



University of Education, Winneba



Using MOODLE for Teaching and Learning at University of Education, Winneba

Final Report

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Acronyms and Abbreviations

CAN	Campus Area Network
CC	Creative Commons
COL	Commonwealth of Learning
DE	Distance Education
EFPO	Externally Funded Projects Office
ET	Educational Technology
F2F	Face-to-Face
FAQs	Frequently Asked Questions
FB	Fulbright Scholar
ICT	Information and Communications Technologies
ID	Instructional Design
IEDE	Institute of Educational Development and Extension
LAMS	Learning Activity Management System
LAN	Local Area Network
LMS	Learning Management System
MOODLE	Modular Object-Oriented Dynamic Learning Environment
NOC	Network Operations Center
OER	Open Educational Resources
PC	Personal Computer
PDF	Portable Document Format
PHEA ETI	Partnership for Higher Education in Africa Educational Technology Initiative
SAIDE	South Africa Institute of Distance Education
SCORM	Shareable Content Reference Model
SHS	Senior High School
UEW	University of Education, Winneba

Glossary

A high-tech scenario is described as one where a full-scale institutionalized course management system has been installed and managed institution-wide.

A Learning Management System (LMS): Also referred to as Course Management Systems (CMS), is an application software that automates the administrative tasks of education/training, such as registering users, tracking courses in a catalog, recording data, charting a user's progress toward certification, and providing reports to managers. LMSs are used to organize a course experience.

A low-tech scenario has little or no experience offering courses online and ICT infrastructure is minimal.

A mid-tech scenario is one in which the website may have pointers to individual courses offered online, but the quality of such courses may be suspect as they are not based on approved standards of the university.

Closed source software can be defined as proprietary software distributed under a licensing agreement to authorized users with private modification, copying and republishing restrictions.

ICT Integration Literacy is the ability to use computers and other technologies combined with a variety of teaching and learning strategies

Large Class Size in the context of this study is one with enrolment exceeding 60. In the UEW situation there are certain classes of over 400 students.

MOODLE is an abbreviation for **Modular Object-Oriented Dynamic Learning Environment**. It is one of the most popular open source alternatives to proprietary LMSs.

Open Educational Resource (OER) is defined as “the open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes.”

Open source software can be defined as software distributed under a licensing agreement which allows the source code (computer code) to be shared, viewed and modified by other users and organizations.

The Hybrid or Blended Mode of Instructional Delivery is one form of instructional delivery where online interactions and resources supplement the traditional face-to-face (F2F) in-class interactions between learners and instructors, among learners and between learners and course content.

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Executive Summary

The Partnership for Higher Education in Africa Educational Technology Initiative (PHEA ETI) is a programme that seeks to assist a number of African Universities, including the University of Education, Winneba (UEW), to develop the capacity to initiate and sustain effective educational technology projects which impact on the nature and quality of student learning experience and outcomes. These projects are coordinated and co-managed by the South African Institute for Distance Education (SAIDE) and the Centre for Educational Technology (CET). The PHEA ETI supports knowledge creation and dissemination across and between partner universities on the use of educational technology. SAIDE and CET support universities to harness the potential of educational technology by:

- 1) Building capacity of institutions to integrate technology into teaching and learning.
- 2) Conducting research into how academics and students use technology for pedagogical purposes.
- 3) Encouraging innovative and creative use of ICTs for broader educational purposes including management information systems, collaborative/social networking of academics, adoption and diffusion of educational technology models/innovations.

The over-riding goals of the UEW Educational Technology Strategy (ETS) under the Initiative are to:

- Encourage academics' and students' use of available ICT facilities for academic purposes to ensure relevant and quality education, and optimal use of ICT to enhance management information systems, thereby justifying the huge investment by UEW in ICTs;
- Address challenges posed by large class sizes and inadequate teaching and learning facilities through the adoption of:
 - hybrid instructional delivery modes for residential Programmes;
 - online learning strategies for distance learners; and
 - pedagogical practices and instructional strategies that meet the diverse learning needs and styles of 21st Century learners

The PHEA ETI is supporting three interventions at UEW, namely: (i) A baseline study on the status of Educational Technology (ET) at (UEW) – Intervention 1; (ii) the development and deployment of hybrid courses on MOODLE Learning Management System – Intervention 2; and (iii) an investigation into how academics and students use MOODLE for teaching and learning – Intervention 3.

Intervention 1 sought to establish the ET status at UEW in terms of availability, access and use of ETs, to provide baseline data or information that can be used to measure the impact of the PHEA ETI at UEW in the long

term. The data and findings of this study would also inform policy-decision making as well as guide future research on on-going ET initiatives.

Intervention 2 focused on the development and deployment of online courses on MOODLE, using a hybrid mode of instructional delivery. The hybrid mode is one form of instructional delivery where online interactions supplement the traditional face-to-face (F2F) in-class interactions between learners and instructors, among learners and between learners and course content. In the UEW context, academics meet their students weekly in-class according to the semester lecture schedule while using the MOODLE platform to provide extra learning resources and activities and engage learners in active collaboration online. The objectives of Intervention 2 included: (i) Integration of ICTs into the teaching and learning activities of the institution; (ii) Deployment of MOODLE to augment face-to-face instruction in a hybrid mode; (iii) Deployment of MOODLE in a purely on-line mode to support distance education; and (iv) Improvement of the efficiency of present teaching and learning strategies and pedagogy. During the period of implementation, however, objectives (i), (ii) and (iv) were pursued, while objective (iii) was observed to be a long term one that would be realized in the post-implementation of the funded period of the PHEA ETI.

Intervention 3 sought to investigate how academics and students use MOODLE for teaching and learning at UEW. This report is based on this intervention, and presents findings of an exploration of the use of MOODLE by academics and students at UEW. The investigation was undertaken in two phases. Phase 1 focused on two lecturers' practices in the use of MOODLE and how this affected students' learning in the two compulsory ICT courses (EDI 502: Computers Applications in Education for postgraduate students and GPD 113: Introduction to ICT for Undergraduate students) that were deployed on the MOODLE Learning Management System (LMS). The Phase 1 courses were used as pilot cases to assist in fine-tuning the MOODLE platform. The first groups of students to make use of the online materials were undergraduates in the second semester of the 2010/2011 academic year. The postgraduate students participated in the Sandwich session (Long Vacation from June to August 2011) of the same academic year. The study initially focused on the two ICT courses because the team that designed and delivered these courses already comprised high users of technology, whose uptake and use of the MOODLE was likely to be appreciably high. The use of technology adopters at this point also provided an opportunity to refine the process in preparation for a wider rollout of the Intervention 2 to include eight more courses across various academic areas in the Phase 2 implementation.

Based on the experiences and lessons learned from the initial pilot of EDI 502 and GPD 113, these courses were re-run during the first semester of the 2011/2012 academic year (September-December 2011). In phase 2 implementation, eight other courses were ready for piloting on MOODLE. These were also deployed during the first semester of the 2011/2012 academic year (September -December 2011). These were a part of 20 courses selected on the basis of a brief survey of academics during the advocacy workshops under the PHEA ETI project at UEW. While participation

was typically voluntary, academics' technology competences and willingness to participate in all the courseware development workshops and to deploy their courses on MOODLE were considered in the selection of participants and courses. Though lecturers delivering these other courses were not an integral part of the research team, the researchers felt that their feedback and experiences with MOODLE would provide useful information for further improvement of the quality of training on MOODLE and courseware development.

This report thus consists of an integrated synthesis of experiences of the academics and learners in both the Phase 1 pilot and Phase 2 implementation of MOODLE. The report consists of documentation of courseware development, academics' training on use of MOODLE, academics' and students' use of MOODLE for teaching and learning, successes and challenges in the use of MOODLE.

This report has five major sections: the introduction and background to the study, review of relevant literature, methodology, research findings and discussion, and conclusion. The introduction and background section gives a general discussion of what the PHEA ETI seeks to achieve and the research problem, purpose and objectives of this study are captured in the light of UEW's earlier attempts in pedagogical integration of ICTs. The literature review critically surveys relevant research works on learning management systems, and how academics and students use MOODLE for teaching. The Methodology section discusses the research context and research design. The analysis of data and research findings and discussion of major findings are presented in the research findings and discussion section. The conclusion section briefly recaptures the major findings, implications of these findings for practice, general conclusions based on the findings, and recommendations and suggestions for further investigation on the current topic.

The findings of the research showed that:

- i. Academics' use of ET has improved since the inception of the PHEA ETI Programme at UEW. Preliminary findings from the baseline study showed that prior to the implementation of the PHEA ETI, UEW had not institutionalized the use of LMS, though the University in the past mounted three courses for online delivery on MOODLE. These courses were developed externally by a South African organization, eDegree. Academics of the University were not involved in the design and development of these courses and were only involved in facilitating the courses after their development for distance learners. Compared with the baseline findings, sixty-nine (69) MOODLE courses are currently being piloted by a cross-section of academics, which are at various levels of completion (visit UEW-MOODLE Site: <http://moodle.uew.edu.gh>). Forty-two of these courses are appreciably developed, as the evaluation of these courses showed. Many more academics are migrating to MOODLE and the spread of use is becoming infectious in the University. The designers of the 42 MOODLE courses under the PHEA ETI have become champions, who would play vital roles in the diffusion of the innovation in UEW and other Ghanaian institutions.

- ii. The capacity of academics to design and develop online courses using instructional design (ID) principles has been enhanced, as indicated by the quality of the 42 champions' courses. This development bodes well for the sustainability of academics' interest in using MOODLE and other ICT resources. Thus, the huge investment in ICTs is now being justified.
- iii. Instructional practices and general pedagogy of academics is undergoing a paradigm shift in favour of student-centered learning and authentic assessment, thanks to the blend of learning theory, technology and nature of online courseware development.
- iv. General competencies and skills for pedagogical use of ICTs among students and academics have also improved as a result of the PHEA ETI.
- v. Deepened involvement and interest of University top management in efforts to modernize instructional delivery through pedagogical use of ICTs that guarantees the sustainability of the gains made by the PHEA ETI.
- vi. Overall, internal capacity and expertise have been enhanced through the University's participation in this Initiative. This makes for a bright future as the University prioritizes the adoption of ET for continuous improvement in the quality of teaching and learning across the curricula.

All these gains have significant implications for the University's efforts in using ICTs to modernize its instructional delivery and management. The University will soon take stock of a large consignment of ICT equipment for sustained and enhanced quality teaching and learning at UEW. Technology competences among academics and graduate students will also continue to engage the attention of the University to ensure the sustainability of the gains made through the PHEA ETI. The courses of high quality developed in MOODLE under the UEW-PHEA ETI will be converted into Open Educational Resources (OER) for easy access by students and learners from all spheres of life, society and the world.

Furthermore, by documenting the processes and practices of academics in the development and deployment of courses on MOODLE, the University as well as sister institutions in Ghana and elsewhere may avoid or minimize the challenges involved in the migration from face-to-face course delivery to a hybrid course delivery using online resources and collaborative activities enhanced by the MOODLE platform. Thus, the lessons learned would serve as a guide on how to roll out the implementation across all academic programmes and courses in the University and other HE institutions, particularly for those that are yet to adopt and adapt MOODLE as a Learning Management System.

1. Introduction

The Partnership for Higher Education in Africa Educational Technology Initiative (PHEA ETI) seeks to assist a number of African Universities to develop the capacity to initiate and sustain effective educational technology projects which impact on the nature and quality of student learning experience and outcomes. The Initiative also supports knowledge creation and dissemination across and between partner universities on the use of educational technology (UEW-PHEA ETI MOA, 2009). The PHEA ETI seeks to assist these Universities to:

- Harness the potential of educational technology by
 - o Building capacity of institutions to integrate technology into teaching and learning.
 - o Conducting research into how academics and students use technology for pedagogical purposes.
- Encourage innovative and creative use of ICTs for broader educational purposes including management information systems, collaborative/social networking of academics, adoption and diffusion of educational technology models/innovations

The over-riding goals of the University of Education, Winneba's Educational Technology Strategy (ETS) are to:

- Encourage faculty and students' use of available ICT facilities to justify the huge investment by UEW in ICTs and ensure relevant and quality education through the optimal use of ICT:
 - o In teaching and learning by academics.
 - o To enhance management information systems.
- Address challenges posed by large class sizes and inadequate teaching and learning facilities through the adoption of:
 - Hybrid instructional delivery modes for residential programmes.
 - Online learning strategies for distance learners.
 - Pedagogical practices and instructional strategies that meet the diverse learning needs and styles of 21st Century learners.

The PHEA ETI is supporting three interventions at the University of Education, Winneba (UEW), namely:

- 1) A baseline study on the status of Educational Technology (ET) at UEW;
- 2) The development and deployment of hybrid courses on MOODLE Learning Management System; and
- 3) An investigation into how academics and students use MOODLE for teaching and learning.

The University of Education, Winneba has made attempts in the past to conscientize and train academics to use technologies, as well as convince

them of the benefits of use of ICT for teaching and learning. These attempts had largely been ad hoc in nature, as follow-up workshops have never been organized since 2005, until the PHEA ETI started in March 2010. A number of factors contributed to this situation:

- There was inadequate local expertise or capacity to continue with the initial workshops once the external facilitator left,
- Many departments failed to set up their computer labs and thus academics' access to computing facilities was limited,
- Classrooms lacked ICT equipment,
- Internet connectivity at the time was severely limited to administrative uses, and not teaching and learning,
- There was no consistent faculty technology professional development programme,
- The few "champions" were not motivated enough to help in the diffusion of ET across the University.

Furthermore, the use of learning management systems was not institutionalized in a way that the PHEA ETI Project seeks to do. However, from the 2009/2010 academic year, the University started addressing the institutional deficiencies highlighted above. The details of these efforts are outlined in the context of the study later.

As part of addressing these deficiencies, the Educational Technology Strategy of the University under the PHEA ETI seeks to address the following challenges to effective pedagogical integration of ICTs:

- Faculty resistance to change and ICT innovation, especially amongst older faculty members
- Low educational technology competencies among faculty members
- Lack of a consistent system-wide programme for integrating educational technology
- Inadequate instructional design and ICT integration knowledge and skills among academics
- Insufficient time for faculty to attend training programmes as a result of work overload and large class sizes
- Low level of academics' use of existing ICT facilities and resources.

The MOODLE Learning Management System Project was conceived as part of the strategy to help build the capacities of academics and students to purposefully use ICTs for teaching and learning.

This report is the outcome of an evaluative qualitative research study on how academics and students use MOODLE for teaching and learning as implemented in Project 2. This report also documents courseware design and development processes and how the use of MOODLE affected academics' teaching practices and students' learning experiences in these courses.

The main research question that guided this investigation was: How does the use of MOODLE impact academics' pedagogical practices and students' experiences of learning and assessment? To answer this research question, the following sub-questions were considered:

- 1) What processes were followed in the planning for the deployment of MOODLE?
- 2) What processes were followed in the implementation of the hybrid online courses?
- 3) What processes were followed in the evaluation of the hybrid online courses?
- 4) How do academics and learners use MOODLE for teaching and learning?
- 5) What lessons can be learned from course delivery through MOODLE?
- 6) What challenges and barriers impede effective ET use at UEW?

By documenting the processes and practices of academics in the development and deployment of courses on MOODLE, the University as well as sister institutions in Ghana and elsewhere can learn so as to avoid or minimize the challenges involved in the migration from face-to-face course delivery to a hybrid course delivery using online resources and collaborative activities enhanced by the MOODLE platform. The courses of high quality developed in MOODLE under the UEW-PHEA ETI will be converted into Open Educational Resources (OER) for easy access by students and learners from all spheres of life, society and the world. This report has five major sections, mapped out in Table 1.

Table 1 Report outline

Report Section	Description of section content
Introduction and background to the study	An introduction to PHEA ETI and UEW ETS. The research problem statement Purpose and objectives of the study and research questions. Background to the project
Review of relevant literature	Critical review of surveys and other relevant research on Online learning and learning management systems, and how academics and students use MOODLE for teaching and learning.
Research design	Discussion of methodology used for the study.
Research findings and discussion	Presentation of data and discussion of research findings.
Conclusion	Highlights the major findings. Concludes by discussing implications of these findings for practice. Recommendations Suggestions for further investigation on the current topic

2. Research problem

UEW, like other universities the world over, is preparing its students to meet 21st Century labour market demands for highly educated workers who can develop, design, and apply sophisticated new technologies. Educational technologies offer many educational gains including improving the teaching and learning experience by solving educational challenges like large classes and inadequate resources, and affording access to education by students who may have found access to education impossible due to distance. However, without sound pedagogic principles underlying their use, the transformative potential of these technologies will not be realised (Clarke, 2007).

Prior to the implementation of the UEW-PHEA ETI, the learning environment of UEW was characterized by:

- Overcrowding in lecture rooms that adversely affected quality of instruction and learning;
- Teacher-centered pedagogical practices and instructional strategies of instructors that may not adequately address diversity of learning styles and needs;
- Overload of instructors (large class sizes and many classes too) that made it difficult for academics to effectively innovate and create enabling learning experiences for students;
- Inability of majority of academics to use available ET resources

Other challenges facing UEW instructional delivery included inadequate interactions among students and between the learner and instructor, low active engagement of students with content, difficulty in giving remediation to academically needy students, inadequate contact hours as other official assignments and time constraints on academics sometimes take them away from the classrooms, and high cost of learning resources as students struggle to photocopy lecture hand-outs.

These problems are documented in a number of sources including earlier studies and preliminary data from baseline study in Project 1, pre-implementation evaluation checklist for academics'(feedback from advocacy workshop evaluation) and learners' ET competences, particularly on online teaching and learning and use of MOODLE. The research team also had access to a recent documentation on large class sizes which provided an insight into the challenges posed by large class sizes from the perspectives of academics and students.

3. Background to the project

The University of Education, Winneba is a multi-campus teacher education institution in Ghana. It has six residential campuses, three of which (North, South, and Central Campuses) are located in Winneba, and the other three in Kumasi, Ashanti Mampong and Ajumako. The student population currently is 50,012, consisting of 23,746 distance education learners, 8, 636 sandwich/part-time students, and 17, 630 regular on-campus students (Publication Unit-U EW, 2011). The University also runs the largest Distance Education Programme in Ghana with 23 learning centers located in all the 10 geographic regions. The University has eight Faculties, two Schools and an Institute.

Face to face instructional delivery faces serious challenges associated with large class sizes, excessive workload and time constraints, inadequate teaching and learning facilities, and dated instructional practices and strategies among academics. A recent documentary (2010/2011 academic year) on selected courses showed that class sizes range from 150 to over 400 students in Languages, Physical Education and Social Studies/Science (a copy of the video will be published together with this report). An enrollment for the GPD 113 for instance is over 3,000 each year.

Most academics use teacher-centered instructional delivery strategies such as lecture expositions, which have not been effective in the development of critical thinking skills, reflective thinking skills and problem solving skills, which are considered critical elements for developing a workforce that can deal with practical challenges in the workplace. This approach is also not effective in dealing with large classes. The Distance Education Programme has also relied mainly on printed textbooks and monthly meetings with tutors for delivery of instruction and remediation. This does not adequately engage learners in their interaction with instructors, course content and among themselves. It is also not cost effective.

The University's ICT Strategic Plan (2003-2008) among other things sought to set up university-wide ICT infrastructure through the provision of Computer laboratories, ICT equipment and software applications, computer networks and Internet connectivity for the purpose of integrating ICT into its corporate business of teaching and learning. As part of this effort, the University has, since 2003/2004 academic year, made attempts to conscientize academics about pedagogical integration of ICTs. For instance, from the period 2003-2005 the University benefitted from the services of an American Fulbright Scholar (the late Professor Emerita Sandra Vogel Turner), who helped academics, through a series of workshops and demonstration sessions, to develop basic technology competences and use of ICT for teaching and learning (basically, use of multimedia tools, PowerPoint™ and Word-processing). During this initial stage of ET initiative, academics were helped to purchase personal computers on hire-purchase agreements with local ICT vendors. Academic departments were also encouraged to set up departmental computer laboratories. The purpose was to increase access to computing facilities by academics and students for teaching and learning.

However, there were no follow-up workshops to address academics' ET needs and concerns since August 2005 when the FB Scholar completed her tour of UEW, until the PHEA ETI revived the initiative set up by the Fulbright scholar. Furthermore, these mass workshops failed to address discipline-specific ET needs and pedagogical integration of ICT. The consequence of these shortcomings is that academics relapsed in their use of ET after they had embraced it.

UEW has also in the past mounted three courses for online delivery on MOODLE. These courses were developed externally by a South African organization, eDegree. Lecturers of the University were not involved in the design and development of these courses and were only involved in facilitating the courses after their development. The distinguishing features about the courses were the pacing, assessment and interactive nature of the courses. Students learned at their own pace, they had immediate feedback for exercises they completed, and they could collaborate with each other using blogs and forums. An evaluation of the use of MOODLE in these courses was conducted after the semester, through questionnaire administration to the 21 student participants who submitted themselves for the end of semester examination. The 21 students consisted of 17 second-year students and four first-year students. The findings of this evaluation revealed that:

While facilitators did post assignments and use the discussion boards, they did not appropriately respond to student challenges and queries.

Academics did not feel a part of the process i.e. they did not own the design and delivery process of the courses. Facilitators found the technology challenging, despite their self-professed confidence with technology in a survey of interested academics that was conducted to assess their technology competences before the courses were delivered on MOODLE. eDegree hosted the MOODLE from South Africa; therefore, technical support

was not readily available at UEW. This also meant that capacity was not built within the institution.

These findings indicate that one of the challenges has to do with the extent to which academics involved in this intervention were outsiders to the process of design and development, and were only involved at the level of driving what an external designer wanted them to do to facilitate the course. In this sense, the academics did not exercise agency – their ownership of the project was limited because they were not part of the design and development.

Using Ko and Rossen's (2004) classification of e-learning environments, the University of Education, Winneba's learning environment may be classified as one in transition from a low-tech to mid-tech scenario. According to this classification of learning scenarios, a low-tech scenario has little or no experience offering courses online and infrastructure is minimal. In a mid-tech scenario, the website may have pointers to individual courses offered online, but the quality of such courses may be suspect as they are not based on approved standards of the university. A high-tech scenario has been described as one where a full-scale institutionalized course management system has been installed and managed institution-wide. The situation at UEW is currently one where the ICT infrastructure and Internet connectivity, capacity of academics to develop online courses and adopt pedagogies and instructional practices has only recently improved to allow the deployment of hybrid courses on MOODLE.

There are fiber optic cable Local Area Networks (LANs) that are interconnected to form the Campus Area Network (CAN). The University has broadband Internet connectivity with aggregate bandwidth of 310 mbps (155 uplink, 155 downlink), and Vodafone Ghana is its Internet Service Provider (ISP). Despite these efforts at providing ICT facilities, instructors and learners' access to computing and Internet facilities is relatively low. Because of inadequate computing facilities and large student enrollment, only first year students have access to the computer lab and access is limited to class sessions too. These are students that take the core ICT courses (GPD 113 and EDI 502). Access to these facilities after classes is not adequate, though steps have been taken in the past year to install Internet kiosks and Wi-Fi hotspots in Halls of residence and specific locations on all campuses. All faculty and staff as well as students have university assigned official email accounts and server space of 10GB for academics, according to the University's Network Administrator annual report (2010/2011 academic year).

However, until the inception of the PHEA ETI, pedagogical use of ICTs had rather been limited (Mereku & Yidana, 2012; Yidana, 2007). There are various reasons for this, including lack of instructional technologies in classroom settings, unreliable internet connectivity mainly as a result of power outages, inadequate knowledge and skills for pedagogical integration of ICTs, dated instructional strategies and practices that are characterized by teacher-centered approaches and curricula that are not aligned to ICT integration. The lack of consistent technology professional development

programmes and an institutional policy for ICT integration is another barrier to effective adoption of educational technology at UEW.

A hybrid instructional delivery mode (a system of instructional delivery using online instructional tools that supplement the face-to-face interactions) of online learning environment was set up to supplement face- to- face (f2f) lectures and practical classes on February 21, 2011. In this mode instructors and learners interact, using a blend of MOODLE learning platform and face-to-face classroom engagement. In this context, MOODLE was used to extend students' access to learning resources and activities online, enhance student-student, student-lecturer and student-content interactions using MOODLE collaborative tools and to enrich activities and resources to support classroom interactions and assessment. Students accessed the environment using their UEW official user accounts (password protected). Students accessed the MOODLE for the entire semester, spanning from February to June 2012. MOODLE was set up and configured at the Network Operations Center (NOC) on a dedicated server procured with funds from the PHEA ETI.

Research on the effectiveness of web-based learning is lacking in the Ghanaian context, as pedagogical integration of ICTs is not yet widespread among Higher Education institutions in the country. The few studies that have been done document the processes and development of open educational resources for delivery of a number of medical programmes (Ludewig-Omolloy, 2011a; 2011b). There is therefore a need for a systematic evaluation of the MOODLE learning environment to ascertain the effectiveness of using a web-based learning management system to enhance teaching and learning at UEW.

The educational significance of this study lies in the fact that its findings will inform UEW's Educational Technology policy and technology professional development programme about best practices and challenges associated with online instructional delivery and learning. By documenting experiences of academics and students using MOODLE, the University will be guided in future institutional rollout of the LMS across all academic disciplines. The use of MOODLE at UEW will help the University to achieve educational goals by inculcating into academics and students' knowledge and skills required for effective pedagogical integration of ICTs. This study is also likely to benefit other institutions in Ghana and elsewhere who would like to or are already deploying MOODLE to enhance teaching and learning.

Preliminary findings from Project 1 (Baseline study on current state of educational technology at UEW) and an earlier study by Yidana (2007) showed that the following challenges still persisted at the outset of the PHEA ETI at UEW in 2010:

- Faculty resistance to change and ICT innovation, especially amongst older faculty members
- Low educational technology competencies among faculty members
- Lack of a consistent system-wide programme for integrating educational technology

- Inadequate instructional design and ICT integration knowledge and skills among academics
- Insufficient time for faculty to attend training programmes as a result of work overload and large class sizes
- Low level of academics' use of existing ICT facilities and resources.

In order to address these myriad challenges, the UEW-PHEA ETI sought to build the capacity of academics to design and develop online courses and to deploy such courses on the MOODLE Server that was procured with funds from the PHEA ETI. The overall goal was to use this intervention to improve the quality of teaching and learning in the University through training of academics on online course development, modern instructional strategies and pedagogy and MOODLE use for teaching and learning.

In light of the identified challenges, this qualitative study therefore seeks to evaluate how the use of MOODLE impacts academics' pedagogical practices and quality of students' learning in a hybrid mode of instructional delivery.

4. Courses under consideration and their characteristics

The PHEA ETI at UEW seeks to address these challenges through online courseware development and the use MOODLE for teaching and learning hybrid courses. The purpose is to improve quality of teaching and learning at UEW through the adaptation of a hybrid/blended model of instructional delivery using the MOODLE learning platform (Project 2). The lessons and experiences gained from the earlier ET initiatives informed the deployment of MOODLE for the courses used in the current Project 2 as well as this associated evaluative research. UEW's ultimate intention is to use MOODLE as its institutional LMS to enhance instructional delivery and expand sources of learning pathways for students. Online learning, when designed and managed optimally, can make learning among students and between lecturers and students more interactive. In order to effectively integrate MOODLE into teaching and learning practices at the university, it is essential to develop an understanding of the relationship between educational programme design and delivery and learning processes. The courseware design and development processes were used to address these concerns. It is intended that this study will contribute to an understanding of the ways in which the use of MOODLE affects learning and teaching activities and practices so as to inform how teaching and learning using MOODLE can be enhanced.

This research project was carried out in two stages in line with the two phases of Project 2. Phase 1 piloted two ICT courses: GPD 113 - Introduction to ICT for undergraduate level 100 students and EDI 502 - Computer Applications in Education for postgraduate (M.Phil. and M.Ed.) students. The purpose of this pilot was to test the installation and configuration of MOODLE for a wider

deployment of courses in Phase 2. GPD 113 is a required course for all first year undergraduate students, while EDI 502 is a mandatory course for all postgraduate students.

The main purpose of these courses is to equip students with basic ICT literacy and competencies to enable them to use available ICT facilities and resources in the conduct of their learning and research work. A module on Internet and MOODLE use was added to the GPD 113 and EDI 502 courses to equip students with the rudiments of online learning. The GPD 113 course covers basic computer systems, MS Office Application and educational use of the Internet. The course is basically a skill-based course and so hands-on activities in the lab were emphasized. The EDI 502 syllabus covers foundations of education technology, use of the Internet and statistical analysis tools (SPSS) for postgraduate students' research work. In both courses, collaborative and activity modules of MOODLE were used to complement f2f interactions among students, between students and instructors and between students and course content as well as in course assessment and evaluation.

The blended course (GPD 113) was piloted from February 2011- June 2011 with a class of over 1,300 level 100 students. The pilot with EDI 502 was during the 2011 Sandwich (Summer) session from June-August 2011, with 98 M.Ed. students. These pilot courses helped the instructors to refine the online components of the two courses in preparation for implementation of Phase 2 of Project 2 - the development and deployment of hybrid courses on MOODLE Learning Management System. It also served the purpose of helping to identify critical training needs of participating academics during the online courseware development and MOODLE use workshops.

The Phase 2 implementation of Project 2 sought to re-run the two piloted mandatory ICT courses after enhancing them, using experiences gained and lessons learned during the initial pilot phase. Also in Phase 2, the number of courses increased to eight from two, and the blended model for these courses was implemented from September - December 2011 during the first semester of the 2011/2012 academic year. The researchers decided to include these other eight courses because the academics were ready to pilot them and also because inputs and feedback from these colleagues and their students would provide useful insight for further improvement on the deployment of MOODLE in more courses across the different Faculties.

Using data gathered and experiences obtained from the June-August sandwich program, EDI 502 was enhanced to include more activities and topics. Additional features added include assignments; and a survey to collect data on student assessment of the impact of the online course. The EDI 502 course on MOODLE was run for the regular MPhil programme, with 354 students in the first Semester of the 2011/2012 academic year. The two lecturers were assigned to teach this level 500 course, and a duplicate course was created on MOODLE for the other lecturer.

Using data gathered and experiences obtained from piloting the GPD 113 course during the second Semester of 2010/2011, the course was improved to include more activities and an additional topic. The course was run in the first Semester of the 2011/2012 academic year. Duplicates of the course were created on MOODLE for the five lecturers, including the two participating lecturers who taught this general course. There were about 1,500 students involved. Course data are currently being analyzed to assess impact.

The other courses that were developed on MOODLE during the 2nd Semester of 2010/2011 and run as a pilot in the first Semester of 2011/2012 during the Phase 2 implementation are shown in Table 2 below.

Table 2 Courses Piloted in First Semester of 2011/2012

Lecturer/Author	Course Code	Course Title	Level and Target Audience
James B. Williams	ICTE 113	Foundations of Educational and Instructional Technology	Required course for level 100 ICT Education students, piloted with 35 ICT students.
Osafo A. Wilson	ICTE 114	Introduction to Distance Education and Online Learning:	Required course for level 100 ICT Education students, piloted with 35 students.
Ruby Hanson	CHE 232	Inorganic Chemistry	Chemistry course for level 200 Science Education students, piloted 27 students.
Patricia Appiah-Boateng	GPD 114	Introduction to ICT	Level 100 course for Basic Education, involving 35 students.
Joyce Asante	ECB 235	Mathematics in Early Years	Level 200 course involving 27 Early Childhood Education students.
Jones Apawu	ICTD 111	Introduction to ICT Systems and Tools for Mathematics Teachers	Level 100 course, involving 157 Mathematics students.
Peter Akayure	ICTD 231	Courseware Design and Development Using Multimedia Tools	Level 200 course, involving 157 Mathematics students.
Issifu Yidana	ICTE 234	Multimedia Authoring and Webpage Design	Level 200 course, involving 25 ICT students.

Two other courses that were supposed to be piloted in the Phase 2 implementation were not ready during the stipulated period. Owing to a

vigorous advocacy drive and motivational incentive packages in the form of monetary reward for participating academics in the Initiative (see details of incentives in the discussion section), at the close of the second semester of the 2011/2012 academic year, over 69 courses from eight faculties and the Institute of Educational Development and Extension (IEDE) have been mounted on MOODLE, though some of them were still being developed and improved. Most academics (80%) who have embraced the PHEA ETI at UEW are from the Winneba Campuses, particularly from the Departments of ICT Education, Mathematics Education, Science Education, Language Education, Creative Arts, IEDE, Educational Studies and Social Science/Studies Education.

5. Online Learning and Course/Learning Management Systems

A Learning Management System (LMS) is application software that automates the administrative tasks of education/training, such as registering users, tracking courses in a catalogue, recording data, charting a user's progress toward certification, and providing reports to managers (Hall, 2004). These systems also serve as a platform to deliver eLearning to students through facilitation of online interactions and distribution of learning materials.¹ Horton (2000) states that LMSs can be used in one of three scenarios namely: (i) in a completely online environment without face-to-face interaction; (ii) in a hybrid course environment where the class frequently meets face-to-face, as well as conduct online meetings and activities; and finally (iii) in a face-to-face course environment with the provision of web-based support materials and activities. Interactive technologies, such as Web-based technology can enhance collaboration and construction of knowledge whether a course is totally online or only partly enhanced by technology (Comeaux & McKenna-Byington, 2003; Liaw, 2004; Zhang, Zhao, Zhou, & Numamaker, 2004). Paulsen (2003) states that the successful use of e-learning systems in delivering online courses may be attributed to the availability of LMSs.

LMSs are available in two forms: Proprietary/closed source and Open Source. Open source software can be defined as software distributed under a licensing agreement which allows the source code (computer code) to be shared, viewed and modified by other users and organizations (coreDNA, 2009). Some examples of Open Source course management systems or learning management systems are ATutor, Anaxagora, Bodington, Docebo, eFront, Dokeos, Claroline, ILIAS, Interact, .LRN, Manhattan Virtual Classroom, MOODLE, OLAT, Sakai, Site@School, Ganessa, and VClass (coreDNA, 2009).

Closed source software is proprietary software that is distributed under a licensing agreement to authorized users with private modification, copying and republishing restrictions (coreDNA, 2009). The cost of proprietary

¹http://www.leftbrainmedia.com/2.1_lms_systems.html

software usually varies from thousands of dollars to hundreds of thousands of dollars, depending on the complexity of the software and other customizations or services that come with it. Proprietary software providers do not allow users to alter or view the source code of its software products. Some examples of closed source/proprietary course management systems are ANGEL, Apex Learning, BadiyanInc, Blackboard, Desire2Learn, eLeap Learning Management Systems, Global Teach, Joomla LMS, WebCT, and Wizdom Web (coreDNA, 2009).

The survey by Unwin, Kleesen, Hollow, Williams, Oloo, Alwala, Mutimucuo, Eduardo and Muinga (2010) based on 358 respondents across 25 African countries, explored usage of Learning Management Systems, and reported familiarity with LMSs. One hundred and seventy four (174) respondents (49% of total sample) affirmed that they had used an LMS for teaching in the previous 12 months and 185 (52% of total sample) had used one for learning. In the same study two LMS environments dominated i.e. Blackboard and MOODLE. The UEW adopted MOODLE (Free Open Source Software) because of (i) cost considerations, (ii) its popularity among African Universities and (iii) its ease of use by academics that are not adequately competent in the use ETs and facilitation of online courses.

The adoption of LMSs for web-based instruction continues to increase in today's higher education institutions (Vovides, Sanchez-Alonso, Mitropoulou, & Nickmans, 2007; Ullman & Rabinowitz, 2004) and studies have shown that students have a positive perception of LMS when used in a blended system (Bongey, Cizadlo, and Kalnbach, 2005; Erah & Dairo, 2008 ; Greyling, Kara, Makka, & Van Niekerk, 2008). A very recent study by Zhu (2012) on student satisfaction, performance, and knowledge construction in online collaborative learning concluded that learning with peers may benefit not only the overall individual performance; it may also enhance team performance by increasing the quality of team product. Students can learn to formulate ideas and opinions more effectively through group discussions. Based on social constructivism and activity theory, the MOODLE online learning system for instance can enrich collaborative learning activities for knowledge construction.

According to Morgan (2003), the Educause Centre for Applied Research studied the faculty use of LMSs, the extent and purpose of use, including the factors on which instructors' decision to use a LMS were based, and whether the use of the LMS resulted in "pedagogical gains". The study results show that the use of an LMS is increasing at a rapid rate. It is however remarkable that the use is not focused on the interactive features of the LMS but on the content creation tools. The results also indicated that although instructors claimed that they had adopted the LMS in order to meet pedagogical needs, it seemed that the actual use of the system was meeting class management needs. It is worth noting that even though the World Wide Web contains vast information and resources, the inefficient use of these resources can limit many instructors who may not know how to harness the strengths of these information forms and resources (Jungwirth & Bruce, 2002). What this means is that courses modeled to be delivered online should include a lesson on

effective use of the web to enable learners to use web-based platforms effectively and optimally.

Greyling, Kara, Makka and Van Niekerk's (2008: 179) observed that "for instructors to have the relevant skills to be able to utilize LMS tools effectively and to incorporate relevant pedagogical practices in their courses they need to have in depth training and access to technical support and assistance." This point was emphasized by Severson (2004) cited in Vovides et al. (2007) who states that "learning to use technology to design instruction requires much more than learning to select a specific set of tools. It is crucial that instructors are trained and supported to acquire the 'new' pedagogical role (that of facilitator/coach) and the implementation advantages they can offer to educational technology" (p.72). When pedagogical approaches to teaching are consistent with the technology, the efforts to use the technology are more likely to yield positive results. Topper (2005: 304) believes that "for teachers to use technology in support of their teaching, and to see it as a pedagogically useful tool, they must be confident and competent with the technology they are planning to use". As a consequence, it is essential that instructors have in mind both technology and pedagogy when designing their course content and assignments for LMS delivery and training and support is absolutely essential if instructors are expected to develop and implement LMSs as powerful learning tools (Nelson, 2003 cited in Vovides et al, 2007). The PHEA ETI has thus considered the training of academics in online course design and development as well as on how to effectively use MOODLE for teaching and learning as a critical component of the Project 2.

The University of Education, Winneba (UEW) adopted the hybrid or blended model because (i) the issue of large class sizes is a big problem that creates less lecturer-student interaction; (ii) most academics have inadequate capacity and time for effective facilitation of full online courses and (iii) the ICT infrastructures/facilities, particularly Internet connectivity, are not yet developed significantly to support exclusive online course delivery. The blended instruction encourages different learning styles and maintains quality lecturer-student interaction in the classroom at the same time (Dukes, Warring & Kirkland, 2006). When instructors replace in-class time with online components such as uploading reading materials for students to download prior to class, discussion forums, quiz etc., it frees up time for the lecturer to address students' learning problems or areas that students may find particularly confusing. Also in courses that offer practical experiences or hands on practice, a hybrid approach provides enough time for the teacher to provide hands on instruction.

6. Research design

The study adopted a general qualitative approach to evaluate and document the processes and activities carried out in the UEW-PHEA ETI Project 2. A qualitative approach was used because this methodology is best suited for analyzing the situation data in order to frame issues and formulate emerging

themes (Owen & Demb, 2004). This study is thus essentially an evaluative study that sought to investigate how academics and students used the MOODLE LMS to enhance teaching and learning. The evaluation used several qualitative instruments and strategies including documentations of processes and activities, observation of academics' and students' use of MOODLE and interviews and focus group discussions. According to Owen and Demb (2004: 640), "a research strategy based on individual interviews and focus group discussions allows for the inclusion of a broad range of perspectives from a variety of individuals who are intimately immersed in the innovative changes on campus as developers, implementers, and/or end users."

6.1 Sample description

Two ICT lecturers were the main participants in this qualitative study. Initially, there were two main reasons that informed their selection. The first reason for using these particular academics in the research was that they were already using ICT for pedagogical purposes and were therefore more inclined to adopt MOODLE at the pilot stage without much difficulty. The second reason was that these academics were directly involved in the UEW-PHEA ETI Projects and were responsible for training and assisting other academics in their development and deployment of courseware on MOODLE. One of these academics was Project 2 Team Leader and the other the overall PHEA ETI Programme Leader and the Principal Researcher for Project 3. The research team for this study included two other senior academics as researchers and two research assistants, who were purposively chosen because of their expertise in educational and instructional technology and research. Their responsibility was to assist the main ICT lecturers to conduct this evaluative research. One of the supportive researchers (Rev. Dr. Alexander Kyei Edwards) also piloted two courses on MOODLE during the Phase 2 implementation of Project 2.

Five others lecturers out of eight who have been using MOODLE under project 2 participated in a focus group discussion. Two sets of students consisting of six members each participated in the student focus group discussions. They were purposively chosen by virtue of their participation in courses run on MOODLE under Project 2. Focus group discussion was preferred over self-completed survey because the use of MOODLE was not yet widely experienced at UEW and because the researchers wanted to delve deeply into participants' experiences with MOODLE to get insight into how the intervention could be rolled out to the wider University academic programmes. This sort of input from academics and students outside the research team provided useful insight into how non-ICT lecturers in particular implemented their courses on MOODLE.

Combining action research and data collected from other participants generated broader comparative data and an opportunity for triangulation, compared to if only action research from two academics' practices and experiences had been used to evaluate project implementation. Furthermore, because the original ICT lecturers were already users of ICT for instructional

purposes, the challenges and difficulties that a majority of academics who still had a lot of inhibitions about the use of ET and MOODLE in particular, would have eluded this study. Thus using the general qualitative evaluative approach that involved more than two ‘champion’ academics and processes from planning to implementation in the study was appropriate. This is because other non-ICT academics would confront their inhibitions and find ways to conquer them through learning about their practices. This would empower them and at the same time expose their practices and their limitations to a community of colleagues who would support them in seeking improvement to these practices in using MOODLE. It was in this spirit that the research team decided to include academics and their students who piloted the other eight courses in the Phase 2 implementation of Project 2. The details of participating academics are given Tables 2 and 3.

6.1.1 Lecturers

Table 3 below indicates all Academics and their experiences and courses taught during the Phase 2 implementation. Academics involved in the other courses that were piloted during Phase 2 included three from the Department Mathematics Education, one from Science Education, one from Early Childhood Education, and three from ICT Education. Of the 10 academics participating in this study, only one was a female. The technology competency level of the non-ICT academics was not very high at the beginning, though they were highly motivated to use MOODLE for their courses (See Table 2).

Table 3 Demographic information of key researcher-participants

Participant	Educational Qualification	Experience with technology	Courses taught:
Lecturer 1: Dr. Issifu Yidana	PhD in Instructional Technology	Has been teaching with technology for the past 20 years in HE: Use of MS Office Suite, Multimedia Applications, Databases and DBMS, Computer Programming (BASIC/VB, C++, VB, JAVA) and extensive teaching and learning experience with Blackboard, instructional/courseware design and development, Web Editing applications, and Computer-based Learning/Instruction	EDI 502 Computer Applications in Education GPD 113 Introduction to ICT, ICTE 234 Multimedia Authoring & Webpage Design and ICTE 231 Visual Literacy in Education
Lecturer 2: Mr. James	M.A. (Educational Administration and	Extensive use of MS Office Suite, Use of ET,	EDI 502 Computer Applications in Education,

Participant	Educational Qualification	Experience with technology	Courses taught:
B. Williams	Technology)	networking, and learning theories	GPD 113 Introduction to ICT, ICTE 113 Foundations of Educational and Instructional Technology;
Lecturer 3: Rev. Dr. Edwards Kyei Alexander	EDD (Educational Leadership and Administration); Masters in Educational Technology	Has extensive experience working with MS Office Suite, Visual Literacy and multimedia applications, experience learning in Blackboard Platform,	EAM 600 Computer Applications and Social Media in Education; GRD 353 Printing Press Management
Lecturer 3: Dr. Fredrick K. Sarfo	Ph.D. (Educational Technology)	Instructional Design, Assistive and adaptive technologies	Did not mount any course on MOODLE
Research Assistant 1: Mr. Raymond B. Boison	M.Ed. (Computer Education and Technology); Instructional Technologist	Extensive experience learning with Blackboard, Web editing applications, Computer Programming, Educational use of Social Networking, Instructional Design, etc.	Assisted MOODLE course developers; assisted with collection and analysis of research data
Research Assistant 2: Mr. Osafo A. Wilson	M.Phil. (Mathematics and ICT Education); Lecturer of Mathematics and Educational Technology	Multimedia Authoring, Databases, Educational Technology and online learning, Instructional Design, etc	ICTE 125 Discrete Mathematics, ICTE 126 Linear Algebra

6.1.2 Students

Two categories of students were involved in this study: 3,000 undergraduate students aged between 21 – 25 years and 200 postgraduate students aged between 25 – 45 years. Both groups of students came from all the academic departments and faculties because the two ICT courses are mandatory for all students in their first year. From a pre-course evaluation of students' background, it was found out that the technology competency level of the undergraduates was higher than the postgraduate students. This was apparently understandable because, about 75% of undergraduate admissions are reserved for Senior High School (SHS) graduates, who have pre-university ICT experiences. The majority (80%) of the postgraduate students had little or no ICT experience prior to their enrolment into the Graduate School. Both categories of students had no experience learning online, except occasional use of the web to search for materials to do assignments.

6.2 Operationalization of the project

The planning for implementation of the UEW-PHEA ETI programme began in March, 2010 after the Inter-institutional workshop held in Johannesburg, earlier in February, 2010. Planning is a very important part of the project implementation process. Planning allowed the project team to set priorities and strategize for project implementation. The key processes followed in the planning process included the setting up of the administrative structures that would manage the project and make sure it was successful. At the planning stage the team organized meetings and workshops and procured equipment and software.

There were four PHEA-ETI preliminary meetings by the programme management team to set up the important project management structures that would guide the design and implementation of the PHEA ETI programme. As part of the planning stage, four researchers, six Researcher Assistants, three Multimedia Specialists and four MOODLE Technicians were appointed. The researchers and assistant researchers were involved mainly in Projects 1 and 2 and they assisted the team leaders to implement these projects. The three multimedia assistants and MOODLE technicians were recruited to assist in the MOODLE management and online courseware development.

After the basic management structures were set up, the ETI management team prepared the implementation plan/Gantt Chart for the various projects. The team also identified and prioritized implementation activities for budgeting purposes and the implementation budget was subsequently prepared based on these activities. During the planning stage the MOODLE server, Adobe CS5 Software suite and antivirus software were procured and installed after an earlier attempt to run MOODLE on a stand-alone PC was disrupted when the PC crashed without the NOC backing up data. MOODLE application was downloaded, installed and configured by the end of the 1st Semester of the 2010/2011 academic year, a little too late to begin the implementation of Project 2 in that semester. The UEW MOODLE site was set up and configured at the NOC by the University's Network Administrator with help from facilitators from SAIDE (South Africa).

The GPD 113 (Introduction to ICT) course was run on a pilot basis during the second semester of the 2010/2011 academic year. The EDI 502 course was piloted in the 2011 Sandwich session (June - August). Users (faculty and students) were registered by the NOC system, using official UEW network accounts. A hybrid mode of online learning environment, using MOODLE, was set up to supplement face-to-face (f2f) lectures and practical classes on February 21, 2011. Students accessed MOODLE content from March to July 2012. A checklist was designed for observing and monitoring activities being carried out by instructor(s) and students on the UEW MOODLE Learning Management System in the EDI 502 Computer Applications in Education and GPD 113 Introduction to ICT courses in both Phases 1 and 2. The strategy was to compare instructors and students' use of the features of MOODLE in both phases with the view to observing improvement in instructional practices and quality of learning. The Phase 2 rerun of these two courses and

eight others which were ready for their first pilot was carried out in the first semester of the 2011/2012 academic year (September – December 2011). From the MOODLE server-side logs, we know that the GPD 113 course was set up on February 21, 2011 and the course instructors ended course activities on June 22, 2011.

6.2.1 Procedures to evaluate the quality of MOODLE courses

The quality of courses was evaluated using a course structure and learning pathway rubric as well as a checklist provided by SAIDE. The details about the course structure and learning pathway adopted are given Table 4. Sixty-nine MOODLE courses were subjected to internal evaluation, from which 42 courses were selected for further internal and external evaluations. This selection was based on the levels of course development and their quality. The internal evaluators were J. B. Williams and Issifu Yidana., Ph.D. SAIDE selected the external evaluators led by Ephraim Mhlanga, Ph.D.

Table 4 UEW-PHEA ETI MOODLE Course Structure and Learning Pathways

Week/Topic	Content/Activities	
	Component	Details
Week 0	Course code and title	Provide the official course code and title
	Introduction	Welcome message to learners What is the course about? What do learners expect from the course? What responsibility is placed on learners in the course?
	Course objectives/goals	General Learning objectives Use text label to direct learners to course manual for details (e.g. grading policy, assignment due dates, class policy, course materials/references)
	Contact information of instructor and Teaching Assistant	Include e-mail, office hours, office location, contact phone number [optional] and link to a brief biography [optional]
	Introduction of instructor and learner in a forum	Give a brief introduction about instructor and ask learners to also introduce themselves to the rest of the class via a forum discussion
	Information about how learners can access support: academic and technical	Provide directions about how, where and whom learners can contact for support.
	Information about web ethics	Give the ground rules about learners' behavior online
	Simple chat to initiate interaction with learners and among learners	Use a simple chat to initiate interaction in first class and to motivate and arouse learners' interest in the MOODLE platform

Week/Topic	Content/Activities	
	Component	Details
	Navigation pane	Give directions about how learners can find their way in the course
Week 1 to Week n	Weekly learning pathway	Topic title Introduction Link Relevant previous knowledge to current topic Learning objectives for topic Presentation Resources linked to learning objectives Lesson in PowerPoint Plain text/pdf notes reading materials Multimedia Link to external web resources Activities (linked to learning objectives) Chats Forums Wiki Reflective learning journal Quizzes Assignments Projects Course evaluation by learners (formative and summative)

Each academic was required to follow this course structure and learning pathway. Course developers were also required to meet the standards demanded by the SAIDE checklist for MOODLE course evaluation.

6.2.2 Capacity building workshops

A series of five workshops were organized for courseware developers from March 2011 to March, 2012. The overarching goal for these workshops was to build and improve the capacity of participating academics to design and develop online courses. The other objective was to assist these academics to shift from teacher-centered pedagogy to learner-centered pedagogical practices and instructional strategies that the MOODLE platform supports. Table 5 gives a summary of the workshops.

Table 5 Workshops organized under the PHEA ETI

Workshop	Target Audience	Purpose
One-Day Research Workshop	3 researchers and 2 research assistants	To build the capacity of these researchers to conduct the research;

Workshop	Target Audience	Purpose
		deliberate on research strategies and terms of reference.
Technical Support Staff Workshop	4 Network technicians and 3 Multimedia experts.	To build the capacity of the network administrator and technicians to manage the MOODLE platform and to also assist academics in courseware design.
Courseware Developers' Assistants Workshop	6 Instructional Technologists	To enhance the capacity of the instructional technologists to assist courseware developers in the deployment of courses on MOODLE.
Five (5) Courseware development workshops	Participating academics/courseware developers	To build the capacity of academics in online course design/development, online pedagogy/learning theories and use of MOODLE for teaching and learning.

The first of these workshops was held on the Winneba South Campus from the 14th March - 18th March 2011. The participants were academics who were invited based on the advocacy workshop survey. The main facilitator was Mr. Andrew Moore of SAIDE. He was supported by the projects two and three leaders who were also the two lecturers piloting the EDI 502 and GPD 113 courses. The objectives of this particular workshop were to enhance the capacity of academics in designing online courses, to improve the capacity of academics in utilizing MOODLE in teaching and learning and to increase awareness and use of Open Educational resources in teaching and learning.

After the initial course development workshop, there was the need to conduct a follow-up workshop for courseware developers to maintain the momentum of academics in their course development process. These workshops were facilitated internally by Projects 2 and 3 leaders. This was a five-day workshop organized as a follow-up to the March 2011 one to assess course developers' progress and offer them technical support on a one-one basis as suggested by participants in the earlier workshop. The workshop reviewed MOODLE environment and its modules as well as instructional and e-learning strategies. For the most part of the last four days, participants worked on their courses, while facilitators offered them one-on-one assistance. Fifteen academics participated in the workshop.

As a result of the evaluation findings of the August 2011 workshop, there was the need to organize another follow-up workshop that was facilitated by Mr. Andrew Moore, the SAIDE MOODLE resource person from 19th to 23rd September, 2011. Forty-two (42) participants (up from 15 in the last workshop) including the two ICT lecturers for EDI 502 and GPD 113 participated in this workshop. This was an overwhelming increase in participation compared to the first two workshops. This meant 27 of the people were new and had not attended the previous training, though some would have attended the very first workshop. As this was a hands-on session, the external facilitator assisted by the two internal facilitators provided

individualized attention to both new and old participants. The increased number of participants further showed that the UEW PHEA ETI Programme was gaining acceptability within the academic community of the University.

A one-day workshop was organized to enhance the capacity of these technologists in courseware development and facilitation of instruction on MOODLE. The participants in this workshop were drawn from the Ohio University trained educational technologists from Winneba, Kumasi and Mampong Campuses. They already had online learning experience using Blackboard LMS. They also had been trained in instructional design, multimedia authoring and pedagogical integration of ICTs among other things. Thus, they had the requisite experience to mentor academics working on their online courses and to help them deploy these courses on MOODLE.

The content of the workshop included courseware design/development principles, MOODLE environment, course structure and learning pathways on MOODLE, facilitating online instruction, quality assurance and Evaluation of courseware for online delivery. Participants' roles and responsibilities were outlined and discussed with them. These include:

- Assisting courseware developers to design and develop their online courses
- Assist courseware developers to upload course materials on MOODLE
- Provide one-to-one on-going technical support (facilitating online instruction) to courseware developers on a faculty basis
- Assist researchers to collate lecturers' and students' activities and experiences with MOODLE
- Use a quality assurance checklist to formatively evaluate the quality of the courses mounted on MOODLE

Despite the fact that a series of workshops had been organised for the writers and technical assistants to build their capacity, the actual work of designing and uploading of courses on MOODLE was not progressing at the desired pace in order to meet the project deadline. The periodic reports from courseware developers' assistants confirmed this. Consequently, the Externally Funded Projects Office (EFPO) in conjunction with the PHEA ETI Programme Management Team organized a retreat writing workshop for course developers at the Kumasi Campus from 28th January to 5th February, 2012. The venue for this workshop was shifted to Kumasi to afford the majority of academics, who came from the Winneba Campuses, the opportunity to concentrate on their course development and deployment, away from the distractions that they face in Winneba. Experiences of the EFPO in similar university-wide projects showed that course writers were able to achieve more when they work outside their immediate environments, as the evaluation of this workshop confirmed.

A total of 31 courseware developers and the six courseware developers' assistants from Winneba, Kumasi and Ashanti Mampong Campuses participated fully in the retreat. The six assistants who were trained in the previous workshop were brought in to offer the one-on-one assistance to

course developers. There was a drop in number of academic participants by 11 compared to the 42 in the previous workshop for course developers. Some academics were not able to make it to Kumasi because of other institutional commitments. The retreat was scheduled to run for nine (9) full days (weekends inclusive) from Saturday 28th January to Sunday 5th February, 2012. This was to ensure that at least nine (9) Units would have been developed by each participant at the end of the retreat. The course developers were thus given a serene atmosphere to continue working individually on their courses as the assistants went round to offer them necessary assistance. The retreat began with a brief opening ceremony by the Vice Chancellor. In his opening remarks, the Vice Chancellor expressed appreciation to the participants for sacrificing their time and weekends to be part of the retreat for the cause of UEW and assured them that they would be appropriately motivated.

Finally, the fifth workshop was organized to offer the external facilitator from SAIDE an opportunity to meet participants in the project who had recently returned from a writing/designing LMS retreat to ascertain progress and quality of the educational products being developed. The primary focus of the workshop was evaluation and facilitation of e-learning courseware. Participants worked on revisions to their courses. The group used an interactive spread sheet that provided simple feedback on 32 criteria to assess their courses, -which were at different levels of development. Participants also learned how to enroll students, make backups of their courses, and insert a social networking Facebook 'Like' box inside their MOODLE course.

6.3 Data collection

The following data collection methods were used:

Reflective Journals of Academics (RJA): one of the two lecturers (Yidana) involved in the Phase 1 implementation kept a reflective journal on all processes that were carried out towards the implementation of MOODLE. Journal input included classroom practice, courseware development process and engagement with MOODLE during implementation stages. This journal documented lecturers' experiences working with other academics and in MOODLE.

MOODLE user logs (MUL) for each of the two courses provided evidence about how academics and students used the MOODLE platform for teaching and learning. Data obtained from the logs included frequency of usage, the type of activity, and students' interactions with facilitators as well as peers on MOODLE. These logs also provided useful information about students' reflections on the influence of MOODLE on their learning as obtained from their reflective journals.

Focus Groups Discussion for Students (FGDS) who participated in the PHEA ETI MOODLE courses was also discussed to obtain students views about how they used MOODLE and how their use of MOODLE impacted the quality of their learning experiences.

Focus Groups Discussion for Academics (FGDA) with selected instructors who participated in the Phase 2 implementation offered the researchers an opportunity to obtain qualitative data from their peer academics about a range of issues concerning how their use of MOODLE impacted their instructional experiences using a hybrid mode of delivery. These discussions with colleagues helped the participating academics to do self-reflections on what works and what did not work during the MOODLE implementation. These also provided useful insights into the challenges and prospects of rolling out this intervention across all academic programmes in the university.

Evaluation reports of Advocacy and MOODLE courseware development workshops (ACWDW) provided the wider university community an opportunity to learn more about the PHEA ETI Programme and useful data on how the MOODLE courses were developed by participating academics. The feedback from participants in the advocacy workshop assisted the PHEA ETI Management Team to select courses and academics for the Project 2. Table 5 gives a summary of these workshops. The workshop reports provided rich data on academics' capacity building with respect to how they developed their MOODLE courses and facilitated the delivery in a hybrid mode.

6.4 Data analysis

This research is basically qualitative in nature. Therefore, the research data from the reflective journals, MOODLE use observations, user logs, workshop reports and focus group interviews were analysed qualitatively according to themes around the research questions. The interviews were semi-structured around the research questions and study constructs. Data from these sources were thus structured and coded without additional segmenting of the content. Video and audio recordings of lecturers' and students' interviews were transcribed and analyzed similarly. Workshop data on participation and interaction of participants were also analysed thematically based on the research questions and study constructs. All the transcripts were read by the researchers and coded according to the study constructs and research questions. Reliability and validity were achieved by triangulation of data collection methods: interview, observation and document review, and analysis (Patton, 1990, cited in Owen & Demb, 2004). The semi-structured interview schedules were checked and validated by internal research reviewers and their comments and suggestions incorporated into the final versions. Since the participants were self-motivated individuals eager to adopt ET, their responses might have been influenced by their innovative considerations and biases. However, follow-up probing during the focus group discussions elicited more objective reasons and clarifications for their responses.

6.5 Ethical considerations

It was important to set out principles guiding the work that would be accepted by all those participating in the project. The purpose of the study was explained to participants in seeking their consent to participate in the study. The progress of the work remained visible to all members of the research group through meetings and periodic progress reports. The researchers accepted responsibility for maintaining confidentiality (O'Brien, 2001). The confidentiality of information provided by all participants/subjects was protected by reporting only group data without any form of identification. Academics' and students' participation in the interviews was also voluntary, though the criterion used for selection was based on their participation in courses run on MOODLE.

6.6 Delimitations and limitations

Phase 1 of Project 2 focused on two general ICT courses (GPD 113 and EDI 502), while the Phase 2 component explored eight other courses across different Faculties in addition to a rerun of the two core ICT courses. The other eight courses were developed and deployed at the same time in the First Semester of the 2011/2012 academic year, making it difficult for academics to fully explore the interactive and collaborative tools of MOODLE. Therefore, the detailed description of processes, practices and experiences is

limited to the two mandatory ICT courses and these other courses that were run on a pilot basis in the two implementation phases of Project 2.

Using the hybrid instructional mode means that the findings of this study may not include all perspectives of teaching and learning online. As a preliminary investigation, however, other areas identified by this research would be further explored as an on-going study. The courses investigated were not representative of academic faculties of the University. The findings are therefore applicable to only those courses, academics and students that participated in this pilot study and cannot be generalized to the larger community of academics and learners at UEW. Although the results of a case study cannot be broadly generalized, the case method provides an in-depth analysis of experience (Own & Demp, 2004).

7. Research findings and discussion

Data from the processes and sources outlined above were analyzed and findings are presented and discussed in this section of the report. The experiences of the two ICT academics for the pilot courses in Phase 1 and how their experiences shaped the development of MOODLE courses by the other eight academics who came into the programme in Phase 2 would be discussed alongside students' experiences with MOODLE. The overall impact of MOODLE use by academics and students on teaching and learning was presented under the discussion section.

7.1 Academics' and learners' use MOODLE for teaching and learning

The key questions to answer in this section were:

- 1) How did academics and learners use MOODLE for teaching and learning?
- 2) What processes were followed in the evaluation of the hybrid online courses?
- 3) How did the lessons learned during the Phase 1 implementation assist in modelling courses under Phase 2?

7.1.1 Observation of use of MOODLE by academics and use by students

In order to the answer the key questions in this section, the following central issues of interest on the use of MOODLE were explored using the following broad sub-questions:

- Does the curricular revision adequately include MOODLE use by learners?
- How was MOODLE introduced to students?
- How did students participate in class using the MOODLE platform?
- What kinds of activity are carried out on MOODLE by (a) instructor(s) and (b) students?
- What kinds of issues do students bring to face-to-face class discussions?
- What is the quality MOODLE lesson presentation?
- Clarity and interactive of language used?
- Lesson objectives clearly stated?

- Sequencing of lesson activities appropriately done?
- Clear instructions given for activities and assignments?
- Were assignments and quizzes adequate and appropriate in content and aligned with instructional objectives?
- How actively do students participate in online activities in terms of students' interactions with peers, course content and instructors?
- Does the course require students to keep journals reflecting their learning experiences?
- Do students face any problem or challenge in using the MOODLE environment?

We present the details of how the two ICT courses were piloted in Phase 1 and how the lessons learned informed the development and deployment of the other courses in Phase 2. Table 6 provides details of observations of the two academics' practices and students' learning on MOODLE.

7.1.1.1 MOODLE Environment Lesson Observation in Phase 1

The MOODLE design followed the standard MOODLE features layout. The modules used by instructors included resources, assignments, chats, quizzes, forums, wikis, surveys, glossaries, journals and choices. Lecturers revised the curricula for EDI 502 and GPD 113 to include MOODLE use and during the first lesson instructors demonstrated to students how to log-in and update their user profiles. Instructors also explained the tracking features of MOODLE which would be used to monitor students' online activities. The expected activities under each feature as outlined in the MOODLE user manual was matched against actual activities carried out on MOODLE during the implementation period. The closer these two sets of activities were the more optimal the use of these features and vice versa. Table 6 summarizes these comparative observations in both Phases 1 and 2.

7.1.1.2 Good Practices of Instructors in the Phase 1 implementation of MOODLE

The following were notable good practices observed during the Phase 1 implementation of Project 2:

- MOODLE content file sizes were not large but small for easy uploading and downloading
- Documents were well labelled
- Students were encouraged to save work during their work online e.g. during postings on forums, journals etc.
- Discussions during f2f and online sessions were dominated by learners, while instructors guided and facilitated them
- A variety of reading resources was provided online for the students.
- Students were encouraged to keep journals of their learning experiences and bring issues to class issues for discussion

7.1.1.3 Areas that needed improvement in Phase 2

From the user logs and classroom observations, it was observed that Phase 1 implementation had a number of pedagogical deficiencies in terms of alignment of some course activities with course content. The observations also showed that the activities on learning theory were over-emphasized to the neglect of ICT applications as required by the course outline of the EDT 502 and GPD 113, particularly from the perspective of the instructors who used mainly teacher-centered instructional strategies. In particular, the delivery of the online component of instructions did not take full advantage of the interactive and collaborative features of MOODLE during the Phase1. For example, the instructions about the students' participation in the online forum discussions did not include the requirement that students read postings of their colleagues and respond to these postings. Instructors' participation in the online collaborative activities was limited too. By the end of Phase 1, it was therefore suggested that instructors should focus on developing online learning experiences that incorporate activities with both a beneficial influence on learning and appeal to a wide student population with diverse learning styles and needs. In this respect the following suggestions were incorporated into the Phase 2 implementation.

- Using multimedia (video and audio recordings) especially with PowerPoint presentations to reach out to the diverse learning styles and needs of such a large class
- Providing links to websites for further readings to enable students' access to more learning resources on the web
- Using a glossary to explain some important terms or where students can paste terms they feel are relevant to the courses that need explanation.
- Giving feedback to students on quizzes and forums re-enforces their learning process
- Summarizing forum discussions would have highlighted the salient points on the various topics
- Providing adequate number of activities to engage learners. For example, set quizzes/assignments/projects for each module of the course to gain insight into students' progress in the course or for students to do regular self-assessment of their progress
- Encouraging students to collaborate during the online forums; collaborative interactions among students and between students and instructor were minimal. For instance, there is no evidence that students responded to neither their colleagues' postings nor the instructor's summary of forum postings. No new threads were created for related issues. Each student just responded to the topic posed by the instructor and where a student posted more than one time, (s)he added more reasons to her or his position in an earlier posting.
- Using assignments and activities on learning theory that use matching activities that MOODLE assessment module and HotPotatoes allow to link learning theory to content tasks and technology tools.

- Using standard course structure and learning pathway to ensure uniformity in MOODLE course delivery.

(Sources: MOODLE user logs, Classroom Observations, and Academic Reflective Journal notes)

In addition to addressing the identified deficiencies during the Phase 2 implementation, a few more features such as survey to evaluate the course, navigation pane to make for easy movement across the course, academic and technical support information were added, and information on how students would get feedback were added in Phase 2. There was improvement in consistency of course layout in terms of font type, colour, use of labels and pictures in Phase 2.

Table 6 MOODLE Observation Comparison of Phases 1 and 2

1. MOODLE 2. Feature	3. Observed Activity Phase 1	4. Observed Activity Phase 2	5. Expected Activity by MOODLE Standards	6. Phase 1			9. EDI 502 for M. Ed Sandwich students and GPD 113 second semester 2010/2011 B. Sc. Students
				7. EDI 502 for M. Ed Sandwich students and GPD 113 second semester 2010/2011 B. Sc. Students	14. Strong Points on Students	15. Strong Points on Instructor	
20. General features 21.	22. General standard features: students registered using their official UEW accounts.	23. Additional general features: 24. survey to evaluate the course 25. navigation pane 26. academic and technical support information on feedback. 27. Consistency of course layout also improved	28. Overall design of MOODLE: 29. user-friendly 30. Efficient Course management 31. efficient Site Management 32. Efficient User management	33. Students enthused by online delivery option	34. Curricula revised to include MOODLE use 35. Explained to students the tracking features of MOODLE,	36. Students faced challenges getting their User IDs and passwords. 37. Students initially faced challenges in logging into MOODLE	38. Students continued to be enthused and excited by online delivery option 39. Fewer login problems were experienced by students. 40. Distribution of students User IDs and passwords was smoother 41. Network connectivity was stable 42.
49. Text Filters	50. Text filter was used to add links 51. Standard text and media formatting was used by instructor 52.	53. No change	54. Auto-linking, Media plug-ins,	55. Navigation and hyper linking was easy	56. Files uploaded on platform were light 57. Course resources were well labelled.	58. None	59. No change
62. Resources	63. Resources displayed included: Word, PowerPoint, Flash, Video formats, Audio formats 64. pages, Internally Text pages	70. Instructors now used more multimedia including video clips and PowerPoint presentations	71. Resources were: 72. prepared files uploaded to the course server; 73. Pages edited directly in MOODLE; 74. External web pages	79. Students were able to interact with content 80. Multimedia content promoted learning on different learning styles	82. Resources were labelled	83. Need to use multimedia tools 84. Video and audio clips inserted in power point present	87. Students had a better experience interacting with content

During the Phase 2 implementation of MOODLE, further steps were taken to address the identified deficiencies. First a standard MOODLE Course Structure and Learning Pathway was prepared to guide us (see Table 4 above). Interested readers may also log in as guest to review UEW Online Courses Site: <http://moodle.uew.edu.gh>.

7.1.1.4 Resources used on MOODLE

The presentation of resources supported learning by students on their own and provided opportunities for learners to develop a sense of ownership of the learning process. Students interacted with the content in an active way and the resources included text, online text, videos, interactive exercises like quizzes, assignments that provided instant feedback. For the EDI 502, for instance, the resources were not adequately aligned with the curriculum content (computer applications in education). More emphasis was placed on ICT and socio-economic development issues and learning theories rather than applications of ICTs in education. This anomaly was detected during the internal course review and addressed appropriately by linking these theories with pedagogical integration of ICTs. Activities were created to match learning theories with technological tools and a set of learning tasks.

7.1.1.5 Use of multimedia and web-based resources

In Phase 1, multimedia elements were minimally used by the instructors. However, in Phase 2 implementation multimedia elements like videos and pictures were extensively used throughout the semester modules. The inclusion of multimedia in online courses would assist instructors to meet the diverse learning needs and styles of a heterogeneous group of students as is the situation at UEW. Initially these multimedia elements were externally linked to the web but in the Phase 2 implementation some of the multimedia was embedded in MOODLE itself with appropriate credits to original sources. There were links to external resources that expanded students' sources of information on various topics.

7.1.1.6 Communication and Interaction

The collaborative tools of MOODLE (chats, forums, and wikis) and self-paced activities like the journal, quizzes, and assignments were used to enhance interaction between instructors and learners, among learners and content. Forums were based on contemporary issues of ICT impact on socio-economic development and learning theories. In the first pilot in both courses the effectiveness of the collaboration was not very good as students just posted their views and never read the views of their colleagues nor responded to colleagues' views. Instructors did not give clear instructions requiring students not only to post their contributions but also to read their colleagues postings and respond to at least two of them. They used these collaborative tools as if it was meant for individualized activities.

Preliminary investigation of the first pilot identified this lapse which was corrected in the Phase 2 implementation. Wikis were used to co-author materials based on the weekly topics but instructors did not organize this into a book. Instructors also encouraged students to keep weekly journals on their reflections about the various topics. These were not threaded journals that would have provided a global picture of students' experiences and challenges over the entire semester. Surveys were used only to evaluate the course at the end of the semester. In Phase 1, surveys were not used at all. However, this was activated

for implementation in Phase 2 and it was actually used to evaluate the EDI 502 course. Overall, the collaborative tools afforded opportunities for student-student, student – teacher and student – content interaction.

In Phase 2 implementation, lecturers used the discussion forum to promote social interaction that got students to debate and react to certain issues. Lecturers put up questions/statements in the discussion forum and students posted their thoughts or opinions and also commented on the postings or thoughts of their other classmates. Lecturers then commented on the replies of the students. Comments by lecturers outside of the research team during a focus group interview buttress this point:

I used the forum a lot. Because we would come to a stage in class [during] the face to face discussion where they would have to give their views on issues and comment on what their friends had also written (Source: FGDA).

*We did forums too where the students were able to comment on other students input.
I used the forums to talk about issues that I really want to pick their minds on.*

Lecturers used journals for interaction on an individual level with the students. Students posted reflections about the lesson, course and their learning and the instructors commented on the students' reflections without the comments being seen by other students. (Source: FGDA).

The following comments of some lecturers corroborate this point:

I used journals to get their [students] feedback of what they have studied or their expectations that one is individual basis so I used the journal for that.

I used journal for assessment or assessing the students.

Emails were another feature used by instructors to communicate/interact with students. Students who had problems sent email messages to the lecturer who replied to the messages with suitable solutions. A lecturer passed the following comment in support of the use of emails:

Some students too had problems with registration and we taught them how to use the message so they used to send email messages to us, requesting for help from us (Source: FGDA).

7.1.1.7 Assessment practices of academics

One of the ICT instructors used quizzes, end of semester exam and laboratory practical work for assessment, while the other used practical assignments and projects. Some of the forums were also graded as part of the assessment. The quizzes consisted of multiple choice types in Phase 1, but short answers type, and matching types were added in the Phase 2 implementation. These were suitable for undergraduate level. For the postgraduate level assignments and forum discussions were the dominant instrument used for assessment. Projects and laboratory practical assignments were the preference of Yidana because of his inclinations towards project- and problem-based learning.

The types of assessments selected and used measured the stated learning objectives and were consistent with the course activities and resources. The grading policy for the course was transparent and easy to understand as specified in the course manuals. They were also stated up front so that students know what score was awarded to what assessment activity. The types of assessments selected and the methods used for submitting the assessment were appropriate for the hybrid learning environment. The assessments were made up of quizzes which provided instant feedback, discussion forums and journals which also provided feedback but not immediately and finally uploading of assignments via a web link. However, one deficiency was that the use of rubrics was limited or not used at all for some courses. This was corroborated from the comments of lecturers interviewed in a focus group discussion. Some of their comments included:

I used quizzes as well and then because it is a programming based course we have to do some practical work. That one they do it offline and upload the files whenever it is ready.

I uploaded the course manual for the course for them and also added some PowerPoint presentations and then some PDF articles for them to read on the online course platform and I gave them some links to some WebPages where they can visit (Source: FGDA).

7.1.1.8 Pedagogical practices of the academics

The two instructors' (Yidana's and Williams') instructional practices differed slightly. At one end of the spectrum Yidana used project-based learning strategies in his instructional delivery while Williams used predominantly lecture approach. This reflected in the mode of assessment of the course where Williams relied on tests/quizzes and Yidana relied on projects and practical assignments as instruments for assessment. Both used lab settings for face-to-face lessons. Yidana who is more inclined to project-based learning indicated that this approach assists students to apply theory and principles in more authentic and functional ways than quizzes, particularly for skill-based courses.

These academics uploaded resources that were accurate and up to date for students to interact with. From the user logs, it was observed that both academics made updates to the course as and when necessary during reviews and notified students. Detailed course manuals that guided the course structure were developed and linked to the MOODLE course sites. Each topic in the course had an introduction that introduced students to the topic. The learning objectives of the course described the measurable outcomes of the course. The learning objectives addressed content mastery, critical thinking skills and core learning skills. The lecturers gave instructions to students on how to meet the learning objectives and these were adequate and easy to understand.

7.1.1.9 Perceptions of academics on use of MOODLE

MOODLE encouraged social interaction and collaboration among learners. Collaboration was achieved through hands-on online interactions, using Wikis, discussion forums, and chats. Students explored and engaged in hands on interaction which strengthened their understanding of the concepts and processes presented. Wikis, forums and chats served as useful platforms for brainstorming, discussion and debates by the students among themselves. Students were able to reflect on their own work and on the work of other students due to the use of these tools. An academic (not part of the research team) also commented in a focus group discussion as follows:

For me I would say [MOODLE training affected me] positively because it is putting you the lecturer on your toes to provide good quality resources and material. Because students now have access to the internet so if you also do not research to put up to date information and resources online for them on MOODLE you will find yourself wanting.

This means that academics are aware that they have to be co-learners in this new learning environment in order to remain functional and current. It also implies that teaching online places more load on instructors, at least for first time adopters.

MOODLE in the context of this project was used as a tool for instructional delivery and facilitation of learning. Instructors used MOODLE as a tool to promote interaction between themselves and the learners and course content. The instructors for EDI 502 and GPD 113 did not use the chat tool during Phases 1 and 2 of the MOODLE implementation. At the initial stages of the semester participants had the opportunity to introduce themselves interacted with the students at prearranged times using the chat module. MOODLE Chat was a popular choice for students, for communication due to the instantaneous replies to their questions. Students asked questions (academic) without fear of being scolded and without being shy as would have been the case with F2F classroom discourse. The use of the chat module by instructors was corroborated by statements of a lecturer during a focus group interview who stated:

At the beginning of the class we used it [MOODLE] to chat with each other and I told them I would be online to chat with them. I used the chats to talk about informal stuff in class.

Observations from the user logs and Yidana's journal of activities confirmed this point, where in both courses topic/week zero contained a familiarization chat that offered participants and instructors to introduce themselves and express their views on their expectations from the courses.

From observations on MOODLE course sites, it was clear that the instructional materials supported the stated learning objectives and contained sufficient information for the student to learn the subject. The instructional materials were presented in a format that was appropriate and were easily accessible and usable by the students. The purpose of the course elements were evident in the resources presented. The organisation of the instructional materials was consistent with the course manual.

For instance, at the time of reviewing the EDI 502 MOODLE course we realized that some of the activities and quizzes did not link learning theories with ET and instructional strategies. Steps were then taken to design matching activities that required learners to match given tasks with the appropriate learning theories and ET tools. This enhanced the quality of instruction as corroborated by feedback on the quality of courses developed from students and faculty, which included the following: [A student] commented that this method of learning is an interesting [one] and better than the classroom situation. It builds one's confidence in learning on the computer.

The use of multimedia and web-based resources supported the learning objectives of the courses and was integrated with texts and lesson assignments. They enhanced student interactivity and guided the students to become more active learners. They were easily downloadable and accessible. They were also

compatible with the existing standards for widespread accessibility. Instructions on how to access resources are sufficient and easy to understand.

When asked how academics use MOODLE for teaching, one academic (Peter Akayure) responded that:

Well I will say I used It [MOODLE] to prepare my course material. Before MOODLE you had everything on you or you had to let the students photocopy some section of a book or something. But now I can extract the parts that I think are important to the course I will lecture, then I put it [lecture notes] there [on MOODLE] so before I come [to class] I expect the students to have read [in advance] (Source: FGDA).

Another academic from the Department of Mathematics Education corroborated Peters's view as follows:

I think that mostly we used [MOODLE] to also present PowerPoint. Now we upload them for the students to have a look at it before we come to class for the presentation so that they know what we are going to discuss and perhaps they can search for information. We created some links for them so that they could go to some websites and then have some information on what we will be teaching the following day. We also inculcated [incorporated] some class activities on the MOODLE so that they would participate in those activities (Source: FGDA).

Clearly, these academics perceive MOODLE as a platform that assist them to develop the online components of their blended courses and extend learning resources to students outside of the F2F classroom settings. This approach offered students opportunities to take greater responsibility for their learning.

7.2 Students' use of MOODLE for learning

The areas of focus in the analysis of data for student use of MOODLE were resource availability and access to students, how students use these resources on MOODLE, how students are assessed and the impact of the use of MOODLE on their quality of learning. As already highlighted, MOODLE in this project was used to supplement the face-to-face classroom session interactions in a hybrid mode. Students' use of MOODLE was observed to occur in two settings: in-class face-to-face interactions with MOODLE and virtual/online interactions for independent and collaborative learning. In class, students used MOODLE to access presentation material and participate in synchronous chats and other forms of interactions with the content, colleagues, and the instructor. They used the MOODLE platform for independent learning outside of the classroom. On average, students indicated that they spent about six hours a week accessing course resources and performing activities. However, the user log indicated that students use of MOODLE mainly occurred during f2f class interactions, i.e., during scheduled class times. This was so because, as discussed later under the challenges section, students' access to computing facilities and Internet outside of the instructional laboratories was limited. Internet connected was also erratic, particularly during the power load-sharing periods when there are power outages. The user logs also indicated students visited the course sites mainly to download courses materials, participate in mandated quizzes and occasionally post their views on forums.

Despite their limited their access to Internet, the MOODLE platform also helped them to collaborate more with their colleagues than they would do in a f2f session and also do quizzes and assignments online. Students participated in online forums, journals, chats, and wikis, which promoted collaboration among learners. They used forums to contribute and share their views on topical issues as directed by the instructor. Chats and emails were used to communicate amongst themselves and their instructor on course issues to a limited extent.

Students had unrestricted access to the course and course materials, including reading materials, lecture notes, articles, PowerPoint presentations, and video clips, provided they had Internet connectivity. According to the students access occasionally was interrupted by power outages that affected internet connectivity. Access to campus computer labs was also limited to scheduled lecture periods only. Consequently, most students use the campus Wi-Fi connectivity and mobile modems with their laptops or the Internet cafes to access MOODLE resources and activities. It would therefore appear that students' main concerns focused on access and availability of computing and Internet facilities rather than technology competences.

They also used journals to document their reflections on various topics on MOODLE. However, the use of journals to document their personal experiences and challenges in the use of MOODLE were not emphasized as revealed by the user logs. In the student focus group discussion one student intimated that they used MOODLE in the following ways:

Sometimes we go there to copy lecture notes, some other time we go there to perform forums, journals and [see if there are] updates (Source: FGDS)

Another student observed that ...

... and when we are having lectures too that will take about 3 hours, depending on when we have the lecture because we are there with the lecturer he takes us through some activities on the MOODLE (Source: FGDS).

Observations of students' reflective journals, however, showed that their weekly records did not actually document their experiences and challenges as they progressed through the course but rather they reflected on topics that the instructor posted online. This was a pedagogical lapse on the part of the instructor who actually developed these courses for Phase 1 implementation. Williams' attention was drawn to this deficiency and he addressed this in Phase 2.

Students were also able to obtain academic and technical support via chats and emails. Students were able to send emails to the instructors or chat with them [instructors] online for support related to academic issues. When they experienced technical difficulties they were able to contact the technical support staff via email and chat to help them resolve those problems. Students had access to important updates on the course as and when new materials were added to the course or when certain changes were made.

7.2.1 Students' views about assessment

On assessment, researchers were interested to know how MOODLE affected the course assessment and what students' experience with online assessment was. Students reported that they had very nice experiences doing assessment online, the online assessment provided the correct answers to the wrong answers that they gave, and the feedback was instant. A participant in the focus group discussion stated that:

... it [assessment using MOODLE] was a very nice experience because just after we finished you have your feedback and you know your weakness and your strengths. (Source: Student Reflective journal)

... after the quiz too it would provide you with the answers like where you got wrong so next time you know the answer.

From these quotations from the student focus group discussions, it is clear that students were enthused by the instant feedback that online quizzes offered. It helped them to do self-assessment and evaluation of their mastery of course materials

7.2.2 Students' views about quality of resources

When asked if they were satisfied with the quality of MOODLE course materials, students observed that the quality of teaching and learning resources put on MOODLE was high as indicated in the following quotation:

It [quality of MOODLE course materials] was perfect. It was perfect in a way that since MOODLE is accessed using the Internet; our lecturers were always finding it easier to give us updates on our notes. In case he gives us notes today and there is an update he would just insert it and you go there and download it.

Another student agreed with this assessment by stating that:

... to add to that the points [notes] given to us are also straightforward and straight to the point.

Another student intimated that:

... and the way they designed it [MOODLE course structure] too. It was very appealing to the eye, like very interesting, the design was in such a way that when you see the information it is kind of attractive.

From the perspective students, it is clear that they were satisfied with the volume and quality of course materials provided by their instructors.

7.2.3 Students' views about instructional strategies

The students were asked what the impact of MOODLE was on their instructors' instructional practices and the methodology they used; how the lecturer was interacting with students during instruction and what methods and strategies they used. Does your lecturer open up communication in the classroom and allow you to contribute or does he do all the talking in class? Student responses to these questions were mixed; some responses showed that the teacher adopted learner centred approaches and others indicated that the instructors used teacher centred instructional strategies. This confirms the differences in the

approaches adopted by the two academics involved in EDI 502 and GPD 113. A participant in a focus group discussion stated:

He was leading us. For example ... he would always come to class and lecture before he puts his notes on the MOODLE so that after the lecture you [students] go to it [MOODLE for the lesson notes].

Yet another student also stated that:

I would also say that sometimes we also lead.

The interactive and collaborative tools of MOODLE are modelled around the social constructivist approaches of instruction. Alignment of instructional strategies and methods to this paradigm would assist in realizing the optimum use of these tools.

7.2.4 Students' views about benefits of MOODLE

Students were asked to discuss the benefits that they derived from participating in courses run on MOODLE. In response to this question, students were of the view that MOODLE reduced the cost of learning to them; helped them to learn at their own pace; and enhanced collaboration amongst themselves as supported by in the following illustrative comments from students:

My first benefit was that with the MOODLE I was not spending a lot. I wasn't buying pens, exercise books, notebooks to copy notes because on campus we have wireless network connectivity I just switch on my computer and just go in there and download to my computer and it is permanently on my computer. And these days we were not experiencing lights out so I was enjoying having uninterrupted work on my laptop.

With MOODLE, I learn at my own pace. Yes, I can just go home slot in my modem, and go to the MOODLE site and read anytime I want.

It also makes you learn on your own and at your own pace and it is less expensive.

These last two quotations indicate that students take more responsibility for their own learning. This also supports faculty assertion that MOODLE enabled them to adopt student-centered instructional strategies in the hybrid mode.

The focus group discussion also sought students' views about their preferences for pure face-to-face and online learning. The discussion was guided by the following questions: If you were supposed to make a choice would you prefer an online course, a blended course or a pure face to face one? Why do you choose this option?

And there is extra information like the discussion we were talking about. Somebody will put in something you will also add it to your knowledge and someone will also take yours.

It also provides me with the opportunity to learn how to exchange or chat with my colleagues learning ideas about a certain topic.

One other benefit that students cited was that MOODLE had helped them to increase their technical skills such typing. Students also indicated that their use of MOODLE helped to access more learning materials in more convenient and motivated ways. The following comments of students confirmed these views:

In all this we use typing so it also helps us to improve our typing skills.

And also we were coming from backgrounds where we used to visit the internet café once a month but this time every day, every second, every minute I am online and on the MOODLE and it has helped me a lot to discover many sites.

It is easy; it is easy in the way that sometimes the lecturers hyperlink some addresses for us so when we just log on to the MOODLE we just click on it and it just takes us to the place where we get extra information.

Again when you are on your books you get tired or dizzy sometimes but when you are on the MOODLE CMS you can switch to something different and get something attractive then come back to the MOODLE again, thus it was kind of motivating in learning. You don't need to carry your books along wherever you go all you need to do is to get online and then wherever you are you have access to the course.

... it [MOODLE] encourages portability with buying of notebooks and things it is not easy to carry but with MOODLE you can download the stuff on your pen drive and carry it wherever you go.

By using multimedia for instance video records of lessons, students felt the presence of a teacher in the course on MOODLE. This was confirmed by a student who said that:

For example too, these courses that we are starting this semester one lecturer has inserted videos that even without him you just watch the videos and you would rather think that he is in front of you lecturing you.

Overall students were unanimous in their view that MOODLE was useful in their learning and that they would encourage others to use MOODLE. This was confirmed by the following quotation from a student:

The reason being that it is interesting, time management; it makes you focused because you are there and the multimedia nature of it brings you to the material so it doesn't take you off as much as the book would do.

7.2.5 Student preference for pure online, blended and pure f2f delivery modes

When students were to state with reasons their preferences for pure online, blended and traditional f2f modes of instructional delivery, all the students who participated in the focus group discussion were equally divided in favour of pure

online (50%) or blended courses (50%). None indicated (s)he preferred the pure face-to-face delivery mode. In this particular situation it could be concluded that students prefer learning online (either pure online or blended) to the traditional face-to-face mode of instruction. They gave the reasons for their preferences as quoted from their responses. One of the reasons in favour of pure online was that online learning offers them the opportunity to access and learn course material anytime anywhere; they have access to the Internet as quoted by one of the students below:

I prefer the online learning because wherever you are, you can be staying in your home [or] anywhere even thousands of miles [away from the instructor or colleagues].

Another reason cited by the students in favour of the blended mode is that the hybrid learning environment creates a social environment for them to interact as cited by the following student:

The reason being that it kind of creates that social environment for you whereby you will meet your colleagues as well and interact with them face to face not whereby you will be seeing them just on chat to remove the social isolation.

Another reason for them preferring online learning is that it affords them the opportunity to learn at their own pace as cited by another student who stated that:

I will go for the purely online. Simply because it allows you to learn at your own pace. Rather than maybe the teacher standing in front of you. Maybe you have something you are doing you would be very busy at that time but this one gives you the opportunity to learn on your own.

Others also looked ahead to their future careers and observed that the online learning using MOODLE would prepare them or equip them with teaching strategies that will enable them to teach with computers when they are in the teaching field as cited by one of the students:

I will go for the blended because in our case most of us are going to the field to teach so we need some of the teaching strategies from the face to face to blend them with the online.

Timely submission of assignments is one other reason why students prefer the online learning as intimated by the comments of one student:

... For instance when there was first no online learning, when you are supposed to submit assignments maybe at 1 o'clock sometimes you get to the lecturers office at 12 O'clock and you would not meet the lecturer. But with the online, 1 o'clock is 1 o'clock, you can even submit at 12:59 and you would be on time.

For those student-workers their main preference for online courses was motivated by the fact that they could work on the course content and assignment online outside the working hours as quoted by the student-worker below:

... but I will take the online session because after work I will stay at home log on with my machine see if there are updates with my notes, if I have some quizzes to do, if I have something to read, check on my grade and all that. It will help me as a worker to learn to do the pure online learning.

Others are of the view that online courses are good for adult learners who are more disciplined in their time management than young learners. They prescribed the blended or hybrid courses for such young learners as quoted by one of the students:

I don't want to debate or contradict myself but the online learning like some of my colleagues have chosen is good in the sense that when you are time constrained let's say you have to go to work and all that is good for you. But in a case whereby you cannot manage your time very well, let's say our young guys who are upcoming some of them are not that old to manage their time schedule to say that I must do this at this time and do that at that time and if they should register for an online course they may not discipline themselves in terms of time and for them I think the blended one would work perfectly for them but where you are old enough to discipline yourself in terms of time and all that I think the online will be ok for you to acquire the certificate that you would otherwise not be able to acquire.

The conclusion from these comments is that students prefer online or blended learning with the face-to-face interactions to pure face-to-face instruction.

7.3 Ensuring quality of MOODLE courses

Producing quality courses has been the focus of the PHEA Programme at UEW. The pedagogical, instructional design and MOODLE technical training workshops ensured that high quality courses were developed in MOODLE. The recruitment of courseware development assistants to help academics with developing their courses and the reviews by both local and external reviewers also sought to make sure that high quality courses were developed. The great part of the third workshop which was facilitated with assistance from SAIDE was to address quality and evaluation issues of the online courses. Participants were introduced to instructional design by first viewing a video that critiqued most e-learning courses entitled the *Big Mistake*. They used a MOODLE Forum to conduct an evaluation of their own e-learning courses. Participants reviewed a 10 point instructional design check list available on the Internet and commented on the appropriateness of the items identified using the MOODLE Journal tool. Working in pairs the participants used a number of sources to develop 15 criteria to assess e-learning courseware. Participants used their criteria sets to evaluate three external e-learning courses: Open University, BBC & John Hopkins School of Public Health. The participants reported back on their experiences and various design issues were discussed. Participants then used the same criteria to provide the facilitator with feedback of the MOODLE course he had designed for the workshop.

A general course evaluation checklist was developed based on synthesizing the various groups evaluation criteria prepared during the workshop. The general course evaluation checklist was distributed to all courseware developers and courseware developers' assistants to serve as a guide for courses being

developed. The courseware assistants served as the first point of contact as outlined by the job description. They were expected to use a quality assurance checklist to formatively evaluate the quality of the courses mounted on MOODLE.

7.3.1 Internal review of courses

There were internal reviews of the courseware by a review team which was locally constituted. Their comments were then passed on to courseware developers to address identified deficiencies and suggested changes to their courses. Some of the identified deficiencies included:

- General overview and introduction standard
- Etiquette expectations: Almost all courses have not addressed this standard. Authors are advised to include this in their course manual or course outline
- Pre-requisite knowledge: Almost all courses did not address this criterion. Authors are advised to include in their course manual/outline
- Course components: instructions on how to find course components missing in all courses. Authors are to include this as part of introduction to the “Navigation tool”
- Technical skills expectation: authors advised to create a paragraph in course manual/outline to include this expectation. Sample paragraph: “Computer literacy is a required skill for this course. This includes user’s ability to go online; use of an internet browser; and experience with MOODLE”.
- The learner support standard:
 - o Course instructions and technical support: this standard has been partly addressed for all courses by the creation of a ‘Blog’ at the UEW MOODLE homepage. Instruction on the blog clearly articulates support available to students regarding how they can access it. Students are also directed to unit and staff responsible to provide help with accessing their courses.

The researchers consequently developed a MOODLE course structure and learning pathway that guided courses developer (See Table 4). This helped considerably to standardize all courses mounted or being mounted on the MOODLE platform.

Finally, a preliminary external review of courses, as part of the on-going evaluation process, was undertaken by a visiting SAIDE MOODLE facilitator during a workshop in the months of April, 2012. The facilitator noticed that quite a number of the courses under development had escaped the usual trap of poor pedagogy. He surmised that this was because UEW was after all a university of education.

However, a shortcoming of the evaluation process observed by the researchers was that due to time constraints there was no chance for peer review of courses before they were deployed for use by the students. Though the evaluation checklist used to evaluate the courses was extensive, peer review of courses would have better helped to verify accuracies of content, pedagogy and learning evaluation. Academics would have also collaborated more effectively and had

the opportunity to share their experiences and challenges. These observations would guide future rollout of the gains of the PHEA Programme across all Faculties of the University.

Furthermore, even though the content of the EDI 502 was accurate and up to date, most of it was not addressing Computer Applications in Education. This was as a result of defects in the curriculum itself where emphasis has been placed on learning theories and impact of ICTs on socio-economic development rather than computer applications in education. This observation will inform a future revision of the curriculum to make it more relevant and useful to graduate students. The content of the GPD 113, on the other hand, was appropriate for the curriculum objectives. The content consisted of general ICT literacy and Microsoft Office suite applications. The instructors employed a blend of project based learning, laboratory practical and lectures to deliver this particular course. On the whole the quality of the content was high.

7.3.2 Evaluation of capacity building workshops

The relevant research question under discussion in this part of the report was: What processes were followed in the implementation of the blended/hybrid online courses in terms of capacity building among participating academics? One of the pivotal goals of the UEW-PHEA ETI was to build academics capacity to develop blended courses and facilitate same course on the MOODLE platform. In this section, we present an evaluation of capacity building workshops organized in furtherance of this goal during the lifespan of this Initiative.

7.3.2.1 External Facilitator's CW Development Workshop 14th March - 18th March 2011

The key outcomes of the workshop were (i) enhanced capacity of academics in designing online courses and (ii) improved the capacity of academics in utilizing MOODLE in teaching and learning. Specifically, the workshop helped academics to gain:

- Familiarity with the pedagogy behind good courseware design
- Ability to plan in detail an e-learning course
- Ability to use the MOODLE as a teaching and learning platform
- Familiarity with the concept OER, the OER movement and the Creative Commons copyright that protects OERs
- Ability to search for specific OER in public repositories
- Ability to adapt OERs and use in teaching and learning.

The main gain from this workshop was that academics' interest and enthusiasm in ET were increased. The evaluation of the workshop, based on a workshop evaluation checklist indicated that academics would prefer hands-on practical activities and one-on-one mentoring during such workshops as observed by one of the participants' comments:

Meet course designers where they are and begin the assistance from that angle. I think this approach will do us much good since we have varied individual challenges though doing the same thing.

The point being made here is that a "one size fits all" model of training is not effective because (i) academics are at different levels of competency and (ii) different academic disciplines may have peculiar approaches to ICT integration.

This observation was factored into the subsequent workshops and remedial measures taken in subsequent workshops to address individual needs and concerns, particularly those academics who joined the project later.

7.3.2.2 August 2011 CW development workshop

The participants' evaluation of the workshop showed that they gained further skills and knowledge that could help them to complete their blended courses successfully. Participants were asked to evaluate the workshop in terms of the content, facilitation, relevance and specific skill and knowledge gained. They were also asked to comment on what was most useful part of the workshop and what challenges they still faced. All the six participants who completed the evaluation questionnaire agreed that:

- 1) the workshop helped to improve their understanding of courseware design and development for online teaching
- 2) the workshop helped to clarify the course design processes that participants need to undertake to complete online teaching and facilitation on MOODLE
- 3) the presentation on learning management system interface (MOODLE skills) were interactive and practical and useful

Overall, participants felt that the workshop was useful and helpful to them in their course development process. It also enhanced their understanding of the various modules of MOODLE as indicated in some of their comments:

Very interactive and learner centered, some of the challenges I faced were addressed with examples and one to one instruction;

The activities helped to empower me, workshop met my maximum expectation; about 75% of my expectations were met;

Chunking my course [: I] was able to chunk three units; it helped me to chunk my course;

It motivated me to work on my MOODLE which I [had] abandoned;

The workshop was very interactive and learner centered; partially.

The aspect of the workshop that participants found most useful included wiki and forums, chat rooms, journals, the one-on-one nature of assistance from resource persons, the chunking and overall planning of the course following Gagne's principles of instruction. When participants were asked to comment on the challenges they still faced by the end of the workshop, they indicated that in using MOODLE some participants still had problems uploading graphics, using wikis and entering math symbols and expressions. Other participants indicated that they still had difficulty creating multiple choice quizzes on MOODLE but claimed when they were introduced to HotPotatoes software, this difficulty was resolved. Yet, others had problems in chunking and creating content with graphics and animations.

7.3.2.3 First external facilitator's follow-up workshop

The purpose of this workshop was to evaluate progress of course development and also to address challenges and difficulties that academics still faced. It was also designed on the basis of the recommendations from earlier participants that

hands-on practical and one-on-one mentorship approaches be adapted to address individual peculiar problems. The workshop covered instructional design principles as used in the courseware design and evaluation, creating quality assurance criteria and MOODLE skills and fixing courseware.

In the evaluation of the workshop, participants indicated that the workshop further deepened their understanding of courseware development process using instructional design principles, use of MOODLE for teaching and learning and online courseware evaluation as observed in some of the comments of participants:

This workshop/ID Course has really helped to enhance our capacity to develop online courses based on ID principles. The COL Model adapted by the facilitator was learning focused and its tenets encouraged the collaborative-and activity-based approach to teaching online. Overall, my expectations of the workshop have been met 80%. The Facilitator's expertise in MOODLE is high and his willingness to share this experience with us was a big plus (Source: external facilitators report).

Good job, the workshop was very insightful. It helped to clarify a lot of the challenges I faced in creating my course (Source: external facilitators report).

Participants also made useful suggestions for improvement in subsequent workshops. These included the need to use a running example to illustrate MOODLE and courseware development skills as pointed out by these participants:

An improvement would be for the facilitator to review the course of one of the participants and point out the mistakes as well as the strong points. (Source: external facilitators report).

One of the new participants who perhaps had not received adequate attention repeated a request made in the very first workshop, thus:

Meet course designers where they are and begin the assistance from that angle. I think this approach will do us much good since we have varied individual challenges though doing the same thing (Source: external facilitators report).

Others suggested the use of online platform to deliver future workshops as this will save time of participants who are already overloaded with other University tasks as pointed out by a participant:

[I have]Enjoyed it [workshop]. I'm wondering if it wouldn't make more sense in trying to do a workshop on-line rather than face-to-face. I like this approach better, but we should get used to being more efficient with our resources. A reality is that with more and more technology, we don't get more efficient ... we only get more [of technology]. That is, we keep adding things - so a workshop now includes using high tech. It's nice and more effective, but in terms of resources, we are not doing more with less... and I'm wondering if that's not what I'm doing with the course I'm developing (Source: external facilitators report).

This participant is also lamenting on the inadequate attention paid to efficient use of resources rather than focus on technology competencies. This was an important point raised because participants needed to focus more on using the MOODLE tools for teaching and learning and accessing other ET resources to develop their courses rather than technical details of MOODLE platform.

On the courseware evaluation criteria that participants spent considerable time developing, some participants were of the view that it was premature to undertake that activity and would rather wait till the courses were considerably developed. A comment of a participant buttresses this:

The evaluation criteria stuff might be more appropriate later. I think it's better to focus on trying to get our courses up and running... and thinking of the big picture of what we really want to accomplish with our individual courses... Too much of the criteria focuses on the surface stuff - it's easy to get caught up in the layout/format issues and miss the deeper purpose of using the MOODLE (Source: external facilitators report).

This participant's comment showed that academics new to technology integration can be frustrated if training focuses more on formalism and technical standards, even though ultimately the desire is to design and develop pedagogically sound courses and instruction. Doing so many things simultaneously for technology novices can complicate an already overwhelmed academic. However, from an instructional design point of view, formative evaluation of the course development processes helped to seamlessly integrate various technology tools and modules more appropriately. Based on participants' requests for one-on-one mentorship and onsite assistance, the management team decided to recruit six instructional technologists, who were assigned to various faculties to assist academics as and when the academics developing resources needed assistance. These course developing assistants were thus trained in a subsequent session as detailed below.

7.3.2.4 Course developing assistants' workshop

The participants' evaluation of the workshop showed that they gained further skills and knowledge that could help them to assist academics in their online course development and delivery over the MOODLE platform.

The PHEA Management Team, based on the suggestions of participants in earlier workshops, directed these assistants to work closely with academics developing MOODLE courses on a one-on-one basis to address their difficulties. Consequently, these instructional technologists offered the much needed individual assistance that significantly accelerated work on the MOODLE courseware development.

7.3.2.5 4.3.2.5 The Kumasi Retreat Writing Workshop for Course Developers

Participants were asked to assess each aspect of the retreat and indicate their degree of agreement and to also state their general perceptions. Additionally, they were asked to indicate their level of progress in the development of their courseware before and after the retreat. Out of 20 respondents, there were 16 male and 1 female but 3 did not indicate their sex. Figure 1 below showed the faculty by faculty representation at the workshop.

Figure 1: Faculty Representation at Workshop

In all, the 20 respondents to the evaluation came from 11 academic departments. The Centre for Distance Education (IEDE) and the ICT Departments were most represented with 15% attendance from each faculty, followed by the Interdisciplinary Department with 10% attendance. This emphasizes the fact that academics who were more comfortable with technology increasingly participated in the courseware development workshops. The IEDE academics that participated in the workshop were already ET users, having benefitted from an earlier project involving Carnegie Corporation of NY.

Figure 2: Department representation

The ICT Academics dominated the MOODLE courseware development because they were more comfortable with ET and were more inclined to embrace the innovation than their non-ICT counterparts.

Participants were asked to indicate their level of progress in the development of their courseware before and after the retreat. Comparing the levels of MOODLE courses developed at the beginning and just before the end of the Kumasi retreat writing workshop showed academics made significant progress in the course development (See Figures 3 and 4). The figures showed that academics accomplished a lot; working away from Winneba and having the developing assistants give them one-on-one attention. Fifty-six percent of participants had completed 5-6 MOODLE weekly lessons by the end the workshop, compared to 70% completing 1-3 weeks before the workshop.

Figure 3: Level of Course Completion before the Kumasi workshop

Figure 4: Level of Course Completion By end of the Kumasi workshop

It should be noted that some academics were developing two or more courses that were at varying levels of completion at the end of the workshop.

The evaluation exercise also sought the views of participants on how this workshop addressed their needs and concerns, and on how useful the courseware developing assistants had been. Participants commented on the usefulness and timing of the workshop as presented in Table 7 below.

Table 7 Participants' perceptions of the workshop

Perception Attribute	%
The retreat helped them to concentrate on developing and mounting their courses on MOODLE.	90
The retreat granted them unhindered access to their assistants who helped them to clarify the course and instructional design processes they needed in developing their courses.	80
The timing and duration of the retreat was very good.	90
The intermittent projections and critique of the work of their colleagues' helped them in shaping their work.	100
The presence and work of other course developers at the retreat greatly motivated them to develop their courses.	100
The retreat was well organized and coordinated.	95
The most useful part of the retreat was the peer review-facilitation by assistants, one on one attention given by the team leader, uploading of reading materials, pre-professional assessment of write-ups and being moved away from their offices.	85
The retreat greatly met their expectation to a large extent, it enabled them to complete their courses as well as learn new things and the exposure and processes were unique. Also, being isolated from the office helped in concentrating on structuring materials collected.	85

Overall, the report from this workshop indicated that academics had improved in their capacity to design blended courses and utilize MOODLE in teaching and learning.

However, the major challenge which faced the retreat was the unstable nature of internet connectivity on the Kumasi Campus. This was reflected by the fact that 40% of respondents commented that the least useful part of the retreat included intermittent disruptions in internet connectivity with absence of individual modems. The Network Administrator, who doubles as a course developer worked around the clock to forestall the situation. Arrangement was also made with Vodafone Ghana who provided a mobile modem which supported the retreat. These notwithstanding, there were still intermittent internet access obstructions and difficulties.

Participants were also disappointed by lack of summaries of previous days' lessons, less flexibility for peer to peer review of materials developed and intermittent disruptions in the conference room. More than half of the respondents representing 55% highlighted they wanted technical and administrative assistance regarding the intermittent network breaks, 30% faced initial problems uploading pictures, books, designing questions and differentiating colours of activities from presentations. Thirty percent of respondents suggested that reliable internet connectivity or modems should be provided in future retreats. Twenty percent suggested that more of such retreats should be organised when school was not in session.

7.3.2.6 Second external facilitator's follow-up workshop

After reviewing the level of progress in courseware development, the external facilitator observed that the writer's retreat discussed in the preceding section was a success; the VC himself attended on the first day and has communicated that courseware development and e-learning as a priority area for the University ((External Facilitator's Report on Kumasi Retreat Writing Working, 28th January to Sunday 5th February, 2012). This was reflected in the facilitator's report that also indicated that SAIDE had authorized the expansion of project 2 so that more staff can be trained to develop courseware.

The new deliverables called for a minimum of 30 staff to be trained (although we are already in excess of this number) and 40 courses to be produced and deployed. Ten of these courses were to be vetted and released as Open CourseWare (OCW) on UEW's own OER repository and via OER Africa. Twenty to thirty of the courses were in a high level of readiness and will be requiring some feedback and modelling from SAIDE although the facilitator was generally impressed with the versions he saw on this recent visit (External Facilitator's Report). He also added that external access to the UEW MOODLE server had vastly improved. This workshop was the first occasion when the facilitator was able to build the MOODLE course on the institutional server while in South Africa. It is quick, responsive and robust. This bodes well for students wanting to work externally from the campus.

Overall, UEW MOODLE course site (<http://moodle.uew.edu.gh>) hosted 69 blended courses at various levels of development at the time of writing this report. Forty-two of these courses were evaluated both internally and externally and found to be of high standard. Ten of the 42 courses are being converted into Open Educational Resources (OERs) to be hosted by a separate server at the network operations center of UEW.

7.4 Lessons learned from implementation of PHEA ETI

In this section, we look at the lessons learned during the implementation of the UEW-PHEA ETI and the impact of the Initiative on UEW's learning environment.

7.4.1 Collaboration among staff

Team work is very essential for the success of projects even at the planning stage, as shared responsibility pushes the plan forward. Too much bureaucracy and formalism can slow down progress as experienced in the initial stages of this project. Institutional culture and government policies on procurement can also negatively affect progress of a project, if proper planning and projections are not done. A typical example was during the procurement of the MOODLE server, Adobe CS 5 Software suite and antivirus software where the winding procurement process delayed the start of the programme.

7.4.2 Get buy in from academics

It is important to get those who are carrying out the processes directly involved in the project (bottom-up approach). The PHEA ETI project is likely to succeed better than previous attempts of technology innovation because academics were involved from the outset of the programme. If academics' concerns and needs are factored into their training, they are more likely to benefit from the training and apply skills and knowledge learnt (Palak, 2004). The modern learners who are native to technology are pushing their teachers to adopt newer ways of teaching to meet their diverse needs and learning styles. This shows that students and teachers are not satisfied with the status quo, that is, the traditional way of teaching and learning. Dissatisfaction with the status quo is one of the eight conditions for academics' adoption of educational technology (Ely, 1999). This suggests that if students and administrators push for faculty use of educational technology academics are more likely to adopt and use technology for instructional purposes.

7.4.3 Consider academics' time demands when setting up workshops

Faculty are very busy people and are overloaded with work, so if workshops are not properly timed there is low participation. A typical example of this scenario was the Courseware Writing Retreat organised in Kumasi which was properly timed and was well attended by faculty as compared to participation in the previous and later workshops. The cause of low participation among academics is time constraints. In order to actively involve academics in innovations of this nature, advocacy is not enough. Scheduling training workshops for times when academics are less occupied with other University activities such as teaching and intern supervision would help. In our experience, organizing these workshops during recess (vacation) period and using venues outside of campus devoid of distractions would improve participation of academics. As suggested by a participant in one of the evaluation reports, some components of workshops, particularly the on-going ones, could be hosted online for academics to access at the leisure time.

7.4.4 4.4.4 Once off generic workshops are not effective

In actual course design process, once off workshops attended by large groups of lecturers do not address individual needs and concerns appropriately. Smaller groups or one-on-one mentorship is needed as a follow up to large group workshops enhances academics' technology integration training. This was corroborated by one of the academics during a focus interview:

A few seminars were held for us [lecturers] to develop but as we were developing you see that challenges keep on popping up and we needed assistance but as at that time we had to struggle it out. But now I think we have now been assigned some technical assistants.

The problem of lack of follow up support after large group workshops was partly resolved when the management team decided to recruit the Ohio University trained instructional technologists to assist academics on-site and on a one-on-one basis.

7.4.5 Set realistic targets based on team competency

Project 1's slow pace affected the implementation of Projects 2 and 3. The plan was that Project 1, a baseline study of educational technology at UEW, would provide empirical evidence about academics' technology competency, access to resources, needs and concerns. This would have helped us to customise the content of the training workshops to meet the needs and concerns of these academics. Project 3 also needed the baseline data and information to measure the immediate impact of the PHEA ETI programme on the University learning environment. This would have helped to validate the findings of this particular study. Unfortunately, the 3 Projects were running in parallel. In assigning responsibilities for project implementation, administrative and academic leadership should assign timeframes for project completion based on realistic evaluation of the skills and competencies of the concerned staff for each project. Adequate capacity building support has to be built into projects where staff skills need to be developed for optimum project implementation.

7.4.6 Poor connectivity and power cuts hinder educational technology interventions

Online teaching and learning can be more effective where internet connectivity and power are reliable. At UEW poor connectivity and power cuts have slowed down progress or disrupted activities in various ways either during workshops, in class or outside class when students and academics want to access the internet to access MOODLE. One student commented:

... It was left with about two or three days and the wireless went off. So I was unable to do that activity on time so that delayed me. So if the internet can be stable it would help. There was also a time when the power went off.

When asked on the whole what conditions they think the university should put in place to enable this online delivery of instruction to be effective, a student answered:

It is just two things according to me. There shouldn't be anything like power failure and the internet should be up and running always.

Consequently, to effectively implement educational technology innovation at UEW, including MOODLE, the University has to improve the connectivity and power supply situation.

7.4.7 Improve infrastructure

Inadequate access to computing facilities is still a concern for continuing students despite the improvement of network infrastructure and setting up of computer laboratories for student training. The consequence of this is that students were able to access MOODLE during the face-to-face interactions in the lab settings but had limited access outside of lecture periods. This was confirmed by one of the students during a focus group interview:

I want to talk about technological equipment. In the sense that we students we are on campus and we need these computers and the

network in order to have this interaction and technological integration. If we have limited computers like if you go to the lab the time which is allowed for students to come and do their own thing is not enough. And you go there too maybe the place can be already full.

Students were highly motivated to use MOODLE for learning and most of them had to rely on internet cafes or buying mobile modems in order to access MOODLE on their laptops. This brought extra cost to the students. Despite the huge investment in ICT labs there is still more room to improve students' access to computing facilities and the Internet without which the online activities would be jeopardised.

7.4.8 MOODLE can solve poor interaction in large classes

Given the large class sizes at UEW, the use of MOODLE as a supplement of face-to-face classes could enhance student-student, student-instructor and student-content interactions. From the student focus group discussions and observation of their activities on MOODLE it is clear that cost of students' access to learning materials has reduced, while interactions among themselves and the level of their engagement with content have increased through their use of MOODLE. This tells us that the challenges (high cost of learning material, inconvenience to learner off campus, low interactions amongst learners and between academics and learners) associated with the face-to-face large classes can be addressed through this blended approach of instructional delivery.

7.4.9 Motivate lecturers who use technology for teaching

Incentives and motivational packages are necessary for encouraging academics to adopt educational technologies. For example, at UEW, when lecturers were assured of monetary rewards and promised promotion using online courses their motivation to participate in the workshops also increased. Even though these promises were made to academics, some of the comments from academics point to the fact that they were not convinced about the university's ability to fulfil its promises:

I think incentives must be given for lecturers who make the effort to upload their courses online. Because it is not that easy.

It [creating online courseware] is time consuming and it even more than one research paper.

Yeah, there should be some motivation in that aspect.

It [online courseware] is more than one research paper, an article.

So maybe we should be promoted or it [online courseware] should be granted as part of the promotion requirements.

Even though intrinsic motivation is preferred, there is the need for the University to intentionally motivate academics to adopt and use educational technology in order to improve the quality of teaching and learning. In the context of UEW, authors of the 42 courses that were judged to be of high quality were each actually paid a remuneration of US\$2500 per course in fulfilment of the assured monetary reward. The VC has also hinted his willingness to push for the acceptance quality online courseware as an item in the promotion basket of the University. This is a promise, not an incentive, which is yet to materialize. Other

forms of incentives could be official acknowledgement and recognition of innovative and creative practices of academics, besides the monetary considerations.

7.4.10 Consider risks and mitigating strategies

At the UEW-PHEA ETI proposal writing stage the team did not consider certain risks and contingencies which later turned out to be critical for the success of the programme. If some of these risks and contingencies were initially conceived, certain delays could have been avoided during the implementation period. The recruitment of the instructional technologists as courseware developers' assistants was not initially catered for, and this had financial implications for the project. When there was a delay in procuring the server, MOODLE was installed and configured on a standalone PC that later on crashed and all data on it was lost because there was no backup system in place. The procurement law and cumbersome procedures in getting things done posed a great risk to the smooth take off of the Initiative at UEW. It took an awful long time to even set up the structures for the implementation process to begin. In proposal writing, care should be taken to outline in detail risks and what the cost of mitigating these is so that the implementation budget adequately caters for these activities from beginning to end.

7.4.11 MOODLE can change the learning environment

A synthesis of the findings based on the sub-research questions form the basis for measuring the impact of the use of MOODLE on lecturers' pedagogical practices and students' experiences of learning and assessment. The constructs of interest include capacity building of academics for online instructional delivery, online courseware development, practices of academics on MOODLE, experiences of academics, and quality of learning and the learning environment. Overall, the key question is: How has the deployment of MOODLE changed the learning environment at UEW?

Even though there were ICT resources (computers, presentation equipment, printers, Internet, etc.) available, their use for teaching and learning at UEW was low at the inception of this project (Source: baseline study report). As a result of the implementation of this project, however, we now have over 69 courses on MOODLE, which are at various levels of completion compared to only three during the pre-intervention era. Majority of these courses were developed by young academics. Forty-two (42) of these courses are being reviewed as exemplary courses that would influence future deployment of MOODLE across the University curricula. Ten of these 42 courses were earmarked to be converted into OER to showcase the University's online courses and also share knowledge with the rest of the academic community in Ghana and elsewhere. The learning environment is now moving into one of medium-tech where the adoption of MOODLE by academics has brought about a shift from non-user to early adopter stage of educational technology diffusion in the University.

Capacity of academics has been enhanced drastically through the series of training workshops organized under the PHEA ETI project. Specifically, about 40 participating academics have gained knowledge and skills in online courseware development and deployment on MOODLE. As a result of their use of MOODLE,

their instructional practices and strategies are also undergoing a paradigm shift from teacher-centeredness to learner-centeredness.

Motivation and enthusiasm of academics and students for the use of educational technology and ICTs in general have increased as a result of their participation in the PHEA ETI programme, particularly among younger academics. This has helped to justify the continued investment in ICT infrastructure and facilities. Academic and administrative leadership interest and commitment in educational technology integration have also increased as a result of the implementation of the Programme. This is important for the sustainability of the gains of the PHEA ETI Programme after it has ended.

Overall, the learning environment may be classified as mid-tech rich one, in which the use of MOODLE is gaining widespread acceptance by academics.

7.5 Discussion of major findings

The main question to discuss in part of the report was: How does the use of MOODLE impact academics' pedagogical practices and students' experiences of learning and assessment?

7.5.1 Capacity building of academics for online instructional delivery

Most academics (over 80%) had no knowledge and skills of teaching and learning online prior to the adoption of MOODLE under the PHEA ETI at UEW. Even though the University in the past (2003-2005) had made attempts to conscientize academics and students on pedagogical integration of ICTs, these attempts were not institutionalized and consequently failed to make permanent changes in adoption and use of ET by academics. The reasons posed for this situation included low technology competencies and inadequate knowledge and skills needed for effective use of ICTs for teaching and learning, particularly among older academics. One of the reasons for the low uptake of technology by academics for pedagogical purposes is lack of training (Unwin, et al., 2010). The PHEA ETI and the UEW earmarked staff capacity building in online course development and deployment on MOODLE as a priority area.

One key finding of this study is that the capacity of participating academics through training to design, develop and deploy online courses on MOODLE has increased from a status of non-adoption (zero level) to motivated users of ET. The adoption and use of MOODLE at UEW is gradually spreading among academics, particularly the young ones. This has positively affected their pedagogical practices in ways that brought a paradigm shift from teacher-centered instructional strategies to learner-centered practices. The reason for this shift is that the training workshops provided not just short-term training to familiarized academics with MOODLE literacy, but also actively involved academics in practical ways throughout the processes of designing, developing and deploying courses on MOODLE. The focus was on training academics to integrate ET rather than teach them technology literacy. Two other extrinsic motivational measures taken to whip up academic interest in using MOODLE were the promise of monetary incentives and promotion prospects that

will consider online courses as one of the criteria, as hinted by the Vice Chancellor.

The long-term needs and concerns of academics have been anticipated in the Project 2 implementation contingencies and risks that included the recruitment and training of instructional technologists who will provide assistance and support to academics in their course development efforts in an ongoing way beyond the PHEA ETI. The Management team recognizes the fact that a few training sessions within the life-span of the Programme may not be sufficient to provide all the necessary skills that academics need to effectively integrate technology in their instructional practices and activities. Therefore, these six young men and woman will provide ongoing training and one-on-one mentorship to academics to ensure that academics do not forget the knowledge and skills gained from the Initiative. Thus, the long term goal is to enhance the capacity of academics to continuously learn not only how to use ICTs but also more importantly how to integrate technology in meaningful ways in their instruction and activities in both in-class settings and online, particularly for the Distance Education students. Even though the University is currently delivering only hybrid courses, its long term goal is to deliver whole programmes purely online. Therefore, the courses being developed under the PHEA ETI assume that these courses will in future be run fully online as and when the Internet infrastructure and academics' online teaching capacities improve.

7.5.2 Processes of online courseware development

The processes followed during the online course development included identifying academics and courses that could be redone for online delivery, training academics on courseware design and development, training academics on use of MOODLE for teaching and learning, demonstrate the relationship among learning theories, pedagogy and instructional technology, training on online facilitation of learning, and course evaluation and quality assurance issues. The need for training academics as outlined arose because of the recognition that academics had inadequate knowledge and skills for pedagogical integration of ICTs, particularly online learning and facilitation. This need is emphasized by Severson (2004, cited in Vovides, et al., 2007) who observed that for instructors to have the relevant skills to utilize LMS tools optimally and to incorporate relevant pedagogical practices in their courses, they need to have in-depth training and access to technical support and assistance. When pedagogical approaches to teaching are consistent with technology, the efforts to use technology are more likely to yield positive results (Topper, 2005).

From the various training workshops, evaluation reports, and the enthusiasm with which academics participating in the PHEA ETI approached their courses development even under severe time constraints, it can be concluded from this study that the processes adopted by PHEA ETI Management yielded positive results.

7.5.3 Practices of academics on MOODLE

MOODLE, like most LMSs, can be used in a pure online environment, in a hybrid course environment where the class frequently meets face-to-face as well as conduct virtual meetings and activities, and in traditional face-to-face course environment with the provision of web-based support materials and activities (Horton, 2000). The option adopted depends on the technology richness status of the learning environment. Going by the classification of Ko and Rossen (2004), the UEW's learning environment may be classified as one in transition from low-tech to mid-tech scenario, which cannot support full online learning. Academics involved in this Initiative therefore used MOODLE as a supplementary platform to their face-to-face classroom instruction and activities in teaching hybrid courses. MOODLE was used to organize content resources, facilitate out of classroom collaborative activities among students, direct students to additional resources on the web, and partially assess the courses online, using assignments and quizzes.

The results of this study showed that the instructional practices of the academics followed sound pedagogical strategies and were effective in motivating learners to actively engage with the course content, colleagues and the instructors. Dukes, Warring and Kirkland's (2006) study revealed that blended instruction encourages different learning styles and maintains quality lecturer-student interaction in the classroom at the same time. The instructors uploaded course materials and designed online collaborative activities on the MOODLE platform in ways that offered students an opportunity to review course materials prior to face-to-face classes and also purposefully interact among themselves. For very large classes, as in the case of UEW, MOODLE expanded the opportunity to optimize their time usage and to address individual learning problems that would be impossible in such classes in the face-to-face mode (Greyling, Kara, Mkka & Van Niekerk, 2008).

7.5.4 Practices of learners on MOODLE

Students used MOODLE both in face-to-face class interactions and for independent and collaborative learning outside the classroom. This allowed more opportunities for learners to participate in lessons without the limitation on access and knowledge levels (Liw, Chen, & Huang, 2008). Besides, interactive technologies on the MOODLE platform enhanced collaboration and construction of knowledge among students and instructors even though the course was only partly enhanced by technology (Hybrid mode) (Comeaux & McKenna-Byington, 2003).

Students accessed presentation material and participated in synchronous chats and other forms of interactions with the content, colleagues, and the instructor in class. According to Bongey, Cizadlo, and Kalnbach (2005) the use of LMS features such as self-tests, grade books, chats, wikis, forums and journals has the potential to improve teaching and learning in all manner of courses, including the hybrid learning environment.

Additionally, students accessed the MOODLE platform to download course materials, including reading materials, lecture notes, articles, PowerPoint

presentations and video clips which they read prior to the face-to-face sessions which allowed students to determine their personal learning needs and be more engaged as they moved at their own pace through the course materials (Zhang, Zhao, Zhou, & Numamaker, 2004). Moreover, learners were encouraged to exchange ideas, share perspectives, and use previous knowledge or experience in order to decide on the best solution for their personal learning needs (Dewiyanti, Brand-Gruwel, Jochems, & Broers, 2007).

7.5.5 Impact on experiences of learners

Unanimously, students found the new learning experience with MOODLE interesting and exciting. This finding is consistent with the finding of a study conducted by Erah and Dairo (2008) which indicated that over 92% of students in a Doctor of Pharmacy program in the University of Benin, Benin City, Nigeria felt that the use of an LMS made teaching and learning more exciting and effective especially when it is combined with the traditional teaching approach.

Adhering to good teaching principles in large classes is challenging resulting in passive absorption of materials by students, delayed feedback and limited interaction with students (Greyling, Kara, Makka, & Van Niekerk, 2008). However, despite the large class sizes which is a problem in UEW, students reported that online quizzes provided instant feedback which helped them to correct their mistakes. Also other online activities such as chat, discussion forums, wikis and journals allowed students to interact frequently with instructors which also facilitated their learning experiences.

It was also reported by students that the quality of teaching and learning resources put on MOODLE was high and promoted independent self-paced learning. This finding is supported by the assertion of Swinney (2004) cited in Vovides, et al. (2007) that the implementation of LMSs such as MOODLE in universities promised better quality resources in education that would deliver more independent and active students. Compared to the traditional face to face class activities which were limited to a few written assignments and quizzes, students reported that in the blended learning environment, they were exposed to more activities online (on a weekly basis) such as wikis, journals, forums and assignments which promoted learner centered active learning and interactivity among students, content and instructors. Additionally, the use of MOODLE increased the ICT competencies of students in areas such as emailing, online research, social collaboration and improved typing skills. Students got important updates to their notes, and regular notification of assignment due dates on MOODLE and that helped them in their time management.

7.5.6 Challenges and barriers to effective use of MOODLE

Even though we appreciate the fact that use of an LMS is just a tiny aspect of pedagogical integration of ICTs, the challenges that the PHEA ETI MOODLE Project faced could inform future implementation of similar projects. The key question of interest here was: What challenges and barriers impede effective ET use at UEW? Implementing a University-wide project such as the PHEA ETI has never been easy anywhere. These challenges border on bureaucratic institutional culture, inadequate infrastructure (Computing facilities and Internet), time constraint, workload of academics, large class sizes and low technology

competencies among academics and learners, particularly the older students in the postgraduate course.

Institutional Culture: The planning stage of the project required logistics, teamwork spirit, and support from various stakeholders of the institution and devotion and commitment to succeed on the part of the implementers. However, institutional culture was a barrier to the speedy take off of the project. The Project management Team also faced certain administrative challenges from the cumbersome administrative procedures and procurement laws of Ghana that delayed the acquisition of equipment and software e.g. the MOODLE sever and the Adobe CS5 Suite software. This consequently affected the early start of Project 2. Kearsley and Marquardt (2001) emphasize that to successfully implement eLearning projects, organizations and institutions may need to change the way their organizations are structured or they need some changes in their organizational culture. Initially, during designing and implementing of the E-learning project, it is more important to be familiar with organizational culture, structure, corresponding and other potentially conflicting strategies (McPherson & Nunes, 2006).

For example, during the planning stage, the programme management team initially had difficulty in getting all team members to meet regularly as a result of other institutional assignments. These meetings were important to setup the structures needed for the successful implementation of the project. This is in line with by Brodsky's (2006) suggestion that there should be consistent scheduled meetings with all involved individuals and stakeholders to plan for eLearning projects to come up with successful implementation models. He goes further to state that it is necessary to make sure that the communication is in order and involves all key stakeholders at the decision making stage or any other early process. The PHEA Project Management Team had to agree to meet whenever at least three of the five members were present for a scheduled meeting. This was as a result of the workload of some team members which was such that carrying out their responsibilities in a timely manner was almost impossible. Overall, the team spirit among project managers was low and this affected collaboration among the various members. This situation arose as a results of some team leaders sticking to the "my Project" posture, which tendered to exclude other members from contributing in meaningful ways.

Another institutional culture that is a threat to creativity, innovation and spirit of sacrifice at UEW in the long term is the cash-driven inducement to get things done. While we appreciate the immense contributions of Carnegie Corporation of New York, World Bank, EduLink, PHEA ETI and other development partners to the operationalization of our ET drive, the introduction of monetary rewards for implementers of these projects has created a feeling of isolation among academics outside of these projects to the extent that most staff now would not do anything without monetary reward. Extrinsic motivation has an expiry date, unless the incentives persist forever, which is almost impossible. Other forms of motivation such as promotion prospects that online courseware development and other creative and innovative uses of ICTs would attract should be used.

Inadequate motivation: Online course development places extra burden on academics in terms of initial time investment. Therefore academics need to be motivated. Most academics indicated that the lack of motivation and provision of incentives for them concerning the development of online courses was one barrier to their uptake of educational technology, particularly in a situation where

large class sizes resulted in increase in workload for academics. Research in the area of instructional technology integration demonstrates a link between motivating and online instructional practices. According to Gautreau (2011) motivation is the key to a faculty member's decision to learn and implement technology into their teaching. The findings of her study supported prior research and showed that a relationship exists between motivating factors identified by faculty and the adoption of a learning management system (Bates, 2000; Betts, 1998; Wilson, 2003). Gautreau indicated that, the prominent factors that motivate the faculty who participated in developing online courses were salary, responsibility, achievement, advancement, institutional policy, the work itself, and recognition.

Low technology competencies of academics: Low technology competencies among academics particularly the older academics was another barrier/challenge experienced. For academics to have the relevant skills to be able to utilize the MOODLE LMS tools set to its full potential and to incorporate relevant pedagogical practices in their courses they need to have in depth training and access to technical support and assistance. This is emphasized by Severson (2004) cited in Vovides et al. (2007) who states that "learning to use technology to design instruction requires much more than learning to select a specific set of tools. It is crucial that instructors are trained and supported to acquire the 'new' pedagogical role (that of facilitator/coach) and the implementation advantages they can offer to educational technology" (p.72). Topper (2005) believes that "for teachers to use technology in support of their teaching, and to see it as a pedagogically useful tool, they must be confident and competent with the technology they are planning to use (p. 304). However, a number of the academics involved in the projects had low ICT skills. This was identified and the training workshops were geared towards building academics' capacity in the use of ICT tools and pedagogical integration of ICTs into teaching. When pedagogical approaches to teaching are consistent with the technology, the efforts to use the technology are more likely to yield positive results as was experienced in the successful development of courses online by the academics.

However, even though academics were able to develop online courses, they only used a limited number of the tools and features contained in the MOODLE LMS. This placed limitations on the interactive and collaborative nature of the courses developed. This is in line with a finding by Unwin, et al. (2010), which revealed that even among experienced users in some African Universities; they used only a small number of the features available to them in their local LMS. This in turn affects the teaching and learning process as these tool sets provided in LMSs are to ensure that the right amount of support is made available in a host of ways for learners. This means there is the need for educators to make sure that support is tailored to meet the various diverse learning needs and styles of these students.

Low technology competencies of students: Another challenge encountered in the implementation stage of the project was students' low levels of computer literacy. This problem is serious among the postgraduate students who have weaker ICT background prior to their admission. A module on Internet and MOODLE use in both the EDI 502 and GPD 113 courses was designed to address this weakness among learners. A study by Salisbury and Ellis (2003) mentioned that professors might believe students to be computer literate, but most students cannot demonstrate foundational skills in computing such as word processing, typing, sending and receiving emails, internet browsing and searching. Computer skills and competencies are one of the factors cited as

essential for student success with online programs. The ability to leverage the Internet and the chosen online learning platform for information, research, communication, and interaction are critical to student motivation, persistence, and success (Bernard, Brauer, Abrami, & Sturkes, 2003; TylerSmith, 2006). For instance, a study by Rakap (2010) revealed that there was a positive correlation between students' computer skills and knowledge gained in online courses. In his research, students with more advanced computer skills scored higher on online quizzes than students with less advanced computer skills. This finding also supports findings of previous research reporting the significance of computer skill and comfort with computer use in web based learning environment (Erlich, Erlich-Philip, & Gal-Ezer, 2005; Jameson & McDonnell, 2007; Summers, Waigandt, & Whittaker, 2005).

Inadequate technology infrastructure: One dominant challenge encountered in the project was the lack of adequate numbers of computers, computer laboratories and reliable high speed internet infrastructure for students to use the MOODLE LMS for learning. Students complained that they had no reliable access to these laboratories after classes and for those who had computers to access the LMS they had challenges with the internet connectivity. This challenge is not limited to UEW alone but most African universities have this problem. According to the report of Dzvimbo, the former Rector of the Africa Virtual University in E-Learning News Africa portal (2009), access to affordable and reliable internet connections and infrastructure are prevalent problems in all African countries. According to him, educational institutions on the continent are unable to provide sufficient infrastructure and buy sufficient bandwidth to support the educational, research, and administrative needs of students and faculties. This adversely affects delivery and teaching using eLearning methodologies that rely on high-speed internet access and readily available ICT infrastructure.

8. Conclusion

From the findings of this study it can be concluded that:

- 1) The adoption and use of MOODLE at UEW is gradually spreading among academics, particularly the young ones. This is evident from the MOODLE site (<http://moodle.uew.edu.gh>) where the number of courses keep increasing.
- 2) Learners prefer online learning to face-to-face interactions and activities. Most students in this study actually felt the hybrid mode of instructional delivery met their learning needs most.
- 3) Academics' instructional practices and strategies are shifting towards learner-centeredness
- 4) Through the courseware design and development workshops, academics' capacity and interest to integrate ICTs into teaching and learning have improved
- 5) The general technology competencies of academics and students have been enhanced, though much remained to be achieved in the long term.
- 6) University Management's interest and support for ET use to modernize instructional delivery have increased

Despite all these gains, access and access time for computing and Internet facilities are still a constraint to academics' and students' effective use of ICTs for teaching and learning. The Programme provided useful lessons that would guide larger scale deployment of MOODLE in the post-implementation era. The internet continues to be a practical medium for delivering instruction in Higher Education for undergraduate and graduate level courses (Rakap, 2010). This is evident from the experiences of both academics and students involved in the PHEA ETI project. Developing effective online courses depends on a great deal of planning and collaboration, and concerted efforts from many people skilled at using the right tools (Caplan, 2004). This is because online course development is highly dependent on ever-changing computer technologies. For example in the UEW scenario, as academics and students were using MOODLE 1.9 for course development, MOODLE 2.0 was released and has more advanced features than the previous version. Other technologies like multimedia development tools are constantly changing.

Caplan and Graham (2004, cited in Anderson & Elloumi, 2005) stated that a strategic building block in the success of online course offerings is the institutional development of a process that encourages and inspires faculty to be creative in a Web-based environment. They went further to state that faculty is often suspicious about technology-based instruction, and hesitant to experiment with it. However, it is often more meaningful for faculty members to know that they will receive recognition for their willingness to engage in innovative online education activities, and that their efforts will reward them with tenure, promotion, salary merit increases, and other tangible benefits. This was a typical scenario seen in the UEW experience where academics were hesitant in the initial adoption of the use of the MOODLE LMS but this quickly changed when academics became aware of the remuneration for courses developed from the

PHEA ETI and the hint of possible recognition that was to be given to participating academics for promotion by the University. The goes to prove that the promise of remuneration further spurred the academics to experiment with these technology tools and produce to the best of their abilities as is evident in the 42 courses produced and deployed on the UEW MOODLE LMS (<http://moddle.uew.edu.gh>)

It is important in the implementation of technology projects for pedagogical standards not to be compromised, regardless of the instructional medium employed. This goes a long way to ensure that the goals of the instructional delivery are met at the end of the projects. Adopting the guidelines and principles presented in this project would help all stakeholders involved in online instructional development in UEW to ensure that their hard work are rewarded with content and fulfilled learners.

9. Recommendations

Based on the findings of this project it is recommended that:

- University of Education, Winneba should continue to invest in building more instructional computer laboratories, put presentation equipment and computing resources and Internet access points in lecture rooms where they are needed most, improve network infrastructure that provides reliable and easy access to the Internet for both academics and students. The results showed that access time for continuing students was limited as only first year students had access to the instructional labs. Continuing students relied on their personal laptops and Internet Cafes to access the MOODLE course sites outside of the Campus. This increased the cost of learning to them because students do pay for Internet services provided by the private service providers.
- Management of the university should provide and communicate the incentives (promotion, salary merit increases, and other tangible benefits) that will be given to academics who engage in online courseware development. This would go a long way to motivate more academics to adopt ICTs for pedagogical purposes.
- Regular and timely workshops should be organized for academics engaged in online course development in an ongoing manner. The experiences from the PHEA ETI Programme showed that academics' participation in training workshops and rate of development of their courses depend on the appropriate timing and location/venues for such workshops. We propose the re-organization of the Continuing Education Unit of IEDE to take e-learning capacity building as an integral part of its functions.
- Facilitation in the form of one-on-one technical support and assistance should be provided for academics involved in online courseware development. The trained instructional technologists should be empowered, challenged and encouraged to provide technical support through one-on-one mentorship relationships with academics. Their last minute involvement on the PHEA ETI made a significant contribution in assisting academics to develop and deploy their courses on MOODLE.

- The University should implement policies that govern the development and delivery of online courses. A Distance Education/Online Learning policy would guide UEW in rolling out the gains of the PHEA ETI Programme on larger scale across all categories of students. We strongly recommend the integration of the activities of the disparate academic facilities: Educational Resource Centre, Multimedia Unit and Continuing Education Unit. This would ensure synergy of their operations and avoid duplications of roles and functions.
- The University should incorporate online courseware development as an item in the strategic plan of the university to ensure that the success of the PHEA ETI is sustained well beyond its life span. By institutionalizing the adoption of online instructional delivery, academics will be motivated and encouraged to use available ICTs for teaching and learning. This would justify the huge investment that UEW is making on ICTs.
- The success of this Project should spur management to initiate the development of fully online courses particularly in the distance education programme. The strategies and design methods used during the PHEA ETI courseware development assumed that the ultimate goal of mounting such courses will be fully online. The University should emphasize pedagogical integration of ICTs, focusing on alignment of:
 - o technology, information and integration literacy
 - o curriculum, pedagogy/instructional strategies, technology literacy and integration skills with technology tools
- A young and vibrant MOODLE management team should be put in place to manage and research into new developments that will enhance the MOODLE LMS and other aspects of pedagogical integration of ICTs. The six instructional technologists trained could form the pool of expertise in this regard. The University should also support the formation of e-fellowships across the Faculties to enhance the diffusion of e-learning and pedagogical integration of ICTs.
- Special orientation courses should be developed and organized for students in the use of the MOODLE LMS. The findings of this study showed that postgraduate students were not technologically competent enough to explore the essential tools of MOODLE for their learning and research work. Instructors should therefore spend some time bringing such students up to speed with the MOODLE platform before commencing actual academic use of the system.
- Special MOODLE user guides and manuals should be developed and distributed to academics and students. Academics were given a pdf version of MOODLE user manual, and they should be encouraged to use this resource independently during the refining and deployment of their courses on MOODLE.
- In the long term, however, the capacity of the Quality Assurance Unit of the University should be enhanced to standardize online courses that make them comparable with the f2f courses.
- The University should establish a longitudinal research project to periodically evaluate the Initiative, based on the current baseline study and this

evaluative report. This would assist Management to gauge the continued success or otherwise of the Initiative in the long term.

- Ongoing advocacy workshops to disseminate the gains and benefits of the PHEA ETI should be organized for administrative and academic leadership as well as all academics should be pursued in a much more vigorous way to sustain the success of the Initiative.

10. Suggestions for further studies

This study investigated how academics and students use MOODLE for teaching and learning in hybrid courses. A longitudinal study on the impact of MOODLE use on the quality of teaching and learning should be conducted. This will show the trend in pedagogical practices and students' performances in the emerging online learning environment at UEW. Further studies can also be conducted to investigate the ET needs and concerns of academics in order to support and review the developed courseware to ensure high quality of educational materials. This will reveal the strength and weaknesses of the curricula and suggest areas for improvement.

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