Innovative Pedagogies

The Impact of Blended Learning in Higher Education during the Covid-19 Pandemic

Tabo, Geoffrey Olok; Dirckinck-Holmfeld, Lone; Bygholm, Ann Kathrin Meilandt

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Innovative pedagogies: The impact of blended learning in higher education during the Covid-19 pandemic

CONTACT INFORMATION:
By: Tabo Olok Geoffrey, Gulu University, tel: +256752890868, mail: g.tabo@gu.ac.ug, Gulu University, Lone Dirckinck-Holmfeld, Aalborg University, tel: +45 22822074, mail: lone@hum.aau.dk,
Ann Bygholm, Aalborg University, mail: ann@hum.aau.dk

Abstract
We explore the impact of blended learning in higher education as as innovative pedagogy integrating problem-based learning and student-centred learning in teaching and learning, during the Covid-19 pandemic. New information technology tools and applications were experimented in teaching and learning at Gulu University between 2020 and 2021 at the peak of the pandemic. The study used qualitative methods and drew on constructivism where knowledge is co-constructed through interacting systems and actors in higher education environment. It is motivating and inspirational to deploy various methods of teaching and learning during the lockdowns. Inspiring innovation such as zero-rating, MEET tool and blended learning were used to address gaps in teaching and learning in university programmes. Preferences for blended learning grew even if institutions operate in resource constrained settings.

We used online training workshops to train teachers on basic ICT tools for content development and digitisation of teachers' teaching and learning materials. Our findings indicate that lecturers progressively develop ICT skills, attitudes, and knowledge and innovative practices to teaching and learning using available free online applications and ICT resources at their disposal. Students' attendance was low because of lack of access to the internet and ownership of computers for blended learning.

Keywords: Innovative pedagogies, Blended learning, PBL, Higher education

Introduction
The acute respiratory syndrome coronavirus 2 (SARS-CoV-2) termed Covid-19 affected nearly 35 million people worldwide killing over a million (Alwan et al., 2020) as it spread through contacts with infected persons or aerosols from an infected individual. The was rapid community spread based on this mode of transmission since the population was unexposed to the new virus (Alwan et al., 2020). There were four waves of the disease with the second wave coming around winter. This wave affected Europe badly. Although the African continent was not strongly affected, WHO cautioned people to adhere to standard operating procedures (SOPs). The Ugandan head of state (president) closed universities and other tertiary institutions thus disrupting education in the country. Basically, the government did not have a roadmap for reopening education institutions to resume normal operations in the country.

Higher education in many African countries suffered from the Covid-19 pandemic situation that resulted in complete lockdown by governments. Complete lockdown is a situation where in the entire country movements are restricted to few hours except for the health personnel and the military. Uganda was worse hit with probably the world's longest lockdown for up to nearly two years with no schools open. The two years were interrupted with partial and complete lockdowns based on the intensity of infections at the time. Therefore, universities could not operate in such an environment where movements were restricted. This challenged higher education managers and other actors to innovate and reengage staff and students (Kaguhangire-barifaijo et al., 2021). Lack of continuity in teaching and learning was at the centre of the crisis as campuses were closed in part and the other reason is that institutions are challenged with inadequate infrastructure and equipment for eLearning (Tweheyo & Mugarura, 2021). This problem was cutting across Ugandan higher education institutions.

The situation gave way for institutions to seek technology supported learning. We now see significant increase in the integration of information and communications technology (ICT) in education. However, these followed the ongoing activities of integrating ICT in schools and universities as alternative delivery methods (Blau et al., 2018). Generally technology enhanced learning (TEL) is conceptualised and documented in many forms viz eLearning (Ntshwarang et al., 2021; Ssekakubo et al., 2011), technology enhanced learning, blended learning and hybrid learning using learning management systems (Sekhaolelo & Kalema, 2016) and other technologies. The use of social networks to enhance

learner experiences and engagements were encouraged because the students are more active on social media. Social networks integrate a cocktail of social media sites (Sekhaolelo & Kalema, 2016).

The emergence of many varieties of competing concepts of ICT supported learning such as Technology Supported Learning, Computer Supported Collaborative Learning, eLearning, Blended Learning, Online learning hybrid learning and more. However blended learning was preferred because of the blend between physical and eLearning systems developed at the University. The following concepts are used here to explain the innovation during the period of the pandemic in Uganda, specifically at Gulu University.

Innovative pedagogies

The pandemic challenged the traditional approaches to teaching and learning as well as the pedagogical approaches in use at the time. Challenges caused by Covid-19 created opportunities to promote remote working and implementation of blended learning in existing curricula. Additionally, people's attitude towards eLearning, staff ICT competencies, collaboration and partnerships (Tweheyo & Mugarura, 2021). Innovations to pedagogical approaches in response to the crisis and flexibility in student admissions to universities. Also investment in ICT resources and infrastructure, staff capacity building and realignment of policies for Open, Distance eLearning (ODeL) (Tweheyo & Mugarura, 2021) are evident. Co-production of responsive systems and co-creation of systems are reported across universities (Khamis et al., 2021).

Blended learning

This term is used to describe a solution that combines several delivery methods including collaboration software, online learning and knowledge management practices (Valiathan, 2002). Its categorization is based on skills, attitudes, and competencies of learners. These are modelled in response to the specific ideals of the problem domain by understanding why and how this approach is adopted to specific contexts. Blended learning affords asynchronous learning supported by LMS (Hadullo et al., 2017). However, universities that are implementing blended learning and eLearning challenged by the lack of infrastructure and slow development of course content (Ssekakubo et al., 2011).

Problem Based Learning (PBL)

This method is popular in engineering since its development. Many varieties of PBL emerged and are implemented in a variety of disciplines (Graaff & Kolmos, 2003). The approach is taken as a theory because of the the student centeredness organised around specific real-world problems and its appreciation of knowledge construction based on contextual learning (Graaff & Kolmos, 2003). The balance between theory and practice makes the approach innovatively contribute to the development of the 21st Century skills by defining theoretical learning principles, educational model and practices within the confines of traditional educational models.

Student Centred Learning

Universities are moving to student centred learning partly to improve students learning experiences and also to influence social development (Khamis et al., 2021) in areas where they are located. This approach grew from Problem based learning as the need for strengthening students learning and university researchers to address community problems. This research practice approach has several strengths towards employability skills, practice, attitudes and knowledge of students are shaped while working on real life problems.

These innovative pedagogies tied together makes learning more effective especially when we integrate ICT to provide for location independent teaching and learning. Also, student centered learning became the buzz word because of lack of face-to-face contact with learners. Traditional pedagogy was preferred before the pandemic where face-to-face mode of teaching and learning is the practice. Several methods of teaching and learning were explored along with innovative pedagogies beyond the popular teacher centred learning using ICT collaborative tools (eg Google meet, zoom, Teams etc). In this article, we illuminate these innovative pedagogies and share our knowledge and experiences in the implementation at Gulu University for future institutional readiness.

Method

We adopt qualitative methods (workshops and document review) to investigate staff experiences during the covid-19 pandemic and to describe processes, tools, challenges, and future directions. These methods allow all stakeholders contribute to the redesign for teaching and learning processes. We draw on the social constructivism (Mackenzie & Knipe, 2006) and learning theories to discuss the delivery approaches used during the emergency periods.

Constructivists assumptions are that knowledge is individually constructed and socially co-constructed from interactions with environment taking multiple perspectives thereby indicating that meaning is distributed among communities and tools used in the context of the phenomenon (Hung et al., 2008). The choice of our theoretical underpinning is based on the understanding that innovation, new ideas and knowledge are socially constructed through interaction through workshops and meetings where active participants engage and interrogate further the existing situation to generate new meanings resulting in appropriate actions to the new situation. Moreover, these approaches promote co-learning as people share their beliefs and knowledge to create new knowledge. Provision of appropriate interactive platforms for teaching and learning even when the future of lifting the lockdowns was not clear.

Results and discussions

The pandemic exposed the daunting deficiencies of the education system in many countries (Tweheyo & Mugarura, 2021) leaving higher education without progress. Innovation became key for the desired positive change (Khamis et al., 2021). Management of teaching and learning at universities became challenging under these circumstances to provide quality education. Participatory approaches among faculties, institutes and IT support departments were employed in engaging with the crisis to run university activities in a new way that was not earlier planned. Sharing experiences and promising good practices from other places where Universities have innovated to implementing eCampuses and documenting the promises for management intervention.

Re-opening of universities

As the situation stabilised with less infections and discovery of the vaccines for Covid-19, the government directed that education institutions must reopen in a phased manner starting with medical students followed by the finalists and later other students. However, the 14th Covid-19 presidential address of the 18th of May 2020 gave a directive for reopening schools thereby triggering internal preparations as experiences seen in this email excerpt here:

> *"…while we wait for the MoES we need to start the preparation for teaching… The ministry will state …the SOP for reopening e.g social distancing, specification for classroom seating, mask, testing ……. quick reporting of identified cases".*

This exemplifies how university management started preparing staff while watching for more directives from the line ministry of Education and Sports. The message intimates how SOPs were strictly to be followed during the new normal.

Institutions were ill prepared for online learning or blended learning evidenced here by the lack of regulatory frameworks, poor IT infrastructure, and academic staff preparedness. Regular meetings were conducted by the academic and technical staff to explore acceptable and available ICT solutions. The next excerpt appraises the use of information technology in bringing together administrators in the new normal while also observing social distancing.

> *"….in preparation for reopening to receive the finalists. It was interesting that we could bring the Deans together despite being separated and dispersed by the Covid-19 lockdown…… Thanks to …. the IT technician who did all the connections. The successful meeting is an indication that, like others are doing, we could adopt this as one of the ways of "new normal" regarding meetings as we practice social distancing. We however need to subscribe as an institution so that other meetings can exploit the platform."*

Online meting zoom platform was here appreciated by managers as they had a successful start to using the virtual meeting space. This is also seen as an innovation within the IT domain in addressing social distancing challenges.

Institutional preparedness

Generally, institutions were not ready for blended learning in what authors called the new normal (Kaguhangire-barifaijo et al., 2021; Tumwesige, 2020). Notably the cost of implementing blended learning was not factored in planning university activities during the pandemic. For the case of Gulu University, there have been attempts towards eLearning through capacity building projects. The uptake of eLearning was rather low although the learning management system (LMS) was in use as a prototype at the university. At the time the LMS (elearning.gu.ac.ug) was being used for running Building Stronger Universities (BSU) project activities and academic workshops with only few departments trying to roll out in their programmes.

To promote the use of the LMS, trainings were organised and conducted by the department of computer science in collaboration with the IT support department. Since it was a crisis, the trainings were short and basically focused on identification of ICT tools and how to use them for teaching and learning. The trainings focused on rapid content development using Hot Potatoes and eXe applications and how to use the LMS. The trainings open opportunities for content development however progress was slow as lecturers complained of the heavy load in addition to their lack of access to the internet because of cost and network challenges.

The Open Distance and eLearning (ODeL) were recommended by the Ministry of education through the National Council for Higher Education (NCHE) as a strategy to open universities. ODeL ran on Moodle LMS that was already installed at Gulu University making it easier to integrate along with virtual meeting applications such as zoom, Google meet, Microsoft Teams, and Big Blue Button (BBB) already familiar to staff. However, some of the lecturers modernised the use of social media platforms like WhatsApp and even Facebook as meeting rooms to deliver lectures and discussions while others used emails to share lecture materials to students. This is what some of the lecturers called the beginning of student centered learning. The practice is continued even when the university is fully opened.

Meanwhile the university is juggling with tools and technologies for eLearning, NCHE provided a guideline for an emergency open, distance and eLearning systems for higher education institutions during the Covid-19 lockdowns. NCHE also undertook an assessment of universities for ODeL. A sample assessment for is presented in Figure 1.

NATIONAL COUNCIL FOR HIGHER EDUCATION

HIGHER EDUCATION INSTITUTION READINESS FOR EMMERGENCY DELIVERY OF ACADEMIC PROGRAMMES USING OPEN, DISTANCE AND E-LEARNING (ODEL) APPROACHES

1. **ODEL POLICY AND INSTITUTIONAL READINESS FOR ODEL**

	Guidelines	Not Seen	Seen but not adequate	Adequate	More than adequate (Ideal)	Onsite Verification notes	Code
1	Evidence of a clear plan from Ministry of Health COVID-19 SoP (Document for SoP guidelines, Sanitizers at Entrances of Universities, Temp Gun etc.)	0	1	2	3		
2	Evidence of a structure and details of the proposed ODeL model (Document demonstrating the ODeL model, minutes of endorsement from council etc.)	0	1	2	3		
3	Evidence of institutional policy on ODeL (policy document endorsed by council and minutes from council)	0	1	2	3		
4	Evidence of dedicated ODeL pedagogy support unit (appointment letter for e-learning officer, e-learning office etc.)	0	1	2	3		
5	Evidence of dedicated of ICT support unit (ICT office, server room, appointment	0	1	2	3		

Figure 1: ODeL assessment for for Universities in Uganda

The assessment emphasised the following eight (8) strategic areas: ODeL policy and institutional readiness, students and staff capacity for ODeL pedagogy, student's readiness for ODeL approaches, students' technology ownership and access profile, ODeL teaching and learning, Institutional ODeL capacity, ODeL learner support and finally continuous formative and summative assessments. This assessment took place while Gulu University implements blended learning, so the tool also showed the need for addressing gaps. Similarly, the assessment intended to provide a platform for inclusive and equitable education whilst promoting lifelong learning (Kaguhangire-barifaijo et al., 2021).

During implementation of ODeL, zoom links were procured and availed to the departments for teaching. These links were limited so, they were shared among lecturers who often taught two classes on the same link. The lecturers creatively made themselves co-hosts and start their lectures at slightly different times (5mins interval) which worked well. It was rather interesting to experience two classes to sharing a single link. The challenge was that some students who came to the room early got into the wrong class which was soon resolved. Much as this looks promising, the

availability of free virtual meeting apps was preferred. More trainings on how to use these apps such as Google meet, classroom, and Google forms were organised in addition to trainings on BBB and Microsoft Teams. Google meet was found to support large classes, generate class attendance, and record class proceedings for future use by learners. Many lecturers migrated to google apps which they claim was consuming less internet data. The autonomy of the teachers and students to organise their own meetings also made Google meet preferred.
An email excerpt from one of the trainers indicates the intensity and enthusiasm of the training and scaffolding of lecturers by fellow lecturers.

> Find here attached the Moodle training document as requested.
>
> Further to the above, this is to request Heads of Departments in the various Faculties to submit Course units to be taught this semester and their respective lecturers to the Directorate of ICT or send an email to elearning@gu.ac.ug for proper planning and preparation for online classes i.e. among others creation of course shells and population of courses.

It was noted that even when these trainings were done and continuous support given to the lecturers, many staff had challenges with immediately using the applications to develop content and lecture. Scaffolding them to some basic technical competence to manage classes continued. Lecture notes were shared through student emails and WhatsApp groups to ease engagements to clarify things in a shorter time. It is important to note that the shared materials were teachers prepared class notes made available as electronic form. In some departments like Computer Science lecturers shared Open Education Resources (OERs) and Massive Open Online Courses (MOOCs) to facilitate student learning even without a policy framework as we indicated earlier. We dwell more into the innovation with IT tools and services.

Online teaching and ODeL
Synchronous and asynchronous teaching and learning were implemented concurrently. Variety of ICT tools and technologies were used by teachers and students in response to infrastructure and economic challenges. There were two sets of tools used during this emergency viz eLearning and collaborative tools.

eLearning tools used by the teachers
- Moodle - LMS
- exe Learning
- Hot potatoes
- Google Classroom
- Big Blue Button (BBB)

BBB an opensource web web conferencing system was zero rated for teaching and learning by the university, so staff were expected to use this tool with Moodle.

Collaboration tools popular with the teachers are:
- Google Meet
- Zoom
- WhatsApp
- Google classroom
- Email

These tools facilitated blended learning during the pandemic and remains popular among teachers and students.

Innovative use of the IT tools and applications
The department of computer science and IT services directorate innovatively supported teaching and learning during the crisis. The trainings and scaffolding of teachers helped to expose tools and apps available and afforded teaching and learning. The exploration of the tools and aligning them to the implementation of blended learning was innovative as much as temporary solutions to the learning problems were delivered. The collaboration between Computer Science constituted not only the knowledge and skills but the critical human resource capacity to implement ODeL in the University. However, the uptake of such new ways of teaching and learning was low amongst lecturers and students basing on the adequacy of ICT skills and attitude to virtual learning. We now summarise some of the innovations explored to support teaching and learning amidst the lockdowns.

Zero rating

University management through the IT Services Directorate solved internet connection to staff and students through zero rating all the cell phone numbers for lines from two telecommunications companies (Mobile telecommunication network (MTN) and Airtel) by zero rating the LMS and BBB to improve students' access to eContent and lectures. Student's and staff's telephone numbers were collected by the IT service and activated by the telecom companies to allow free access to university's online learning tools and resources. Service Level Agreements (SLAs) were reached between the parties including Research and Education Network Uganda (RENU), MTN, Airtel and Gulu University. The solution was good since teaching and learning took place with improved attendance.

For example, here is a communication about the zero rating of university web services for students and staff using MTN phone lines. You notice that the message addresses the problem of missing online lectures because of internet bundles.

> *"…The Website with all University Subdomains are as well zero-rated on MTN mobile network meaning that to access anything on *gu.ac.ug you DO NOT NEED data bundles for as long as you are using MTN to access the internet. You only need to enable data connection on your mobile device and that is it. Examples of such subdomains are, https://elearning.gu.ac.ug/ (Old Moodle), https://guelle.gu.ac.ug/ (New Moodle) https://meet.gu.ac.ug/(BigBlueButton), https://opac.gu.ac.ug/ (Institution repository/eResources), and ….*
>
> *As a reminder, with these developments and assuming other factors constant, NO STUDENT SHOULD MISS AN ONLINE CLASS DUE TO LACK OF DATA BUNDLES".*

The email message from the IT services presents commitment from the university to address the challenges of access. Collectively, it is an interesting solution that could be replicated in resource constraint settings to keep learning active as it was at Gulu University. We could not however, establish the cost of the zero-rating network solution.

Developing a Monitoring and Evaluation tool

One of the challenges experienced by the Universities during the emergency ODeL implementation was in monitoring and evaluation of ODeL activities. Monitoring and Evaluation provides the basis for improving operation and insights into the ODeL activities for correct decision making. Gulu University developed an innovative web-based solution called monitoring and Evaluation Elearning Tool (MEET) to provide a reporting platform for both lecturers and students as they engage in ODeL. The MEET is an inspiring innovation that serves as a management function to support accurate reporting and analysis. The management use the MEET report for evaluation and improving of ODeL based on submissions from students and heads of departments. The report was therefore used by management for decision making.

The tool provides near real time reporting from departments since the system is online and accessible to all staff and students. We present the MEET tool (Figure 3) as an innovation from the Department of Computer Science at Gulu University that helped management and department monitor progress in the implementation of ODeL.

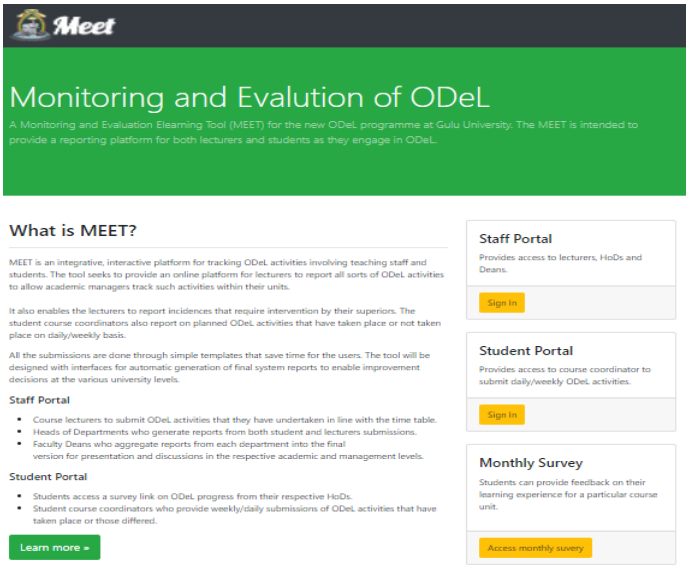

Figure 3: M&E tool developed at Gulu University for ODeL

The tool has staff and student portals with additional function of generating graphical impression of monthly reports of teaching and learning activities from departments. The lecturers and students report on the system once a lecture is complete as scheduled. The student leader or the staff approves the entry depending on who entered. Importantly, student assessment is administered on the online system. The learners also respond to the monthly learning activities based on what the Head of departments have created. The system is operated at various authentication levels through a dashboard. Management accesses the dashboard to view aggregated reports for decision making. Aggregated reports are also collated by the heads of department and shared with the faculty members for further improvement.

The developments are an indication of how collectively people can innovate, create knowledge, and use available tools during crisis. The process of co-creation leads to co-learning by the parties involved. This is in line with the social construction of knowledge through interactions in a democratic process involving stakeholders in co-creation. Similarly, there were instances where co-learning was taking place during the trainings and preparation of training materials and activities.

In summary, the activities leading to changes in the teaching and learning during the pandemic was generally motivated by the sense of urgency created by the crisis. The creation of innovative solutions for blended learning within the time made teaching and learning possible. Moreover, engaging all sectors of the University helped create short term wins to accelerate positive changes.

Conclusion

Often innovation comes through making simple ideas work at the time of need. Co-creation of solutions to pressing problems such as what the world experienced during the covid-19 leads to important and inspiring innovations such as the use of IT tools and apps, zero rating and MEET for teaching and learning. These approaches are applicable to organisations that may require changes business processes. Now higher education institutions are driven by such innovation to teaching and learning even though adoption is still rather low in poor resourced areas.

Importantly higher education institutions must plan appropriately to address ICT infrastructure and policies gaps to allow sharing of content in the form of OERs and MOOCs. Higher Education sector need robust leadership and management for developing sustainable systems for the sector in case of a similar scenarios.

Recommendations

Enabling technological and pedagogical innovations has potential to decimate professional jobs specifically for teachers at higher education institutions. Therefore, such innovations should be cultivated to flourish in the universities even when they are resource constrained. Further work in blended learning models to focus on tools and access for students from developing countries of the world.

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