offline settings. As such, the purpose of this chapter is:

- To present an alternative learning strategy to the traditional lecturer-centred, PowerPoint slide-based strategy. This is one of the possible solutions to promote meaningful learning within an online-offline space during and beyond the COVID-19 pandemic;
- To present the conceptual and theoretical principles associated with this strategy;
- To present the possible advantages that this strategy could promote; and
- To show how the proposed strategy links to the types of knowledge and cognitive processes.

2 Information and Communication Technology in Education

Data from the DoBE (Department of Basic Education 2019) reveal that 63.5% of schools are without a computer centre and approximately 80% of ordinary operational schools have no internet access for teaching and learning. This highlights that there is a huge disparity related to access to ICT resources and internet connectivity. Nonetheless, once these learners enrol at university, there appears to be an emphasis on using technology such as a desktop, laptop or tablet as a tool to search for information, print or upload an assignment typed in Ms Word or to design a PowerPoint presentation. At university level there seems to be a tendency for 'death by PowerPoint' (Garber 2001), i.e. replacing the chalkboard or whiteboard for its digital family member. Such teaching results in a 'learning from' PowerPoint denoting an instructivist-behaviouristic lecturer-centred philosophy (see Figure 1) using technology as a presentational or representational tool (Du Plessis 2016).

The educational philosophy pendulum has swung in the South African educational landscape from the instructivist-behaviouristic position to the constructivist locus. The constructivist position in simplistic form promotes student-centeredness, active involvement in the learning process, collaboration among peers and the lecturer, and self-reflection. Internationally, there has been a constant call for meaningful learning through active participation and product creation (Ashburn 2006; Ferris & Wilder 2017; Kennewell 2017) to enable students' 'abilities to understand complex ideas and learn challenging content using technology' (Ashburn 2006: 2), promoting deep knowledge in conjunction with utilising ICTs.

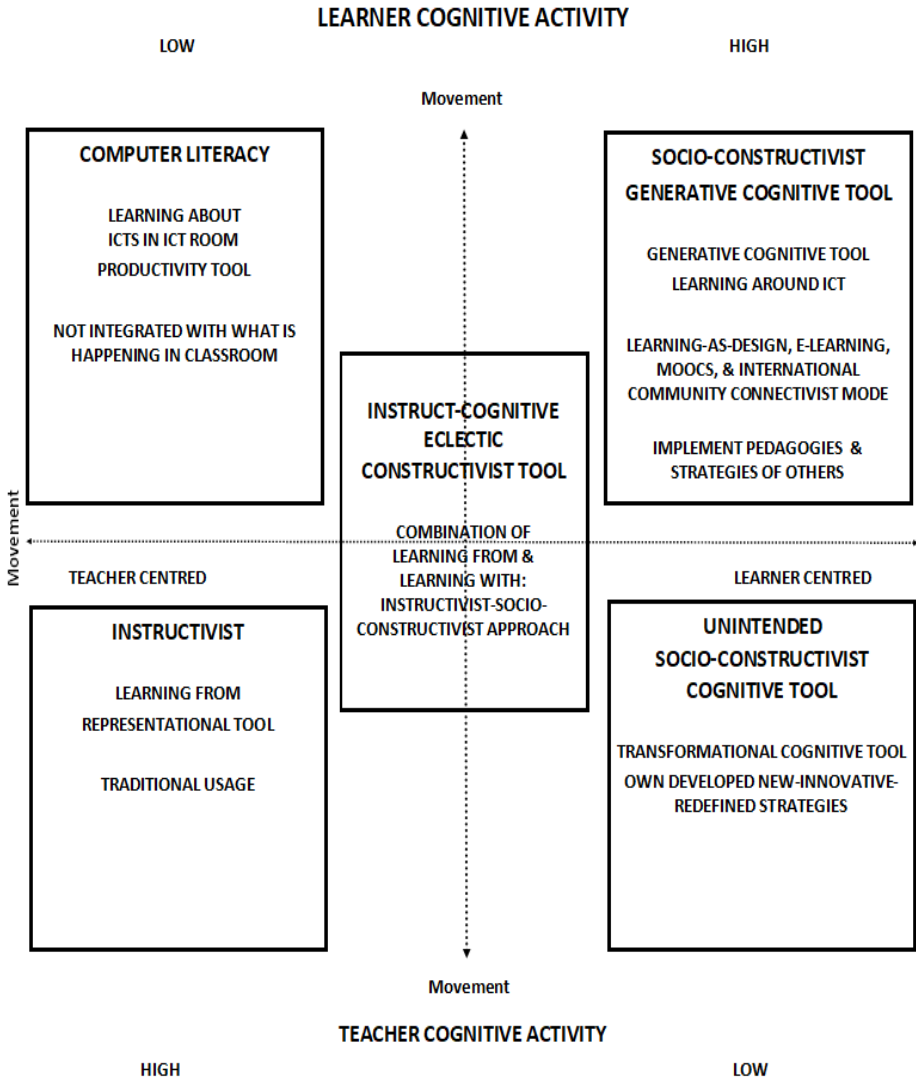

Figure 1: ICT implementation matrix (Du Plessis 2016: 143)

Meaningful learning refers to making meaning through active and wilful engagement embedded by the five attributes, namely being active, construc-

tive, intentional, authentic, and cooperative (Jonassen, Howland, Moore, Marra & Crismond 2008) student-centred learning. We concur with this view.

In the USA, several 21st-century skills have been articulated in need of development among the young, to meet the envisioned challenges that this century will pose. These include Information, Media and Technology Skills with extensive focus on creativity and innovation, critical thinking, collaboration and communication (American Association of Colleges of Teacher Education 2010) which link to the critical outcomes of the South African Department of Basic Education (Department of Basic Education, 2011: 5). One of the main challenges locally is student access to ICT resources and internet access, since the majority of students do not have the financial means to afford devices. Consequently, the proposed strategy presented towards the end of this chapter, subscribes to utilising technology resources in an authentic and meaningful manner, to create an artefact while the student does not have to be constantly online. This depends on how the learning is structured.

3 Types of Knowledge for Learning and Higher-order Thinking

The learning that should be encouraged at tertiary level should promote higher cognitive processing and knowledge on various domains and could utilise Bloom's taxonomy (Bloom, Engelhart, Furst, Hill & Kratwohl 1956) or the revised taxonomy of Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths and Wittrock (2001). Space does not allow us to elaborate on this.

This is the reason, the proposed strategy makes explicit provision for engaging with this taxonomy when posing questions and presenting the project brief by the designer, to the students. There are also four knowledge dimensions in the taxonomy, namely factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge (Anderson *et al.* 2001). These four knowledge dimensions can be utilised on any of the six cognitive process dimensions. These cognitive and knowledge dimensions in the taxonomy (see Anderson *et al.* 2001) are central to the 'project-based learning strategy in a combination of a predominantly lecturer-centred space' and the 'project-based learning strategy in a predominantly student-centeredness space'. These two learning strategies will be presented later in the chapter.

In addition to these four types of knowledge, engaging with knowledge and learning can also be on several planes or levels, e.g. a surface level, and deep level. Surface knowledge or learning focus on rote learning and memorisation (Czerkawski 2014) which results in breadth with little depth and consequently it is in many instances not knowledge, but rather fragments of information (Bennet & Bennet 2008) devoid of meaningful learning (Islamoglu & Branch 2013). Deep learning should be the focus. This does not imply that surface knowledge should be avoided, as one does require such knowledge before one can engage at a higher or deeper level. However, the danger is when surface knowledge or learning dominates. Deep learning then refers to meaningful learning coupled with understanding (Islamoglu & Branch 2013; Bennet & Bennet 2008); hence, making connections (Bennet & Bennet 2008) which can be promoted through authentic and collaborative dialogical interaction through employing a distinctive product or artefact creation (Ruhalahti, Aarnio & Ruokamo 2018).

Accordingly, our strategy promotes deep learning as the focus and is not on memorisation, but on engaging with the material in a meaningful manner. This requires making connections and the construction of an authentic product or artefact that can be used by peers (or anyone else) to promote deep learning and understanding.

4 Theoretical Perspectives for ICT-based Created Products Embedded in Constructionism

The theoretical perspectives that underpin the proposed 'ICT assisted project-questions-based learning strategy in a combination of a predominantly lecturer-centred space' and 'ICT assisted project-questions-based learning strategy in a predominantly student-centeredness space' are presented as follows:

- Knowledge-as-design;
- Cognitive constructivism (if an individual is solely involved);
- Social constructivism (if peers or groups are involved); and
- Constructionism

'Knowing-as-designing' or 'knowledge-as-design' is attributed to Perkins (1986) and refers to the attainment of knowledge as a result of designing rather

than mere interpretation. Alternatively one can refer to this as *'designing to learn'* or learning through creating a product or artefact. We are not going to engage in-depth with what constitutes knowledge within a knowledge-as-design learning space, but within the context of this chapter we conceptualise it as follows:

> Knowledge-as-design requires that an individual, pair or group of students engage in an authentic, meaningful and (or) content exploration related to a topic(s), theme(s), chapter(s), questions or problems posed which then have to be answered and repackaged through the creation of a product or artefact. The artefact is designed and created through utilising ICT related technology tools to package their product in such a manner that another student(s) could benefit when engaging with this designed product. This process requires formal reflection based on their construction experiences.

The individual who learns the most when product creation is involved is the designer of the product and not the user (Jonassen, Myers & McKillop, 1996) due to critical skills that the designer has to engage with, the designer's reflection and the problems encountered by the designer which has to be solved by the designer. Learning-as-design emphasises that both process and the product are of importance for learning (Jonassen *et al.* 1996; see also Rob & Rob 2018), as students are exposed to various critical thinking skills during the design process such as project management skills, research skills, organisation skills, representation skills, presentation skills and reflection skills (Carver *et al.* 1992; Lehrer 1993). During the design process there are analysis, synthesis, investigation, composing, constructing, re-writing, re-composing, etc. which require mental effort. Hence the student becomes a producer instead of a consumer (Kafai, Ching & Marshall 1997) while the final product enables the student as the designer to 'externalise' their knowledge (Jonassen *et al.* 2008).

Cognitive constructivism refers to learning as a process which requires that the individual actively constructs knowledge in the mind utilising past experiences as the initial foundation (Piaget 1968, cited by Rob & Rob 2018) through a process of accommodation and assimilation which requires the adjustment of mental schemes (Bodner 1986; Carpendala, Müller & Bibok 2008; Kohler 2008). The learning process thus involves the active knowledge

construction by the individual student and as such opposes the mere transmission of knowledge (Rob & Rob 2018). Rob and Rob (2018: 274) further posit that 'people learn more effectively when they are engaged in constructing personally meaningful artefacts' thus linking to the premise of knowledge-as-design of Perkins (1986) and accordingly supporting the proposal presented in this chapter.

Social constructivism is attributed to Vygotsky, who posits that knowledge construction occurs on two levels, namely on the social plane due to interaction and then inside the self on an individual plane (Ackerman 2004 citing Vygotsky 1978 in Lock 1989), taking into consideration, knowledge construction or learning and the social context and culture: which includes language, systems and the interaction with individuals from the community (Ackerman 2004).

Constructionism is ascribed to Papert (Ackerman 2001; Kynigos 2015) and refers to 'the art of learning, or 'learning to learn', and on the significance of making things in learning', with emphasis on the interaction through dialogue or conversation with their own and their peer's designed products or artefact to promote the construction of new knowledge (Ackerman, 2001, p. 438; see also Rob & Rob, 2018). Tools, media and context play a significant role according to Papert (Ackerman 2001, concerning Seymour Papert) in knowledge construction, aspects which Piaget seemed to overlook (Ackerman, 2001). Papert's (Rob & Rob 2018) constructionism denotes nine learning dimensions, namely (1) past experience; (2) new experience; (3) meaningful artefact (linked to a specific goal); (4) real-world product; (5) collaboration; (6) sharing with others; (7) tools (including ICTs); (8) media; and (9) context (Rob & Rob 2018: 277). As such, Papert (Papert & Harel 1991) is thus a proponent of meaningful product creation, or as Ackerman (2001) states *'making things [emphasized in italics] in learning'* by utilising technology as a cognitive tool to as Jonassen *et al.* (1996; 1999; 2008) state to 'learn with' and not to 'learn from'.

Literature and research-based evidence portray a positive picture of project-based learning coupled with product creation. Zancul, Sousa-Zomer and Cauchick-Miguel (2015) as well as other authors point to the potential benefits of project-based learning. This includes enhancement of motivation, satisfaction, long-term learning skills, collaboration, problem-solving, accountability, independent learning, integrate learning from other subjects or modules, and self-taught knowledge (for more detail see Bell 2010; Kokotsaki,

Menzies & Wiggins 2016; Frank, Lavi & Elata 2003; Amissah, 2019).

5 Project-based Learning

Project-based learning or project work is not a new development, but it seems that it is under-utilised (Tan & Chapman 2017). It refers to the engagement of students in the form of a project to 'find ways to verify a phenomenon or solve a problem' which involves various thinking skills (Tan & Chapman 2017). Kraus and Boss (2013) distinguish between project-based learning and thematic learning by stating that thematic learning does not imply a project for example. They continue by stating that project-based learning contains certain essential aspects such as 'gain[ing] important knowledge, skills, and dispositions by investigating open-ended questions to "make meaning" that they transmit in purposeful ways' (Kraus & Boss 2013: 5). Larmer and Mergendoller (2010) posit that there are a few key principles that can assist with making a project meaningful, namely (1) a need to know; (2) a driving question; (3) student voice and choice; (4) 21st-century skills embedded; (5) inquiry and innovation are required; (6) feedback and revision; and (7) a publicly presented product.

The planning for project-based learning consists of a series of steps to be followed, namely (Stix & Hrbek 2006: 167):

- Step 1: Setting the stage for students with real-life samples;
- Step 2: Taking on the role of project designers;
- Step 3: Discussing and accumulating the necessary background information;
- Step 4: Negotiating the criteria for evaluation;
- Step 5: Accumulating the materials;
- Step 6: Creating the project;
- Step 7: Preparing to present the project;
- Step 8: Presenting the project; and
- Step 9: Reflecting on the process and evaluating the process.

From the literature, it is observable that there is not a one-size-fits-all framework, as the steps to follow are different, yet share similar nuances (see, for example, Sherman & Sherman 2004; Krauss & Boss 2013). Our proposed

strategy as activity contains these project-based learning elements. However, it does not follow it strictly while at the same time it is more comprehensive. As such, the intention is to provide substance by showing through the version presented in this chapter, how it can be done when students create a product based on a topic, theme or problem presented. Equally important, the rationale is that the completed product should require that peers engage with the product. This can be done by uploading it online to a learning platform, disseminated via email or shared through social media tools such as WhatsApp.

6 Creation and Technology Options

Our strategy could be implemented in four possible ways. The first one offers three options and is lecturer centred. The second is individually student centred. The third is pair-based student centred and the fourth and last option is group-based student centred:

- Lecturer created and all students answer individually, or in pairs or groups larger than two;
- Individual-student created: Product or artefact is created and shared with lecturer and student class group (peers);
- Pair-student created: Product or artefact is created and shared with lecturer and student class group (peers); and
- Group-collaborative student created: Product or artefact is created and shared with lecturer and student class group (peers).

The product as a response can range from utilising very low-tech to moderate tech completed individually, in pairs or groups larger than two members and will depend on the type of access the student has to technology devices, software or applications and internet connectivity. Some of the possibilities are as follows:

- Paper-based product or portfolio;
- PowerPoint slides designed on paper (low-tech), but not on Power-Point if the student does not have access to the software and an ICT device. However, slides can still be designed on paper (storyboarding) and handed in as product;

- PowerPoint slides using PowerPoint or equivalent (freeware such as Libre Office or Open Office) with no narration (simple tech);
- PowerPoint slides with narration using PowerPoint or equivalent saved as a ppt file (simple tech);
- PowerPoint slides with narration using PowerPoint or equivalent saved as mpeg4 video (simple tech);
- Cellphone cellphilm creation (simple tech); and
- Wiki (moderate tech), which requires online connectivity.

The creation and tech options should become clearer after engaging with the following two sections.

7 ICT-assisted Project-questions-based Learning Strategy in a Combination of a Predominantly Lecturer-centred Space

In the following subsections, we present the different phases of the strategy that a lecturer could follow. The detailed overview as presented on the following pages resonates with Ferris and Wilder (2017) who show what is required from the lecturer and student, i.e. the 'how to' dimension, as strategies should be shared with a view to learning becoming active and meaningful. This three-phase strategy presented in this section is lecturer-centred for most of these three phases. The lecturer is actively involved in most of the activities as it is evident from Phase 1. It is only in Phases 2 and 3 that the students are active when they engage with the creation of their artefact in Phase 2. In Phase 3, depending on the availability of internet access, students could also be involved in the online discussions and feedback activities. The role of the student during this strategy is to design a product based on the sources, provided questions, and a prescribed technology-related tool which derives from the lecturer (see Phase 1).

The focus of the proposed learning strategy requires the utilisation of technology on either a low, simple or moderate level. It is important to think about which technology-related tools (applications or software) could be utilised by students while being offline most of the time as well as how data consumption could be minimised when online. The outline of the phases must be presented in writing (electronic format) to students to guide them. The

various phase headings and the first bullet below each phase heading, can be used. The lecturer, as a designer of this project can then select the aspects alluded to. These aspects will be included in the requirements to be sent to the student in greater detail, i.e. shaping, moulding or adapting it to serve the purpose required. The proposed framework is not cast in stone. Hence the lecturer as the designer, is encouraged to experiment and to move aspects indicated under Phase 1 in a different sequence as needed. Figure 2 visually depicts the proposed framework.

7.1 Phase 1: Lecturer Preparation

- Decision making
    - Select topic, theme or problem to investigate related to academic content.
        - Articulate the above into a paragraph that sets the scene in three to ten lines through writing or typing it. Provide an overview of what has to be done and what is expected.
        - Present clearly that the intention is that peers should benefit from the product creation, as they will or could be exploring the created product to assist them with their learning and understanding of the topic, problem or theme.
    - Indicate to the students that they will be designing their project for an audience, i.e. their peers and lecturer who could also act as possible reviewers (see Phase 3).
    - Phrase the initial outcomes and refer to Bloom's (1956) taxonomy or the revised taxonomy of Anderson *et al.* (2001)
    - Type of student involvement in the project
        - Lecturer created and the students respond individually,
        - Lecturer created and the students respond in pairs (students agree upon pairs or lecturer assigns pairs) or
        - Lecturer created and students respond in groups of three to five (students agree upon group or lecturer assigns groups).

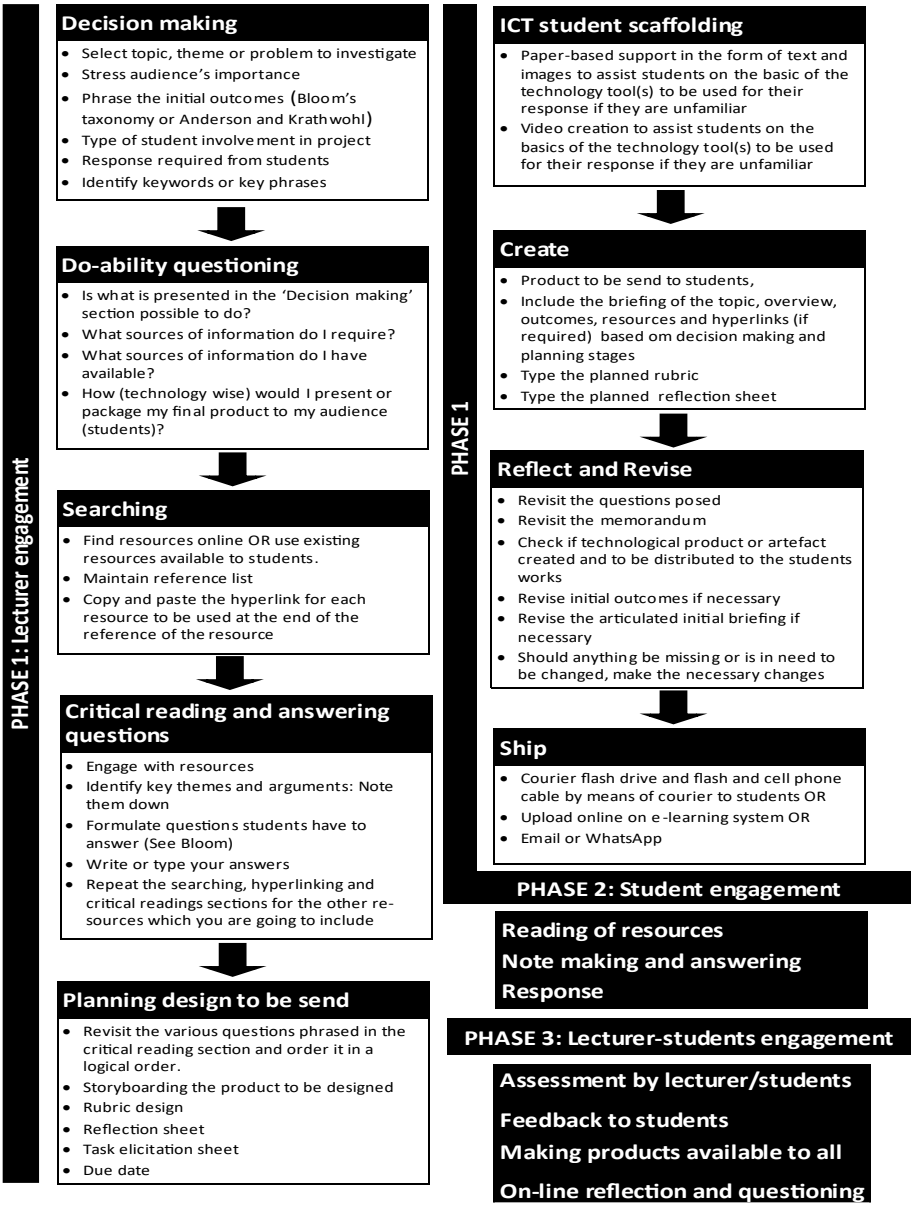

Figure 2: Visual presentation of the proposed framework

  - Response required from students
    - Paper-based artefact as a response project to be emailed, WhatsApp-ed or uploaded to an online e-learning system.
    - ICT-based artefact created offline in e.g. Ms Word, PowerPoint, Ms Publisher, Ms Excel, etc. to be emailed, WhatsApp-ed or uploaded to an online e-learning system.
    - ICT video created artefact utilising cellphone offline to create a cellphilm as a response (topic will determine the appropriateness of such a response).
    - ICT based fully online tools utilised such as the creation of an online website such as Wix, a Wiki, etc. Any content, links, files, images, text, etc. are presented as an artefact in the cloud.
  - Keywords or key phrases to be written down or type these through using brainstorming with yourself if online searching is required [if not, skip this].

- Do-ability questioning
  - Is this what has been articulated above do-able? If not, revisit the *'Decision making'* process and revise.
  - What sources of information do I require?
  - What sources of information do I have available?
  - How would I present or package my final product to my audience (students), i.e. which applications or software are required that they should have access to?

- Searching [if online searching is required, or else skip this].
  - Find resources online OR use existing resources available to students, e.g. textbook(s), handouts, etc.
  - Write, type or copy and paste the references of the sources
  - Copy and paste the hyperlink for each resource to be used at the end of the reference of the resource.

- Critical reading and answering questions

- Read the resource that you have searched for or watch the videos that you have found and make notes for your reference.
- Identify key themes and arguments and note them down.
- Formulate any questions which you would want your students to answer based on the resources that you are reading.
    - Indicate Bloom *et al.* (1956) or Anderson *et al.*'s (2001) taxonomy level within brackets at the end of each question.
    - Ensure that questions on most of the cognitive levels as indicated by Bloom *et al.*'s (1956) or Anderson *et al.*'s (2001) taxonomy have been phrased. If not, revise and ensure that there are questions on the higher levels and not only on the first three lower levels.
- Write or type your answers to the posed (created) questions to serve as a memorandum.
- Repeat searching for and inserting hyperlinks related to the required media to be included, e.g. articles, videos (online, downloaded or self-created), textbooks, etc. until you have all the resources that you deemed necessary for your students to engage with.

- Planning design of artefact or product to be sent to students
    - Revisit the various questions phrased in the critical reading section and arrange it in a logical order.
    - Storyboarding the product to be designed (if required).
    - Rubric design.
    - Reflection sheet [This can be sent electronically or in printed form as part of the project briefing. This can be completed on a daily, twice daily, weekly and/or at the end of the project].
        - What goals have you set for your project?
        - Which of these goals have you achieved and which not? Provide reasons.
        - How did you plan to complete your project on time?
        - What did you think about while you were busy with your project? Why?

        - Have you experienced any problem or struggled with anything? Explain.
        - Were these problems solved? If 'yes', by whom and how?
        - What have you learnt during this project? (NOT about the content, but skills-wise).
        - Which aspects of the project made you feel proud?
        - What will you do differently next time? Why?
    - Task elicitation sheet reflecting on aspects that the student should engage with during the project. Think about all the different things, tasks and thinking that you had to do, which were important for you to be successful in this project (not the things that you should have done). Write down each of these things and below each one, how this aspect helped you or hindered you. [This can be sent electronically or in printed form as part of the project briefing]
    - Due date of submission.

- ICT student scaffolding [if required]
    - Paper-based support in the form of text and images to assist students on the basics of the technology tool(s) to be used for their response if they are unfamiliar with any of the required tools AND/OR
    - Video creation or links to videos to assist students on the basics of the technology tool(s) to be used for their response if they are unfamiliar with any of them. The videos thus provide the *'how to'* use the tool(s).

- Create the product
    - Create the product to be sent to the students.
    - Include the briefing of the topic, overview, outcomes, resources and hyperlinks (if required) created, utilising the application(s) or software selected, as well as utilising the ideas planned on the storyboard.
    - Type the planned rubric.
    - Type the lecturer planned reflection sheet.
    - Type task-elicitation sheet.

- Reflect and revise
    - Revisit the questions posed.
    - Revisit the memorandum.
    - Test and check if the created electronic product or artefact works, before it is distributed to the students if you create an electronic product. Else, check and revise electronic 'paper-based' material if required [if an electronic product is not going to be sent].
    - Revise initial outcomes, if necessary.
    - Revise the articulated initial briefing, if necessary.
    - Should anything be missing or needs to be changed, make the necessary modifications.

- Ship
    - Courier the flash drive and cellphone data transfer cable (cellphone connector on one side of cable and USB connector on the other side of the cable for access from USB drive to a cellphone, if necessary) through employing a courier to students OR
    - Upload online on e-learning system OR
    - Email or WhatsApp or use similar technology.

7.2 Phase 2: Student Engagement

- Reading of resources
- Note making or typing of the answers
- Response required
    - Create a response based on the requirements of the project.
    - Complete reflection sheet and task-elicitation sheet.
    - Email or WhatsApp completed project to the lecturer or upload onto the online system, depending on the requirements stipulated in the project briefing.

7.3 Phase 3: Lecturer-students Engagement

- Assessment by lecturer or students.
- Feedback to students via email, WhatsApp, online e-learning or in a manner decided upon.

- Making products available to all students for their perusal (if connectivity allows it).
- On-line reflection and questioning (if connectivity allows it)
    - Students engage utilising WhatsApp, discussion group created by the lecturer on online e-learning system or equivalent, etc. on questions that the lecturer provided. This will only occur if connectivity is available to students.
    - Students pose questions on the group with which peers can engage and respond to related to their engagement with the products.

This approach requires good planning skills and ICT skills from the lecturer pursuing this learning approach. It is also vital that whenever possible, students should be reminded about their project in a manner that conveys excitement from the lecturer's side to act as motivation. Furthermore, it is important to make them aware that should the Phase 3 part '*Making products available to all students for their perusal'* and *'Reflection and questioning'* be considered by the lecturer, then the students should also be reminded that they are designing for an audience. This is important, as the greater awareness of an audience could result in taking their prospective viewers' needs into account, through anticipating what they think their needs are (see Hung 2019). It might also require students to think carefully about their planning and presentation (Liu 2003).

8 ICT Assisted Project-questions-based Learning Strategy in a Predominantly Student-centred Space

In the previous section we presented an *'ICT assisted project-questions-based learning strategy'*. This was a predominantly lecturer-centred space, i.e. it was the lecturer that was mostly active. However, the *'ICT assisted project-questions-based learning strategy in a predominantly student-centred space'* presented in this section, relinquishes most of the lecturer control and decision-making to the student, student pairs or a collaborative student group to be actively involved in everything that the lecturer previously controlled, except the provision of the topic, theme or problem to be investigated. Alternatively, the lecturer could provide the topic and overview section and students

thereafter have an option to agree with what has been provided or adapt the proposals that could be then considered by the lecturer. This could result in some students engaging with the original brief, while others could pursue the adapted or altered preference.

The role of the student during this strategy is not only to design a product, but also to locate the sources and to phrase questions on the different levels of Bloom *et al.* (1956) or Anderson *et al.*'s (2001) taxonomy. The student is thus in control while the lecturer merely provides the topic whereas everything else stipulated in Phase 1 requires full engagement from the student.

As stated in the *'ICT assisted project-questions-based learning strategy in a combination of a predominantly lecturer-centred space'* section, it is important to reiterate that students have to be provided with a detailed product brief, as well as the steps that they should follow to develop their product as students-as-designers so that there is the least possible ambiguity. When students are engaged within the *'ICT assisted project-questions-based learning strategy in a predominantly student-centred space'*, they are taking over most of the roles of the lecturer in a student-as-designer approach. Hence, it is imperative that students submit a detailed, yet brief, reflection as an overview of how they approached Phase 1, i.e. what they have done concerning each heading including any problems experienced and how these problems were solved. The might also require to submit a task-elicitation.

9 Linking the Cognitive and Knowledge Process Dimensions to the Proposed Strategy

The presentation in Table 1 depicts the extent to which the integration of cognitive and knowledge process dimensions is present in the proposed learning project-based strategy, utilising the matrix of Anderson *et al.* (2001).

Table 1 Overleaf:

Knowledge and cognitive dimensions of student-created cyber-local artefacts embedded in critical self-reflection utilising the revised taxonomy of Anderson *et al.* (2001)

Cognitive process	Types of knowledge			
	Factual (Basic information)	**Conceptual (How basic information connects)**	**Procedural (Ways on how to do something as well as knowledge of the criteria used)**	**Metacognitive (Thinking about one's own thinking or progress)**
Remembering (Recall)	Students pose questions at this level Student or peers answers questions posed on the lower level (knowledge)		Recall technology skills when utilising applications or software	
Understanding (Providing a summary, comparing or classifying something)		Students pose questions at this level Student or peers answers questions posed on the understanding or application level	Searching for information and evaluating the quality of the information found	
Applying (Applying or carrying out a procedure)	Student engage with peer's designed projects		Students pose questions at this level Student answers questions posed on the understanding or application level Apply technology skills when utilising applications or software	
Analyzing (Investigate something)	Student engage with peer's designed projects	Students pose questions at this level Student or peers answers questions posed on the analysis level		Reflection on own part using journal reflection writing based on questions related to experiencing the project: Skills, knowledge and procedures
Evaluating (Assessing a product, process or something else based on criteria)	Student engage with peer's designed projects (forming assessment meaning) OR Formally assess a peer's project	Student engage with peer's designed projects (forming assessment meaning) OR Formally assess a peer's project	Student engage with peer's designed projects (forming assessment meaning) OR Formally assess a peer's project	Student critically reflect on peer's designed projects Reflection on own part using journal reflection writing based on questions related to experiencing the project: Skills, knowledge and procedures
Creating (Producing a product, planning or designing a product or procedure)		Students design and create their project individually, pairs or as a group	Students design and create their project individually, pairs or as a group	Reflection on own part related to their design, possible changes to be made in future and why these changes

It is evident from the table that mapping the proposed strategy seems to address cognitive processes and knowledge types on all sides of the spectrum. Accordingly, it thus appears that the presented project approach does not merely focus on one cognitive dimension, namely knowledge acquisition. However, it has as its focus, where students are actively involved in a 'knowledge-as-design' approach as proposed by Perkins (1986). We posit that this strategy as an activity has the potential to contribute to the development of knowledge, cognitive skills, technology skills, planning skills, as well as questioning and answering skills.

10. Conclusion

We find ourselves in unchartered waters where higher education institutions are faced with difficult decisions between rescuing the academic year on the one hand, and on the other, risking students' lives with further infection and death. The COVID-19 pandemic has further exposed the historical fault-lines of the South African society. The epistemological exclusion of students from poorer backgrounds that has characterised higher education for decades could now be exacerbated by the automatic switch to online teaching, thereby advantaging once more, the middle and the affluent classes. The promotion of e-learning (or emergency remote learning) during this trying time is an emergency response where face-to-face teaching of the traditional classroom, is simply replaced with online teaching without deeper pedagogical and practical considerations, which thus could result in dissonance.

The bigger question that our chapter raises is: How can we create equitable digital or online platforms that enhance meaningful learning? Our chapter envisages offline-online learning and teaching that do not simply replace face-to-face traditional teaching with digital platforms, but is a rethink of pedagogy itself. This strategy builds on blended learning which our Faculty of Education adopted a few years ago. This strategy is also based on our understanding that learning is not only cognitive by nature, but is also social in character. If there is one lesson that the lockdown and social distancing has taught us, it is the fact that as humans we need social interaction. The chapter also makes suggestions as to how to get students involved in their own learning, which is an age-old question in education. We are of the view that a dual strategy of offline-online teaching presents a better alternative than a pure online option which is also better aligned with equity goals. It is by no means

perfect and has many weaknesses in the unequal social, economic, and educational contexts of South Africa. As such, those interested in implementing the proposed strategy are encouraged to adapt it to not only best serving their contexts and their students' needs, but to assisting with achieving their module outcomes, as well as addressing the digital 21st-century skills (American Association of Colleges of Teacher Education, 2010; 21st-Century Skills related to the Fourth Industrial Revolution, Reaves, 2019). As Blignaut (2020) aptly points out, we cannot continue teaching students of the 21st century with the same old approaches of yesteryear.

Covid-19 marks, we think, an important turning point for higher education to innovate and rethink the curriculum, pedagogy, and delivery modes. We are at the crossroads in higher education from a curriculum, pedagogic, and delivery-mode perspective. How we respond to these challenges could determine the very nature and survival of higher education in the future. The proposed strategy presented in this chapter might be useful and produce positive outcomes during and post COVID-19.

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