ENHANCEMENT OF CRITICAL THINKING SKILLS IN STUDENTS USING MOBILE-BLENDED LEARNING WITH A COLLABORATIVE INQUIRY-BASED APPROACH

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ABSTRACT

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Despite the emphasis on the need to teach university students critical thinking skills that will better prepare them for the future, most classrooms globally are still fraught with the old-fashioned approaches. These methods only focus on equipping students with knowledge of concepts that do not sufficiently avail them with the required abilities to solve real-life problems in modern society. Jobs in the 21st century require skills that are focused on what individuals can accomplish with their acquired knowledge through analysis, evaluation and reorganisation of information to solve problems. To achieve this, students need to be engaged in active learning that encourages the use of their cognitive process, in order to sufficiently prepare them for the future. Cognitive development requires that learning should not just consist of repetitive accumulation of facts and knowledge, but must also encompass effective deep conceptual change in order to support life-long learning. After a thorough review of the literature that focuses on blended learning and the development of critical thinking skills, as well as the contemporary demands of the world of work, this paper concluded that, with the appropriate competencies and support for both teachers and students, mobile blended linked with collaborative inquiry-based learning has the potential to enhance the students' skills.

Keywords: Blended learning; collaborative inquiry-based learning; critical thinking abilities

1. INTRODUCTION

In the 21st century, jobs require different abilities from employees, which were not associated with previous eras. These differences demand a change in the approach of teaching and learning in order to adequately empower learners with the skills to develop and transform their environment. It is obvious that educators continue to struggle to get the attention of today's children into a learning mode, which will better equip them for their future. This is because the focus is on what individuals can accomplish with their acquired

knowledge to analyse, evaluate and synthesise information to solve real-life problems. The jobs whose tasks involve analysis, creativity and problem-solving skills, increasingly require employees with critical thinking abilities (Ananiadou and Claro, 2009; Rimini and Spiezia, 2016). Today's children unlike former generations, grow up with rapidly changing technologies that make them less receptive to traditional modes of learning (Roehl et al., 2013). The Adoption of active learning processes is essential to better prepare learners for the future. The capacity to engage in critical thinking, enables an individual to proffer solutions to challenges in real-world contexts, rather than just equipping them with only specific knowledge of a set of concepts (Doerfert, 2011; Brierton et al., 2016). Critical thinking skills demands deep conceptual change and the reconceptualisation of information, to promote life-long learning.

The development of students' higher order thinking is critical in a knowledge-based society (Yeung, 2012; Leung, 2013; Lee and Lai, 2017), and also a requirement for survival in an ever changing technological world (Partnership for 21st century skills, 2009; Brierton et al., 2016). The need for technology integration, particularly mobile technology in education is to facilitate students' interactivity and collaboration, which culminates in developing their abilities to analyse and reorganise knowledge to solve real-life problems, is a necessity. The need for today's students to develop these skills has become exponentially important, as jobs that require repetitive operations are being taken over by robots and other technological devices (Murnane and Levy 2004; Cañas et al., 2017).

Despite the necessity for these skills, research reveals that teaching strategies that encourage the development of lower-order thinking are still being practiced globally (Obiete et al., 2015; O'Nwachukwu, 2017; Lee and Lai, 2017; Cañas et al., 2017). There is a resounding interest in the utilisation of blended learning, particularly in higher education (Bergmann and Sams, 2012). Recent studies found that blended learning with collaborative inquiry-based learning, demonstrated favourable effects on the development of students' cognitive processes (Wagner et al., 2013; Long et al., 2017).

2. BLENDED LEARNING

A close observation revealed that educational settings that once only supported face-to-face learning, are evolving rapidly into environments that now accommodate technology mediated learning. This emphasises the importance of facilitating interaction and collaborative efforts to achieve higher results in human endeavours (Graham, 2004; Cocquyt et al., 2018). In the past, distance learning was designed as a one-way communication between an expert (teacher) and a passive-receptor (learner) based on cognitive-behaviourist theory. As technology develops, distance learning is being used to facilitate interactive and constructivist (collaborative) learning by taking advantage of online communications, which allows students to study anywhere in the world.

Blended learning is a combination of two instructional models that incorporates both the traditional face-to-face classroom system, and an online learning platform (Liu et al., 2016; Han and Ellis, 2019) that employs a mix of asynchronous and synchronous interactions (Wu et al., 2010).

Online experiences offer valuable tools that supplement or replace aspects of face-to-face traditional lectures, and textbook-based approaches to teaching and learning. Lectures encourage memorising and the recalling of information, which are lower levels of Bloom's taxonomy of learning (Bloom et. al., 1956), while engaging in real-time problem solving during class, enables students to synthesise and apply knowledge through reflection and reconceptualisation of ideas (Graham, 2004; Amador et al., 2006). Research has revealed that a course-design embedded with in-class problem-solving, improves learners' performance and reduces the achievement gap between the students (Stockwell et al., 2015).

The availability and utilisation of digital learning facilities, have led to increased deployment of ICT-mediated instructional elements into the conventional learning environment. This practice affords educators the opportunity to help their students acquire the information and terms associated with the course before class starts, which provides them time to carry out collaborative problem-solving tasks that engage their cognitive processes (Couch, 2014; Clark, 2015; Lee and Lai, 2017).

In any e-learning scenario such as mobile-blended learning, students are expected to exercise self-efficacy and regulative skills, while the teachers who are experts in their fields, should be responsive to the interactions of the learners on the platform to achieve the desired objectives. This type of learning does not imply a mere combination of the two models, but involves their integration to achieve specific learning objectives by taking advantage of the two environments.

This method affords teachers adequate class time for collaborative problem-solving activities, demonstrations, question and answer sessions, and other engaging tasks that lead the students to a greater depth of understanding (Saitta et al., 2016). It is a pedagogical approach that provides teachers with the

opportunity to invert the classroom and homework activities (Du et al., 2014; Obari and Lambacher, 2015), which allows them more time to tutor their students (Wallace, 2014; Alsowat, 2016).

Studies have shown that students can watch, pause and repeat the online learning materials on their mobile devices, which allows them to gain a clearer understanding of the content before class (Herreid and Schiller 2013; Lee and Lai, 2017). This affords the teachers sufficient time to engage them in collaborative inquiry tasks that promote their critical thinking abilities. Nederveld and Berge (2015) stated that in blended learning, teachers are able to concentrate on the application of knowledge of higher-order learning, instead of lower-level thinking activities, which offers the opportunity to identify mistakes and reinforce critical and creative thinking as well as effective communication.

When students are sent learning materials to study via mobile devices, it ensures a more collaborative and engaging environment in the classroom, enabling them to evaluate and reconceptualise the content for problem solving in real life situations. In higher learning institutions, students appreciate the opportunities of flexibility and improved access to learning materials offered by this technology, which results in greater academic achievements due to improved interaction and collaboration with both their peers and lecturers (Talley and Scherer, 2013; Vaughan, 2014; Alsowat, 2016).

3. COLLABORATIVE INQUIRY-BASED LEARNING

In an environment where education is student centred, learning is considered as knowledge constructing activities where learners collaboratively obtain, reorganise and use the information acquired for analysing and problem solving. Collaborative learning refers to the instructional method that offers the opportunity to learn as a team with positive interdependence, group accountability and interactions which culminates in assisting others to accomplish specific targets (Slavin, 2014; Fu and Hwang, 2018). Collaborative inquiry-based learning is an approach that involves asking questions, gleaning information and new ideas in order to solve problems as a group. This type of learning helps students to exercise their analytical skills (identify similarities or differences in content) to define the cause of change in a variable and its effect (Duran and Dokme, 2016). Mobile-blended learning integrates and exposes students to real-world contexts that trigger their critical thinking processes, while teachers play the role of a guide/facilitator in scaffolding learning through timely questioning (Livingstone, 2012; Zoha and Cohen, 2016).

This approach focuses on active learning, encouraging students to ask questions, formulate hypotheses, and test them using problem solving techniques (Laru et al., 2012). Such learning takes place when students glean both content and reasoning skills including practices within a discipline, via collaborative investigation suitable for real-world situations. In interactive inquiry-based learning, students exercise reflection and approach situations critically. This involves the students' ability to investigate and search for information, which allows them to formulate their own ideas through critical thinking (Seranica et al., 2018). Authentic learning results from a social constructivist's view, which emphasises that learners are active researchers, and knowledge is generated by investigating and actively experiencing reality.

To encourage productive interaction that promotes critical thinking, sufficient scaffolding is necessary because according to Vygotsky (1978), it makes learning more manageable for students by presenting complex tasks in a manner that makes them accessible, feasible and within the learners' grasp. The factors of inquiry-based learning include both structure and the types of activities that are required by learners to enhance their thinking skills, which will allow them to address problems (Prince and Felder, 2006; Levy and Petrulis, 2012). The focus of inquiry is the comprehension of existing knowledge to resolve situations and develop new abilities; the structure involves inquiring questions framed by teachers or students; and tasks that include problem solving and investigations of practical situations, which results in the generation of greater understanding.

Engaging in social interaction with peers in real-world contexts has the potential of facilitating learners' ability to reflect on previous exposure, and collaborative inquiry learning environments, is critical in developing their social experiences (Hwang et al., 2011; Fu and Hwang, 2018). Such social interactions should be focused on the promotion of critical thinking abilities, which will enable the students to effectively transfer knowledge across courses and apply it to unfamiliar situations. Interactive and collaborative environments empower them to exercise their minds enabling them to formulate solutions to problems and develop higher-order tendencies, as they respond to their peers' questions in more complex and confident ways. Modern mobile technologies can assist students in gaining greater knowledge, due to their portability and support for collaboration that leads to the exploration and discovery of new information.

4. TEACHER'S ROLE IN COLLABORATIVE INQUIRY-BASED LEARNING

The teacher's role in any inquiry-based learning, is to guide the learners to unfold knowledge themselves by playing the role of a facilitator rather than that of an information provider. Zuckerman et al. (1998) stated that within inquiry-based learning, the teachers must stimulate their students' imagination by presenting them with situations that are within their grasp to recognise the new elements that relate to their existing knowledge, and provide them the opportunity to work collaboratively to resolve the problems. Students must be encouraged to continually ask questions to assess their understanding and improve their knowledge.

When teachers are actively involved in challenging students to think by using questions to guide their thought processes, they become more focused in their desire for knowledge. Effective implementation of inquiry instruction, requires teachers to appropriately scaffold activities that will enable their students to understand how to exercise their minds as they collaborate with their peers, and how to deeply reflect on their acquired step-by-step knowledge of how to resolve situations (Harris and Rooks, 2010; Gillies and Nichols, 2015).

5. CRITICAL THINKING

Learning experiences that emphasise analysis, evaluation and synthesis help to develop skills for problem-solving through interpretation, creativity and generalisation. These learning experiences promote reproductive thinking rather than productive reasoning. Thomas and Thorne (2009) stressed that critical thinking ability is a level that is beyond memorisation of information or quoting facts back to an individual in exactly the same manner as they were previously expressed. It is the use of critical and creative thought that enables an individual to solve complex problems through analysis, evaluation and synthesis of knowledge (Yeung, 2012; Lee and Lai, 2017). Critical thinking is observed when an individual receives and stores new knowledge, while interrelating and applying such information to address unfamiliar situations. It is the ability of individuals to achieve a complex and logical thinking process that allows them to interpret, evaluate and manipulate previous experiences, in order to confront present life challenges.

6. THE NEED TO DEVELOP HIGHER ORDER THINKING IN STUDENTS

The development of critical thinking has been a major educational goal for many years, because it equips students with the ability to work and address challenges throughout their lives (Association of American Colleges and Universities, 2010). Research has shown that memorisation of knowledge does not result in the ability to use it to solve problems (Brierton et al., 2016; Hwang et al., 2017). All levels of education aim to produce students who are critical thinkers, analytical and problem solvers who are not only able to acquire concepts, but also able to evaluate and synthesise their knowledge to address various scenarios. Newmann (1988) maintained that while critical thinking means challenging and a broader use of the mind, lower-order thinking occurs in a routine manner that limits the potential of the mind. This use of the mind is accomplished through analysis, clarification and manipulation of information to resolve problems. Therefore, the ability to adequately comprehend the context of a problem is very critical, because it helps in the application of appropriate knowledge to the situation.

Critical thinking abilities are required for survival in an ever-changing technological and knowledge-based society (Partnership for 21st century skills, 2009; Brierton et al., 2016), which can be developed through collaborative learning. This necessitates the need to integrate mobile technology in educational contexts to facilitate student's interactivity and collaboration, that will culminate in the building and development of their cognitive abilities (Chang et al., 2011; Hwang et al., 2017), because of its excellent functionality and the pervasiveness among both teachers and learners. Students who utilise ICT facilities in their studies gain a deeper understanding of complex concepts and develop critical thinking abilities as well as being able to apply what they have learnt to solve real life problems (Boyce et al., 2014; Wong et al., 2015). The information-driven society workforce requires a generation of individuals who can think individually and make effective decisions. The development of critical thinking skills in students cannot be over emphasised in order to promote the conversion of their knowledge and skills into being productive in the workplace.

7. LINKS BETWEEN MOBILE-BLENDED WITH COLLABORATIVE INQUIRY-BASED LEARNING APPROACH AND CRITICAL THINKING ENHANCEMENT

When mobile-blended learning is effectively implemented, teachers acquire a greater amount of class time to engage students in collaborative inquiry-based learning (Fu and Hwang, 2018; Jantakoon and Piriyasurawong, 2018). As students work collectively and share ideas on their inquiry activities, such a collaborative and interactive context facilitates the development of their creative thinking which better equips them for effective participation in their later life engagements.

The aim of education in this digital era is to expose students to more active learning, which facilitates their collaborative problem-solving abilities, culminating in equipping them with the realities of the world of work. When students are engaged in real-time inquiry tasks during class, it encourages them to analyse, evaluate, synthesise, and apply knowledge through reflection and reconceptualisation of ideas. Critical thinking ability is a level that is beyond the memorisation of information or quoting facts back to an individual in the same manner as they were previously expressed (Thomas and Thorne, 2009). It is the use of critical and creative thought that enables an individual to solve complex problems through analysis, evaluation, and synthesis of knowledge (Lee and Lai, 2017). The constructivist theory emphasised that learners are required to be exposed to learning experiences that inspire and empower them to construct their knowledge, leading to the facilitation of their thinking abilities.

In an environment where education is student-centred, learning is known as knowledge constructing activities where learners collaboratively obtain, and improve on the information acquired to solve problems. Interaction and collaboration are important in the process of developing students' critical thinking (Slavin, 2014). They need to reflect on what they were previously exposed to, and what they are currently experiencing.

Engaging in social interaction with peers in real-world contexts has the potential of facilitating learners' ability to reflect on previous exposure and views. These social relationships promote the development of their cognitive processes that enables them to effectively transfer their knowledge across courses, and apply it to unfamiliar situations. Collaboration enables students to interact among themselves by exchanging views and ideas to effectively discover new knowledge to accomplish their objectives. It allows them the opportunity to benefit from the inspiration of working as a team, while assisting each other to achieve specific objectives (Fu and Hwang, 2018). Interactive and collaborative environments empower learners to exercise their minds to find solutions to problems and develop higher-order tendencies, as they respond to their peer's questions and remarks.

8. ENHANCEMENT OF CRITICAL THINKING SKILLS IN STUDENTS USING MOBILE-BLENDED WITH COLLABORATIVE INQUIRY-BASED LEARNING APPROACH

This approach involves both before and during class activities (mobile-blended learning). The before class activities are classified as online or mobile learning because they are mediated by technology, while the class activities are focused on the development of their critical thinking skills. The instructional content is delivered online, which allows the students to study at their leisure, in order to create adequate time for problem-solving activities in the class. It is during the face-to-face classes that the teachers have the opportunity to engage the students' cognitive skills by challenging them to use the knowledge they derived from the mobile content, to solve real-life problems.

8.1 Teacher' mobile activities (before class)
1) Teachers analyse learners' needs, to establish their learning objectives.
2) The design and development of the mobile instructional content is the foundation of the in-class learning, and should equip the learners with sufficient information for inquiry activities during the face-to-face sessions (Fu and Hwang, 2018; Jantakoon and Piriyasurawong, 2018). The teacher needs to ensure that such content is explicit enough for the students to understand with little or no difficulty, by using the appropriate terms within their grasp.
3) Delivery of mobile instructional materials using an appropriate format (video, text, image or a combination of them) and with a user-friendly platform for students to study (Bergmann and Sams, 2014; Alsowat, 2016). Delivery of the online learning materials requires a user-friendly platform that is easy to use and functions effectively to promote blended learning (Shrain, 2012).
4) Enhance students' understanding of the mobile content by providing them with clarification of any confusing concepts. The online presence of the teacher should be sustained, to ensure interaction with the students. The learners' understanding of the content is reinforced when their

teacher engages them during interactive questions and answers, via their mobile devices. Teachers need to ensure that their students engage in social constructivism, by exchanging ideas about the content and search for related materials via mobile interaction (Fu and Hwang, 2018; Cocquyt et al., 2018). As they share ideas and search for related information online, they acquire greater insight, which leads them to an increased understanding of the content.

These activities are performed via mobile technology, which are fundamental in adequately preparing the learners for the interactive classroom that is focused on the development of their critical thinking skills.

8.2 Face-to-face activities to enhance critical thinking abilities (during class)

During real time classes, the role of the teacher shifts from that of knowledge provider to being a mentor or guide, with the following tasks:

1) Review of the mobile content. A recap of the instructional material at the beginning of the class is to refresh the students' memory, and provide them with the opportunity to ask questions about the content (Roehl et al., 2013; Bergmann and Sams, 2014; Lai and Hwang, 2016). During the review, the teacher will be able to ascertain the learners' level of understanding of the content through questioning, and correct any misconceptions of it. This will ensure that they are sufficiently empowered to solve problems, using the knowledge gained from the mobile material.

2) Grouping: Generation of real-life ill-structured problems. The exposure of learners to ill-structured problems, triggers their reasoning ability and engages their critical thinking (Smy et al., 2016; De León, 2018). This type of problem does not have specific direction, however, the learners are left to determine its direction, which allows them to proffer possible solutions. Such exercises engage their cognitive abilities, by empowering them with the abilities to approach challenges and find solutions in real-life contexts.

3) The students should be divided into heterogeneous learning groups. The ability of a learning group to solve problems collaboratively, depends on the diversity of the membership in relation to their domains of knowledge and backgrounds (Edmondson and Harvey, 2017; Avdiji et al., 2018). This diversity, to a large extent, determines their level of sharing perspectives and alternative solutions to solving problems. In heterogeneous grouping, the learners with a higher level of intelligence will inspire the ones with lower grades in inquiry learning, which helps to eliminate the stigmatisation of the low achievers when the grouping is homogenous. In addition, the diversity of the learning group members determines the effectiveness of their collaborative efforts, because it reflects their domains of knowledge and environment.

4) Facilitating or elaborating interactions among the learners. Ensuring that students engage in discussions amongst themselves to find solutions to problems collaboratively, enables them to engage their cognitive process, as they work their way through the stages of critical thinking (Clark, 2015; Lee and Lai, 2017). Learners should be exposed to activities that lead to elaborate interactions within their groups. This helps them to share ideas, which results in reflection and reorganisation of their knowledge in their inquiry learning activities. Such reflection and reconceptualisation of previous knowledge promotes their skills to analyse, evaluate and synthesise the perspectives of their peers to solve problems, while developing their own critical thinking skills.

5) Scaffolding learners' knowledge. While the students continue their collaborative inquiry learning tasks, teachers play the role of a guardian and facilitator, by scaffolding their knowledge with questions that encourage them to exercise their minds to resolve unfamiliar problems. Effective implementation of inquiry instructions, requires teachers to appropriately scaffold tasks that will enable their students to understand how to exercise their minds, acquire step-by-step knowledge on how to address situations, collaborate with their peers and how to deeply reflect on their learning (Harris and Rooks, 2010; Gillies and Nichols, 2015; Cañas et al., 2017).

9. EVALUATION OF MOBILE-BLENDED LEARNING INNOVATION

The implementation of mobile-blended can be evaluated to generate information on the level of its effectiveness. The evaluation is usually conducted by experts of blended learning, to ascertain the success level of the innovation. The students and the teachers were asked to express their opinions on the process, with the aid of a questionnaire (Woltering et al., 2009). This form of evaluation, will provide information that will determine the modifications required for making the project more effective (Kurt, 2017). The questionnaire for the learners is usually anonymous and structured to elicit responses regarding their satisfaction,

motivation, learning gains, etc., about the innovation, as well as the instructor's attributes, the teamwork, the design, the amount of work, etc., using the five-point Likert-scale (Woltering et al., 2009; Bernard et al., 2016).

The teachers' questionnaire is focused on the practicability of the process, such as workload, allocation of time for both online and classroom contexts, training requirements, etc. Both the teachers' and students' evaluations, as part of the follow-up activities, determine whether or not the innovation is effective in achieving its goal, and to identify the areas that can be improved upon for efficiency and effectiveness (Guskey, 2003).

10. FACTORS THAT FACILITATE A SUCCESSFUL MOBILE-BLENDED LEARNING PROJECT

The following include the major factors that encourage successful adoption of mobile blended learning.

10.1 School policy

The school policy should place a premium on the participation of the teachers in the process of deciding to introduce innovation. When teachers become part of the process of making such decisions to implement mobile-blended learning, they will readily assume ownership of the decision and willingly integrate it in their professional activities (Mangunda, 2003; Somech, 2010; Gelaye, 2019). Algoush (2010) stated that teachers' participation in the decision-making process in schools, leads to improved communications with school management and also promotes the quality of such decisions. As they are the custodians of teaching/learning and implementers of school activities, their involvement ensures valid and feasible decisions are made, as well as better implementation, resulting in improved students' achievement (Gemechu, 2014). Since teachers' inclusion is essential for the improvement and overall transformation of school activities, management should create opportunities that will encourage their participation (Bademo and Tefera, 2016). Their involvement will enable the management to glean information regarding the possible barriers of implementation, and find ways to eliminate them.

10.2 Competency

Teachers' skills to manage both the online and face-to-face components of mobile-blended learning helps to achieve the desired outcomes. Many researchers have highlighted the importance of the competencies of teachers in a mobile-blended learning environment, such as their technological skills and ability to adapt the appropriate blend of the two contexts, to achieve the desired outcomes (Alebaikan and Troudi, 2010; Korr et. al., 2012). Teacher development training should equip them with blended learning instructional design, pedagogy, learning management system usage, and assessment if they are to succeed in a mobile-blended learning environment (Oliver and Stallings, 2014; Arney, 2015; Pulham and Graham, 2018). Teacher's skills to appropriately guide students in mobile-blended learning contexts, towards achieving their goals. The ability of students to exercise maturity and readiness to study independently with self-regulated learning skills, and their mobile technology competence as well as the ability to manage time, determines their level of engagement and achievement.

10.3 Mobile instructional content

The design and delivery of instructional content for mobile learning is significantly different from those of other learning contexts (Caudill, 2007). Owing to the small screen size of the devices, the learning materials should be delivered in chunks that will avoid overwhelming the students (Jantakoon and Piriyasurawong, 2018). Where possible, video format should be used, because these forms of learning materials are most effective in blended learning (Lo and Hew, 2017). Learners are better prepared for the face-to-face component of blended learning, when they study the online materials in a video format rather than text-based content (Grypp and Luebeck, 2015). Teachers' online presence needs to be regular and interactive to promote students' understanding of the content. Since the mobile content is the foundation of the classroom activities, it should complement the face-to-face sessions of blended learning, and should also be available to students synchronously and asynchronously (Keskin and Yurdugül, 2019). This enables the collaboration of peers when it is synchronous, while it can be accessed to consolidate learning in the asynchronous mode. Also, the content should be delivered to the learners via a user-friendly platform. The ease of use and functionality of the online learning platform significantly affects learners' achievements in blended learning (Shrain, 2012). When the students are satisfied with the functionality of the learning management system, they will gain more from the project. The online learning content, quality of the technology, as well as how it is used, will have an impact on the learners' satisfaction and achievement.

10.4 Mobile-blended learning orientation

A robust orientation before the introduction of mobile-blended learning offers an opportunity to introduce both teachers and students to their various roles, appropriate hardware/software sensitisation,

assist them in setting up the devices, support them in setting up their accounts, and exposing them to the acceptable user policy of the school. Yi (2008) carried out a study to examine the effect of orientation on the adoption of blended learning among nursing students and claimed that it enhanced the communication skills and clinical practices. Washington (2009), one of the major proponents of blended learning, emphasised that orientation helps to promote learning outcomes and the attainment of the institutional goals. He stressed that induction and other factors, rather than dependence on technology alone result in a blend that leads to the achievement of the desired objectives. This process leads to improved functionality of the students' interaction with blended learning. Orientation managed by the instructional technology director is very useful, as it provides an opportunity to set up the devices, support students to set up their accounts, exposed the students to the acceptable user policy of the school and the guidelines on the use of the apps selected by the teachers (Reichert and Mouza, 2018). As the innovation is being implemented, the teachers and students that later join, also require a robust blended learning orientation, to ease their anxieties and enhance their confidence in this environment (Antwi et. al., 2019). Mobile-blended learning orientation, among others, provides a forum to explain to the users how and where they can seek support for effective participation, and the incentives for the teachers will help motivate them to be committed to the project.

10.5 Support for teachers and students in a blended learning environment

Teachers' support is found to be crucial in the implementation of blended learning. This support can be in the form of teaching assistants, technical support and exposure to successful blended learning prototypes, as well as orientation. Such forms of support can be accessed through teacher collaboration, experienced teachers serving as mentors to the beginners, while establishing technical support units, ensures smooth functionality of the devices and the entire innovation of mobile-blended learning (Heaney and Walker, 2012; Kenney and Newcombe, 2010; Gedik et al., 2013; Ma'arop and Embi, 2016). In the work of Han et al. (2019) technical and teaching support were found to be among the drivers of successful blended learning in schools, which boosted the teachers' confidence and allayed their anxiety in embracing this type of innovation. Teachers require regular training to enhance their competence on how to redesign content for online instruction and manipulate learning management systems proficiently (Arney, 2015; Pulham and Graham, 2018). Such support initiatives are directed towards achieving a proper blend of the two components in attaining the intended outcome.

Support for blended leaning students is necessary, because they are at the centre of the innovation. Rovai (2002) stated that when learners support themselves, their sense of belonging and social ties are enhanced, which in turn strengthens their participation in online learning. Support from teachers and peers is essential for encouraging and sustaining learners studying online (Lee et al., 2011; Fryer and Bovee, 2018). Also, the creation of a blended learning community is required to promote collaborative and interactive study. According to Astleitner (2000) as cited in Kintu et al. (2017), when collaboration and social support are not embedded in online learning platforms, participants feel isolated and eventually withdraw from studying the mobile content. Online teacher support is necessary for the promotion of higher order thinking skills in students, which reflects a constructivist approach to teaching and learning, while guarantying their sustainability (Johnson, 2017; Fryer and Bovee, 2018). Furthermore, Aghaee and Keller (2016) found that online peer support was very helpful for undergraduate students, which guaranteed the effectiveness of internet learning. In addition, Han et al. (2019) emphasised that timely support is essential to sustain blended learning and its effectiveness when teachers' and students' challenges are detected. Studies have shown that technical support is crucial to promote learners' effective interaction with technology mediated instructional materials, because it helps to eliminate the anxiety associated with the use of technological tools, and close the digital gap among students (Graham, 2004; Johnson, 2017; Cocquyt et al., 2018). Prior to implementation, the need to put in place a robust mobile-blended learning lifeline for the students, cannot be overemphasised because it helps to dispel their uneasiness and promote their confidence to leverage the benefits provided by the technology, as learning tools.

11. CONCLUSION

In order to adequately prepare students for modern society that expects the best from everyone, it is obvious that there must be a paradigm shift from teaching that only equips them with specific concepts and skills, to strategies that will challenge and broaden their outlooks and minds. This will enable them to question the knowledge they have acquired so as to create their own understanding from their abilities to analyse, evaluate and synthesise information to solve real-life problems. The implementation of blended learning requires adequate infrastructure, competent and motivated teachers who are able to better equip their students to effectively contribute to and benefit from knowledge-based society.

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