

## EXPLORING MOODLE FUNCTIONALITY FOR MANAGING OPEN DISTANCE LEARNING E-ASSESSMENTS

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### ABSTRACT

Current and emerging technologies enable Open Distance Learning (ODL) institutions integrate e-Learning in innovative ways and add value to the existing teaching-learning and assessment processes. ODL e-Assessment systems have evolved from Computer Assisted / Aided Assessment (CAA) systems through intelligent assessment and feedback systems. E-Assessment (electronic assessment) connotes using electronic technology and tools to design and administer assessments, collect and store students' assessment evidences, grade performance, provide feedback and generate reports. The widely recognized advantages of e-Assessment over traditional, paper-based assessment include: lower long term costs, instant feedback to students, greater flexibility with respect to location and timing, improved reliability with machine marking, improved impartiality, and enhanced question styles that incorporate interactivity and multimedia. The advent of Learning Management Systems (LMS), such as Moodle (Modular Object-Oriented Dynamic Learning Environment) paved the way for integrated advanced services for: interactive dialogue, controlling knowledge at different stages of distance process and e-Assessment systems. Moodle provides the complete integrated environment for handling all aspects of e-Assessment from authoring questions through to reports for course teams (Butcher, 2008). This study explores how Moodle functionality: supports diagnostic, formative, summative and competency-based assessments and facilitates ODL institutions design, administer and manage e-Assessments.

**Keywords:** Competency-based assessment, e-assessment, e-learning, Moodle, learning management system, open distance learning.

### INTRODUCTION

Current and emerging technologies enable Open Distance Learning (ODL) institutions integrate e-Learning in innovative ways and add value to the existing teaching-learning and assessment processes. E-Learning has emerged to describe the application of information and communication technologies (ICTs) to enhance distance education, implement open learning policies, make learning activities more flexible and enable those learning activities to be distributed among many learning venues (Farrell, 2003).

The advent of Learning Management Systems (LMS), such as Moodle paved the way for integrated e-Assessment systems. Moodle (Modular Object-Oriented Dynamic Learning Environment), an open source LMS supports self-assessment, peer assessment, formative, summative and competency-based assessment. Moodle-enabled e-Assessment provides students with e-submission facility; reduces carbon footprint and expedites assignment return process with timely feedback. This paper explores how Moodle functionality: supports diagnostic, formative, summative and competency-based assessments and facilitates ODL institutions design, administer and manage e-Assessments.

## **Assessment**

Assessment is an ongoing process of gathering evidence about students' performance and creating an enabling feedback mechanism to improve their learning. In the ODL system, formative assessment (assignments) with instant feedback helps distance learners to self-assess their learning and improve their performance in summative assessment (term-end examinations). Assessment in ODL is not only meant for grading and certifying students, but even helpful for their learning improvement and for monitoring the effectiveness of academic programs and adopting appropriate strategies to accomplish institutional objectives (Chaudhary, 2013).

Assessment and weightage systems vary from country to country. Most of the Indian ODL Institutions follow a three-tier assessment system: (i) self-assessment through self-check exercises/in-text questions and activities embedded in the Self-Learning Material (SLM), (ii) continuous evaluation / formative assessment through assignments with 30% weightage and (iii) summative assessment through term-end examinations with 70% weightage. Technology-enabled self-assessment allows learners to self-check one's progress toward the learning goals and tasks and measure their own skills in desired areas and get a customized professional development plan to improve their skills; thereby increasing both self-regulation and achievement (Schunk, 2003 & Menon, 2011).

In the initial phase, ODL Institutions may explore how online learning technologies support self-assessment and formative assessment with timely and constructive feedback. Natural language analytics engines, such as OpenEssayist enable ODL institutions to provide automated feedback to support students writing essays for summative assessment (Whitelock, 2015). With the increased availability of and access to networked technologies, ODL institutions need to adopt new models of assessment beyond the traditional assignments and examinations in order to improve students' higher order cognitive skills. Higher-level cognitive and effective skills cannot readily be assessed using traditional assessment formats, hence the need to deliver better high stake assessments and more authentic e-assessments to distance education students arises (Crisp and James, 2016).

## **e-Assessment**

In the traditional ODL systems, face to face (f-2-f) academic counselling at the study center is limited to 10% of the study hours. During the counselling, students barely receive assignment development and preparation support, as the sessions allotted are inadequate to provide support from pre-entry through post-study. Integrating e-Assessment strategies enable ODL institutions not only to extend learning and assessment support beyond the f-2-f sessions but also to make students informed of the assessment process well in advance. e-Assessment (electronic assessment) connotes using electronic technology and tools to design and administer assessments, collect and store students' assessment evidences (assignments, presentation, project reports, audio-visual recordings, etc.), grade performance, provide feedback and generate reports. e-Assessment process involves "assessment scheduling; submission of assignments; tracking of submissions; extension requests and approvals; academic integrity; academic misconduct processes; examinations; marks recording; moderation and external examining" (Ferrell and Gray 2013). Thus, an integrated e-assessment system facilitates: e-Submission, e-Marking, e-Grading, e-Feedback and e-Reports.

## **Advantages of e-Assessment**

The advantages of online assessment over traditional, paper-based assessment are widely recognized – lower long term costs, instant feedback to students, greater flexibility with respect to location and timing, improved reliability with machine marking, improved impartiality, and enhanced question styles that incorporate interactivity and multimedia (Boyle, 2005; James, McInnis, & Devlin, 2002).

e-Assessment offers the following benefits to ODL institutions and addresses various challenges encountered in administering assessments.

- Saves a considerable amount of time and administrative efforts associated with assessment cycle – communicating, collecting, distributing, filing, anonymising assignments prior to marking and generating reports throughout the year. Time saved can be utilized in adapting teaching-learning methods to address individual learning needs.
- Assists in overcoming the barriers of time, location, and cost of test delivery using a wide array of multimedia technologies to enhance a test's authenticity or improve its accessibility (Bergstrom, Fryer, & Norris, J., 2006).
- Allows student profiling with links to targeted team based support; facilitates student induction and diagnostics and enhances efficiency (Open University, UK).
- Provides access to external examiners or markers to students' assignments at any time without the transfer of hard copies. Handling assignments at several levels is a big challenge for ODL institutions.
- Expedites assignment return process with timely feedback. Students have difficulties receiving feedback on assignments that is timely and useful. This can be addressed through e-Assessment.
- Allows assessment of higher-order skills more effectively than traditional methods and facilitates formative assessment (Boyle, 2005).
- Formative assessment (Tutor-marked assignments) facilitates online contact and interaction between learner and tutor. Tutor-marked assignments (TMA) are often the main point of contact between a learner and his or her tutor, and online tutor-marked assessment facility connects learner with tutor and also reduces learner isolation (COL, 1999).
- Provides instant and tailored feedback for formative assessment.
- Enables ODL institutions use the assessment data to evaluate course's strengths and weaknesses and teaching effectiveness so as to improve the program effectiveness.

ODL institutions have been using Computer Assisted / Aided Assessment (CAA) systems and software since 1990s as stand-alone assessment systems. ODL e-Assessment systems have evolved from Computer Assisted / Aided Assessment (CAA) systems through adaptive and intelligent assessment and feedback systems. Maple T.A, Moodle, A-Tutor, T C Exam, ILMS are some popular e-Assessment platforms used by the Higher Education institutions including ODL institutions (Osuji, 2012).

The UK Open University (OU), a forerunner in the technology-integrated ODL systems used its in-house developed e-Assessment system – OpenMark in the early 2000s, with emphasis on feedback, multiple attempts, engaging and flexible assessment (Butcher, 2008). The OU has been using Moodle for diagnostic and formative e-Assessment since 2005 and for summative assessment since 2008. Since then, OU has been contributing to and developing Moodle quiz module, question types and other plugins (created and maintained by the Open University <https://moodle.org/plugins/browse.php?list=set&id=10>) to improve the learning and assessment experience of students.

## **MOODLE**

Moodle (Modular Object-Oriented Dynamic Learning Environment), a popular open source software, is highly adaptable to different contexts and scalable easily from single, one-off uses on a particular course to serving the needs of large universities (Whitworth, A and Benson, 2010). Moodle allows effectively implement modern distance education technologies through integrated advanced services for interactive dialogue and communication between a student and a teacher, controlling knowledge at different stages of distance process and achieve complete localization through language packs (Samigulina & Shayakhmetova, 2015).

Typically, Moodle serves the following functions:

- **e-Administration:** authenticating and registering students and teachers/facilitators to courses
- **e-Content Management and Delivery:** uploading, organizing and delivering learning materials and allowing students download and store learning materials
- **e-Learning:** facilitating interaction, collaboration and communication with counsellors/tutors, students and content and
- **e-Assessment:** assessing, grading and reporting student's performance.

Being an Open Source LMS, Moodle allows ODL institutions to integrate their existing systems, such as pre-enrolment systems and/or customize its functionality for:

- (i) providing administrative support;
- (ii) post-enrolment learning support – content and instructional delivery using multiple media and strategies to create enhanced and engaging learning experience, academic counselling and tutoring through synchronous (chat and video conferencing) and asynchronous (forums and wikis) interaction and collaboration, tracking and reminding learners of their progress;
- (iii) assessment and grading with timely feedback;
- (iv) post-study career counselling etc.

Moodle functionality allows ODL institutions to conduct diagnostic, formative (teacher assessment, peer assessment and self-assessment) and summative assessments, grade learners' and report performance and provide feedback. Moodle provides the complete integrated environment for handling all aspects of e-Assessment from forms for authoring questions through to reports for course teams (Butcher, 2008). ODL institutions can explore Moodle functionality and modules to:

- Group students and assign academic counsellors for providing learning support through assessment support (groups and grouping functionality)
- Create and administer assessment tasks (Assignment, Quiz)
- Provide Feedback (asynchronous – assignment and synchronous – quiz)
- Grade using rubrics and marking guide (advanced grading)
- Generate grade reports (user and overview reports)

The Moodle Gradebook enables students to monitor and self-assess their progress, whereas teacher's view of the Gradebook encourages dialogue between student and teacher (Boud, 2000 & Nicol & Milligan, 2006).

### **Moodle and e-Assessment**

Moodle capabilities can be used to design Tutor Marked Assignments (TMA) and Computer Marked Assignments (CMA). TMA marked by tutors/ academic counsellors comprise a variety of questions such as essay type, short answer type, problem solving exercises etc. and are generally used to assess the higher order cognitive objectives such as analysis, synthesis, judgement, comprehension, application, etc. (Biswas & Pradhan, 2002). On the other hand, CMA, marked by computers comprise of multiple choice questions. Moodle capabilities support both TMA and CMA. ODL institutions can use Quiz module for CMA and Assignment module for TMA.

## MOODLE ASSIGNMENT MODULE

Assignment module enables academic counsellors to communicate task and deadline, collect work, grade performance and provide feedback. Assignment submission capability allows file submission or online text submission. Distance learners can upload their course assignments either in word-processed or pdf documents, spreadsheets, images, or audio and video clips as a draft. Alternatively, the assignment may require students to type text directly into the text editor. Students can submit work individually or as a member of a group.

Draft feature allows students to edit their submission till the deadline and submit the final copy by clicking on *Submit assignment button*. Before final submission, students require to accept that their submission is their original work. This submission by students may help in avoiding plagiarism to a greater extent.

Notifications features notifies the student when he/she submits an assignment and also notifies teachers when a student submit assignments, or when students submit assignments late. Assignments can be graded using a point grading or rubric, an advanced grading method. Final grades are recorded in the gradebook, which can be viewed by students.

ODL Institutions can assign multiple markers/evaluators to a Moodle course for assessing learners' performance as students enrolled to a course can be huge in numbers. Graders can download all assignment submission for offline grading and add grades in the grader report online or using the offline grading worksheet. Moodle feedback functionality allows academic counsellors provide constructive feedback on student's performance. This feedback mechanism during formative assessment helps students correct their mistakes and reinforce their learning.

For summative assessments, ODL institutions may explore online proctored exams to address the security issues for high-stake tests. As recommended by Coy (2013), "Moodle settings should be combined with test proctoring or invigilation to achieve high security" and monitor student's behavior closely. In Moodle, enabling "Show the user's picture" option serves proctoring purpose by displaying the student's profile picture on screen during quiz attempts. Biometric Signature ID (BoiSig-ID, <https://www.biosig-id.com/industry/biosig-id-and-the-education-industry>) plugin provides an automated authenticating mechanism throughout the course; SMOWL (<http://www.smowl.net/>) authentication system based on facial recognition technology monitors students via the computer's webcam and compares their face against the system's database of stored images; BioAuth (<http://www.vmonaco.com/software>) and BioLogger plugins capture keystrokes for authentication and online test taker (OTT) verification throughout a quiz attempt. Integrating one of these automated authentication and verification plugins and/or technologies facilitate ODL institutions conduct online summative assessments in a secured environment.

### Advantages to ODL Institutions

Moodle assignment module offers the following benefits to ODL institutions, students, and educators:

#### Collecting and Grading Assignments

Collecting, tracking and grading student assignments online alleviate ODL institution's burden in terms of the financial and administrative challenges involved in managing assessments, especially with the rising enrollments. Moodle assignment module simplifies and expedites assignment collection, grading and providing feedback online.

## Assignment Settings

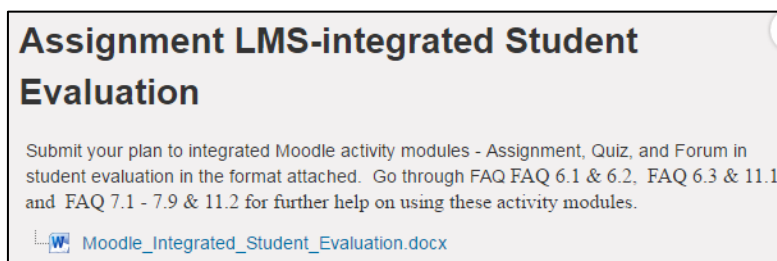
Configuring the following Moodle assignment settings eases the processes of communicating through collecting assignments.

### Instructions

Providing instructions – what they have to do; how they have to submit; when is the deadline; what is the word limit and file format to be submitted etc. support students in submitting their assignments. One can also provide links to resources related to the assignment, such as a pre-recorded video clip, a link to a pdf file or a link to a webpage, along with the instructions.

### Additional files

This feature allows attaching files, such as example submissions or answer templates. The attached files will then be displayed on the assignment page under the description as downloadable links (*see Fig. 1: Assignment with answer template*).



**Figure: 1**  
**Assignment instructions with answer template**

### Availability

Following settings will enable students submit their assignments either before due date or cut-off date.

- **Allow submission from:** Enabling this feature will not allow students to submit before this date. Disabling this feature will allow students to start submitting right away. In the ODL scenario, disabling this feature will provide flexibility to students.
- **Due date:** This feature displays when the assignment is due. Submissions will still be allowed after this date but any assignments submitted after this date are marked as late.
- **Cut-off date:** This feature prevents submission after the cut-off date. In the ODL scenario, this feature may not be useful, as ODL students may not have Net connectivity 24X7.

### Feedback Types

While reviewing assignments, evaluators can leave feedback comments or upload files or annotate directly on the student's submission. These feedback files can be marked-up student submissions, documents with comments or spoken audio.

### Notifications

Sending submission notification to students reassures that they have submitted their assignments, especially when using features like draft submissions and file uploads. This feature notifies markers of the assignments and provides a reminder to access assignments submitted after the due date.

### Draft Feature

Allows students to edit their submission till the deadline and submit the final copy.

### Offline Grading

Allows academic counsellors download assignments and offline grading worksheet and grade student's performance and provide feedback offline. 'Uploading grading worksheet' option allows transfer grades and feedback to course grade book. This feature is not only useful for online assignments but also for offline assignments, such as practical examinations.

### Blind Marking

Hides the identity and randomly generates participant numbers as soon as students submit their assignments. This feature allows academic counsellors grade distance learners' work anonymously; thus avoiding unfair grading practices, if any.

### Marking Workflow

Marking will go through a series of workflow stages (Not marked, In marking, Marking completed, In review, Ready for release, Released) before being released to students and grades and feedback are hidden until reviewed for quality checking. The 'Released' stage makes grades visible to students.

### Marking Allocation

If used together with marking workflow, Tutors/Academic Counsellors can be allocated to specific students in bulk (see Fig. 2: Marker allocation workflow).

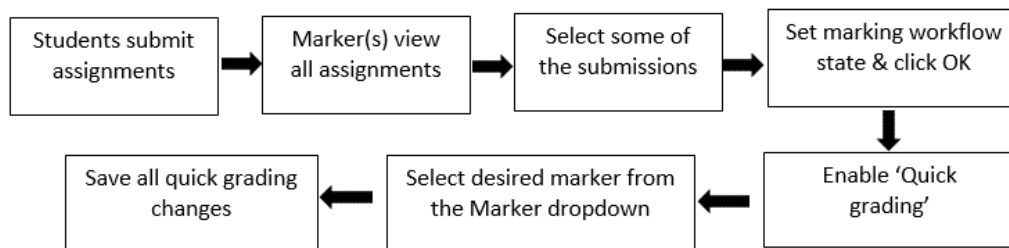


Figure 2. Marker allocation workflow

### Advanced Grading

Advance grading methods, such as rubrics and marking guide enable ODL institutions use various assessment forms for marking students' performance.

#### Rubric

Allows define grading criteria and performance levels for each assignment. Rubrics allow ODL institutions not only to communicate the assessment criteria, performance levels and expectations but also to make assessment consistent and transparent by providing the detailed description of the earned grade (Bonnie, 2008). Rubric attached to the assignment information allows distance learners compare and improve their work before submitting their assignment.

#### Marking guide

Useful for providing marking criteria for Academic Counsellors and students. Pre-defined criteria enable counsellors operate within marking guidelines defined while assessing student's performance.

- Marking guide attached to the assignment information helps distance learners align their work with the criteria (expected performance) while submitting their assignment.
- Additionally, adding frequently used comments to marking guide help academic counsellors pick the right comment from the readily available comments.

Designing assessment tasks and feedback strategies helps distance learners improve their performance.



## Assignment Feedback

Sadler (1989) defines feedback as information about the gap between what the student did (actual performance) and what was expected (the assignment outcomes), information that is intended to help the student close that gap. As observed by Chaudhary and Dey (2003), tutors/academic counsellors assess and grade assignments without feedback. In such scenarios, formative assessment will not help distance learners to identify their weaknesses and strengthen their learning. Feedback with clear, specific guidance on strengths and weaknesses and explanatory comments is considered as *developed* or *descriptive feedback*. A *developed feedback* with thought-provoking questions engages students in conversation and encourages them to review and revise their learning process and to adjust learning and improve performance (McGrath, April L, 2011, Goldsmith, 2014). Academic counsellors should provide constructive and 'developed feedback' rather than general comments or 'undeveloped feedback', such as 'Incomplete answer' or 'Answer partially correct' etc.

Moodle flexible assessment and feedback system allows academic counsellors provide feedback online or use the 'Response file' option and upload files, such as marked-up student submissions, with a detailed written feedback (see Fig. 3a: Feedback file) on student's performance or audio feedback etc. Moodle 3.1 version onwards allows teachers annotate directly on the student's submitted files using comments, highlight and stamp features, provided the teacher enables "Comment inline" and Moodle admin enables Ghostscript and unoconv / Universal Office Converter (see Fig. 3b: Annotating assignments).

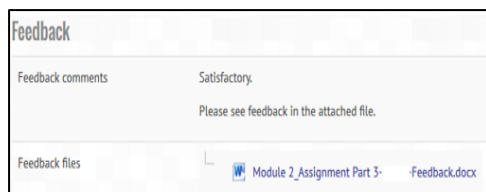


Figure 3a.  
Feedback file

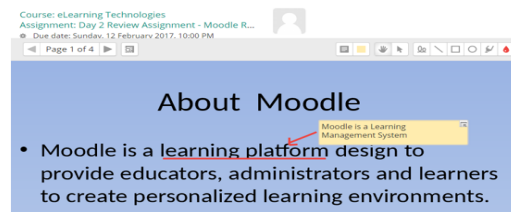


Figure 3b.  
Annotating assignments

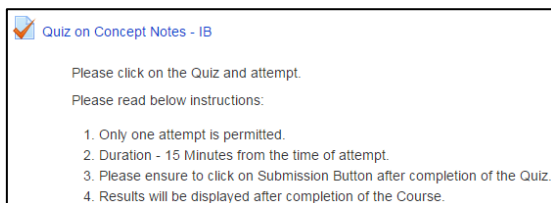
Using 'Send notifications' option, ODL institutions can notify distance learners about their graded assignment. A student can view his/her personalized feedback in his 'user report'. Moodle feedback functionality supports asynchronous feedback – comments on assignments and notes given on draft papers submitted and synchronous feedback – online quiz prompts.

## Moodle Quiz Module

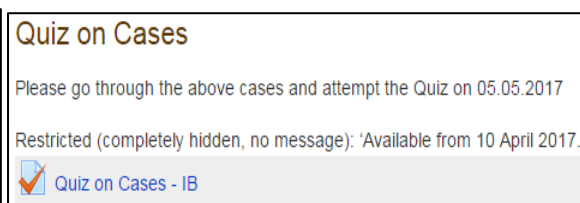
Moodle quiz feature and a number of contributed plug-ins accommodate a variety of educators' testing needs (Al Nadabi, 2015). Quiz module enables ODL institutions administer Computer Marked Assessments as a time-bound activity with a time limit. It supports various questions types, namely, multiple choice, true/false, matching, short-answer, essay and numerical. In addition to formative and summative assessment, quiz module can be used for self-assessment exercises and practice exams. Objective type questions attempted are marked automatically and recorded in the gradebook; whereas, academic counsellors need to grade essay questions manually. Automatic grading makes assessment error-free, thereby creates a reliable assessment system.

The Moodle Quiz and OpenMark together allow the UK Open University's Course Teams to set interactive computer-marked assessments (iCMAs) (Open University, UK). The Icfai University (<http://www.icfaionlineprograms.org/>), India offers distance learning programs and utilizes the quiz module for formative assessment - testing students' conceptual understanding (see Fig. 4a: Formative assessment) and summative assessment (see Fig. 4b: Summative assessment).





**Figure 4a.**  
**Formative assessment**



**Figure 4b.**  
**Summative assessment**

**Question bank capability allows ODL institutions to create categories (unit-wise/ level of easiness – easy or moderate or difficult) and add or import questions to the question bank and randomly select questions from the question bank so that each distance learner will get a different set of questions. Additionally, institutions can opt for shuffling the questions and answers for avoiding mal practices.**

**ODL institutions can offer the appropriate review options for students, that is to say, when the correct answers and feedback are shown to students. For self-assessment quizzes and practice exams, review can be set to 'immediately after the attempt'. For assessment quizzes, one can set it to 'after the quiz is closed', as it prevents distance learners share correct answers with their peers.**

### **Quiz Feedback**

**Automated feedback mechanism is most effective in providing motivation and in shaping behavior and mental constructs (Anderson, 2008). Moodle Quiz module supports automated feedback mechanism for each question, along with the correct answer. There are several ways to give feedback to students: on each question or overall. However, giving feedback to each question is preferable to overall feedback as it allows students review their performance.**

**To cite the example of the UK Open University, its interactive computer-marked assessments (iCMAs) provide feedback to help students with their learning. "OpenMark will provide instant feedback while the Moodle Quiz will provide either instant feedback or delayed feedback where course teams wish to withhold answers until after a specified date" (Open University, UK). Academic counsellors can use the 'general feedback' capability of Moodle quiz to provide the correct answer and clarification for the learner whose response was incorrect with a fully worked answer or a link to course material.**

**Though Moodle Assignment and Quiz modules are discussed in detail in this paper, other modules, namely forum, questionnaire, workshop, e-portfolio etc. can be explored to design diagnostic assessment, teacher-assessment and peer assessment tasks. Moodle questionnaire module supports pre-assessment (diagnostic) at the beginning of a course or a module to determine what distance learners have already mastered. Quiz module is useful for formative assessment while studying a course or module to determine what they have learned and need to learn for summative assessment. Assignment module supports summative assessment and project work and portfolio module allows distance learners export their assignment submission, forum discussions and posts, glossary entries etc. Forum module facilitates providing support to distance learners from learning through mastering the competencies. Communicating grading criteria through rubrics helps students to determine if they have mastered the skills before uploading evidences of learning or submitting their project for assessment. Moodle 3.1 version onwards promotes the delivery of Competency-based Education (CBE) and Competency-based Assessment (CBA).**

## COMPETENCY-BASED EDUCATION (CBE)

Competency-based education (CBE), a student-centered model offers flexibility to master competencies and advance to the next level upon the demonstration of competencies through a variety of assessments to recognize prior learning and multiple learning paths to increase access, equity and credential attainment opportunities.

### Competency-based Education and Distance Learning

Competency-based programs are suitable for adult learners seeking to re-skill and meet the immediate needs of businesses and profession, not necessarily waiting for term-end examinations. A feature of most competency-based programs is a partnership between employers and educators in identifying the competencies required and design assessments to assess the mastery of each competency (Bates, 2014). Western Governors University (WGU) offers competency-based distance learning programs, wherein adult learners earn their degrees by focusing on what they need to know and passing assessments using the knowledge and skills they already have, not based on credits completed (Lorenzo, 2007). WGU uses written papers, portfolios, projects, observed student performance and computer-marked assignments as appropriate, with detailed rubrics. Assessments are submitted online and if they require human evaluation, qualified graders (subject matter experts trained by WGU in assessment) are randomly assigned to mark work on a pass/fail basis. If students fail, the graders provide feedback on the areas where competency was not demonstrated. Students may resubmit if necessary (Bates, 2014).

ODL institutions should make better use of technology to design and develop flexible and personalized competency-based courses at different levels (certificate through Doctoral Degree) with: explicit competencies aligned to industry/market needs. Moodle facilitates design and administer personalized competency-based assessment (CBA).

### Moodle-enabled Competency-based Assessment

Moodle facilitates creating and applying frameworks to courses and assessment tasks for assessing learner's proficiency against the pre-defined competencies in Moodle (<https://docs.moodle.org/31/en/Competencies>). Competencies and learning plans are the two main concepts of CBE in Moodle. Defining a competency framework allows Moodle administrator to add competencies. Administrator enables competencies at the site level; sets up competency frameworks as defined by the ODL institution; adds competencies to each framework; creates learning plan templates and adds competencies to each learning plan; and assign learning plans to each student or to a cohort of students.

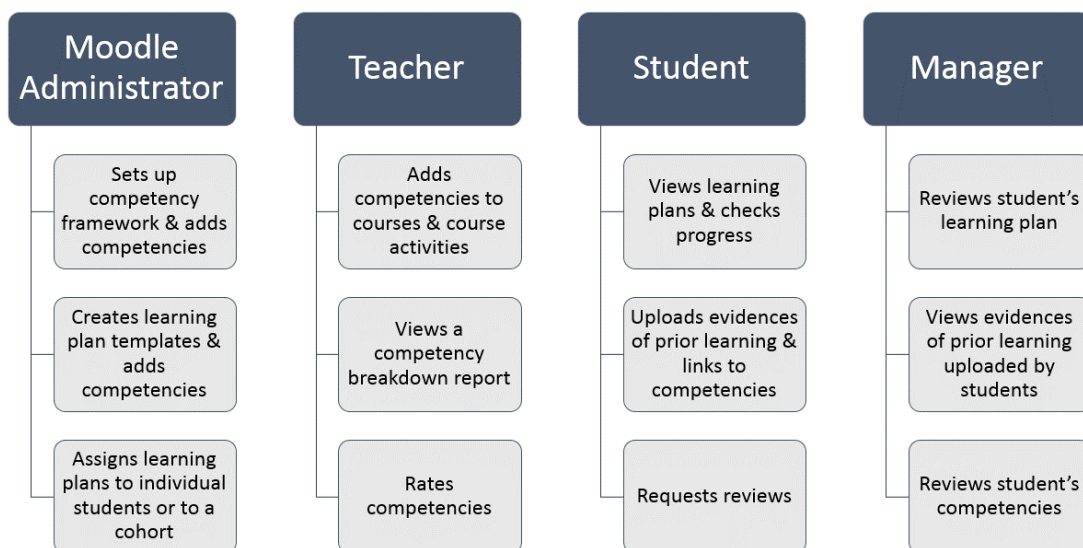


Figure 5. Moodle Competency-based assessment workflow

Then, the teacher adds competencies to the course and assigns to activities and assessments; views a competency breakdown report and rates competencies. A student views learning plans, checks progress; uploads evidences of prior learning and links it to competencies and requests reviews. Distance education administrators with Moodle *Manager* capabilities can review student learning plans; view evidences of prior learning uploaded by students and review competencies (see Fig. 5: Moodle Competency-based assessment workflow).

Redesigning or adapting existing ODL courses into market-driven and professionally-aligned competency-based programs with interactive academic delivery, skill-based learning activities, authentic assessments, timely support and constructive feedback plays a critical role not only in providing a positive, knowledge-retaining and personalized learning experience to learners but also in preparing students career-ready and/or industry ready.

## CONCLUSION

Moodle allows ODL institutions to integrate existing systems; administer diagnostic, formative, summative and competency-based assessments; grade and report learners' performance and provide descriptive feedback. Through this paper, an attempt is made to explore how Moodle assists the ODL institutions administer and manage e-Assessments in an efficient and cost-effective manner.

ODL institutional readiness; curriculum designers, course developers, academic counsellors/tutors and students preparedness are vital: for creating flexible, reliable, usable, secure e-Assessment systems and for addressing the challenges associated with infrastructure, Moodle customization and technical support, e-Learning adoption, designing, developing and facilitating online courses and competency-based programs, devising assessments (formative, summative and competency-based), communicating grading criteria through rubrics.

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