

Development of Interactive Learning Objects with Just In Time Tutorials Self Assessment for Open and Distance Learning Education

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Abstract

This paper describes how guidance is provided in the Learning Objects (LOs) with Just In Time Tutorials (JITTs) self assessment to encourage autonomous learning in their learning and achieve the desired learning outcome. The guidance in the form of JITTs is developed to assist and guide learners to acquire skills specified in the learning outcomes. The subject matter expert will orchestrate different levels of difficulty of assessment questions in LOs to match the learning outcome. Learners may be asked to master the previous learning objects before proceeding to the next one. This new development allows learners to identify their strengths and weaknesses through reflective learning via self assessment. Open and distance learning (ODL) education is pertinent in ensuring learners achieved the desired learning outcomes. In doing so, it will place special emphasis on whether the learners achieve the desired learning outcomes through interactive LOs with JITTs self assessment. The Control Engineering module together with Block Diagram Reduction Method learning object are chosen for this project. The development and process of implementing interactive LOs with JITTs is discussed and presented.

Keywords: *Learning Object, JITTs Self Assessment, Open and Distance Learning*

1. Introduction

Improving achievement for all ODL learners is one of the key directives of developing interactive LOs with JITTs self assessment. In ODL education, face to face meeting between the tutors / lecturers and learners are rather limited. The attrition rate is higher for the ODL learning mode compare to the traditional full time class room learning mode. This is due to the ODL learners with multiple commitments such as family and career. ODL learners are lacking time to read the traditional textbook loading with lengthy explanation. Instead, traditional textbook can completely rewrite in the LOs format. Interactive LOs help the learners to pick up new knowledge faster due to its shorter, independent learning experiences. This approach of learning is much more in tune with the learning styles and life long learning of the ODL adult learners' requirement. (Robin M., Chris P., Martin W., 2005) said courses overloaded with contents lead to ODL learners dropping out. They also lead to the surface learning rather than deep and focus learning, as ODL learners do not have time to engage with the lengthy learning materials. Self-managed learning (SML) is one of the important components in ODL education. Refer to Open University Malaysia (OUM) module Course Guide, SML weigh more than two third of total learning hours per module. Interactive LOs help the ODL learners to develop self-directed learning skills as interactive LOs contents is brief, step by step and guided. According to the Northwest Regional Educational Laboratory's (2004), "helping learners become self-directed learners who take responsibility for their own academic performance" was ranked top priorities by 75% of academician. The ODL learners do not need to worry of what to read and focus on since all LOs contents are important. To help ODL learners assess their learning progress, interactive LOs developed was embedded with self assessment based on multiple choice questions format. Self assessments provide JITTs when the learners give the wrong answer. The contents of JITTs include hints and tips of how to solve the particular questions. The learners must re-attempt the same question till they get the right answer before proceed to the next question. This is to ensure that the learners fully understand the LOs from the basic level to advanced level.

2. Learning Objects

LOs is a formed of well organized knowledge and information. It is a resource, usually digital and web-based that can be used and re-used to support learning. There are few definitions of LOs. Generally, Learning Technology Standard Committee of Institute of Electrical and Electronics Engineers (2002) define a LOs as “any entity, digital or non-digital, that may be used for learning, education or training. Unlike traditional textbook where the explicit concepts and theories provide throughout each topic and link to another topic, each LOs provide small chunk of essential components of an effective learning experiences. According to Robin Mason (2005) survey found the typical comments by learners were:

“I liked learning in small chunks and making a choice at the beginning of the week as to which learning objects to work on.”

“I found LOs instructive and stimulating. I felt that it offered me greater flexibility in how I approached my studies and what I studied”

Each LOs stands alone as a discrete learning which the learners can ideally complete in one learning lesson. The most essential of LOs developed for this project is to encourage learners-centred, self-directed learning environment for the learners to learn the topic in their own way.

3. JITTs Self Assessment

Each LOs developed was embedded with the JITTs self assessment. Self assessment is part of important components to form holistic pedagogical framework. Learners are able to track their progress by attempting the self-assessment. MCQs were chosen as self assessment format due to its popularity and efficiency. Unlike a simple MCQ test as shown in Figure 1, where the test system move forward through the decision tree and arriving at the report node with the scoring. This type of summative assessment refers to the assessment of the learning and summarizes the development of the learner sits for a test and then the teacher marks the test and assigns a score.

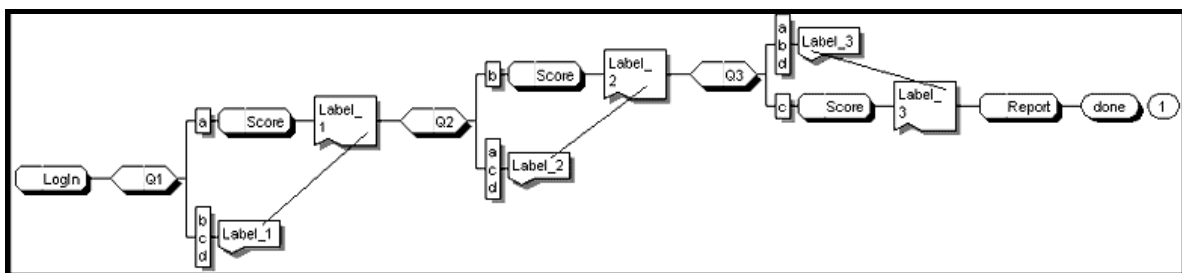


Figure 1: Decision Tree for Simple MCQ Test

The MCQ developed was embedded with JITTs, as shown in Figure 2. Figure 1 and Figure 2 were adopted from Barry Brosch (2002), draw using XpertRule software. When the learners attempt Q1, answer ‘a’ is a right answer and the MCQ test proceeds to Q2. If learners answer b, c or d, JITTs will pop up to give hints and guide the learners how to solve Q1. After JITTs, the test proceeds to the same question Q1 for the learners to re-attempt. The test only proceeds to Q2 when the learners get the right answer.

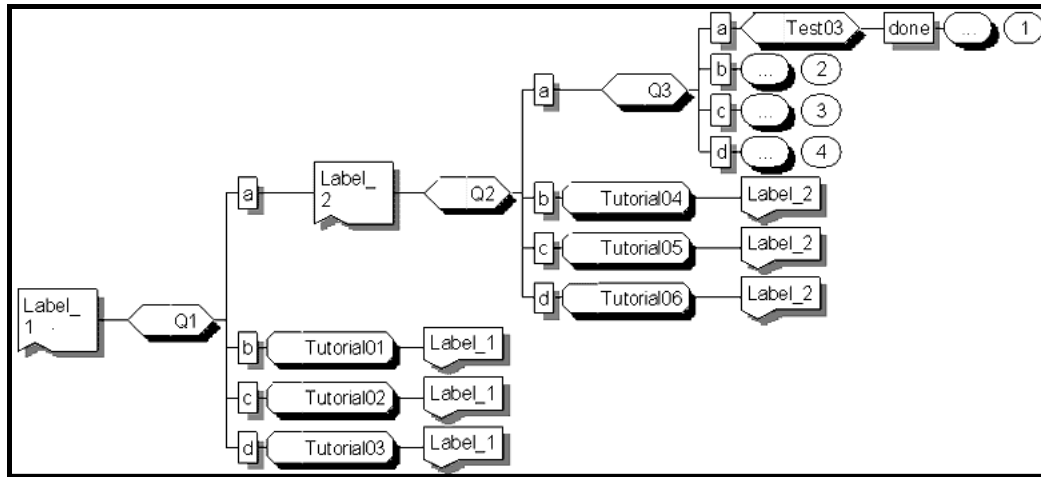


Figure 2: Decision Tree for MCQ Test with JITTs

In this context, marks are not the most crucial issue. More important in this context is the nature of feedback provided. This type of assessment is known as formative assessment where a self reflective process intends to promote learner achievement. Black and William (1998) consider an assessment ‘formative’ when the feedback from learning activities is used to adapt the teaching to meet the learner’s needs. Embedded in learning materials, formative assessments are considering a part of instruction and instructional sequence. More research is needed to identify what types of feedback are more efficient in stimulating learning or more efficient in motivating the student to persist with self assessment.

4. Implementation

4.1 Developing Interactive LOs

Most of the content development for learning in the technical area in Universities and content providers has been organised around the subject attributes or topics. In the move towards building competency of ODL learners, a modular approach using learning objects are being used. Every learning object has its own learning outcomes that the learners need to achieve. As an ODL learner, they need the flexibility to learn on their own. Learning takes place any time the learners are ready. Activities and self assessment in the LOs are important to build learners’ competency in the skills expected of them. Learning capacity is build through this activities and self-assessment. As learners get used to practicing the activities and answering the questions and getting feedback on their own, learning takes place. This interactivity allows the learners to develop the skills needed.

In engineering programme, Control Engineering is one of the common subjects that provide fundamental basis to the technological programme. The first LO developed was based on Block Diagram Reduction method (BDRM). The objective is to develop the interactive LOs with JITTs self assessment that will be uploaded to the OUM learning management system (myLMS) course tools learning resources for the learners. Before the programmer developed the system, the subject matter expert (SME) liaises with instructional designer to develop the storyboard. The objective is to train learners to familiarize the eight common block diagram transformation and simplify multiple sub-systems to simple block diagram in order to determine the system closed loop transfer function. SME divided the storyboard into four parts, namely the theory, steps in solving the problems, example with solution and self assessment.

Eight common block diagram transformation to be included in the instruction are:

1. Combining blocks in cascade
2. Combining blocks in parallel
3. Simplifying feedback block
4. Moving a summing point behind a block
5. Moving a summing point ahead of a block
6. Moving a pickoff point ahead of a block
7. Moving a pickoff point behind a block, and
8. Rearranging summing point

Figure 3 show the feedback transformation. In order to guide the learners how to begin simplifying the interconnected multiple blocks diagram, SME determine five general steps needed to simplify the block diagram. They are:

- Step 1: Combine all cascade block if any.
- Step 2: Combine all parallel or feed forward blocks if any.
- Step 3: Eliminate all minor feedback loops if any.
- Step 4: Move summing point or pickoff pointed so that block diagram can be simplify.
- Step 5: Repeat step 1 to 4 till the block diagram reduce to the simplest form.

Finally the example with animated solution was developed to demonstrate the application of theories and steps discussed above. This gives step by step guidance to Learners to make learning interesting in order to motivate the learners to be self-directed. Figure 4 show the example with step by step animated solution.

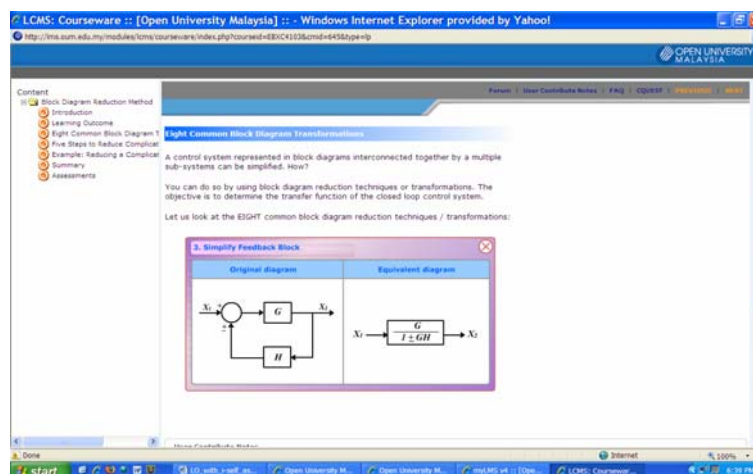


Figure 3: Block Diagram Transformation

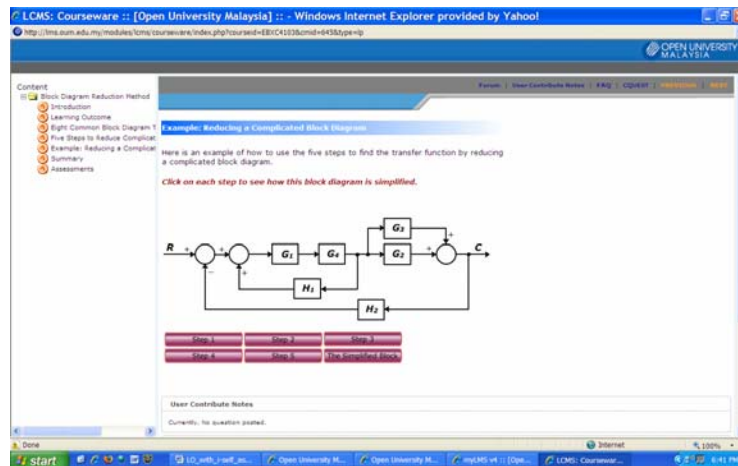


Figure 4: Example with guided solution

4.2 Developing JITTs Self Assessment

Developing learning attributes and skills of learners through MCQs is pertinent in the LOs. Innovative approaches to assessment will encourage learning. Feedback provided could become the motivator for the learners to build their competencies. Learning and assessment is most significant motivator to learners. Thus, applying MCQs in the LOs is expected to drive learners in achieving the competencies expected of them.

Previous sub-section explained the development of LOs. After learners have gone through the instruction material, the next step is to develop the JITTs self assessment. As a beginning, 6-questions of MCQs designed to help learners master the eight block diagram transformation. Ultimately the ideal number of questions should range from 10 to 20 per learning object. All 6 questions were carefully designed to ensure all eight transformations were applied. Figure 5 show first questions where learners are required to find the transfer function of the block diagram based on block diagram reduction method. There are four choices with only one correct answer. If learners got it right, the assessment proceeds to second question. If the learners got it wrong, JITTs will pop up to guide the learners, as shown in Figure 6.

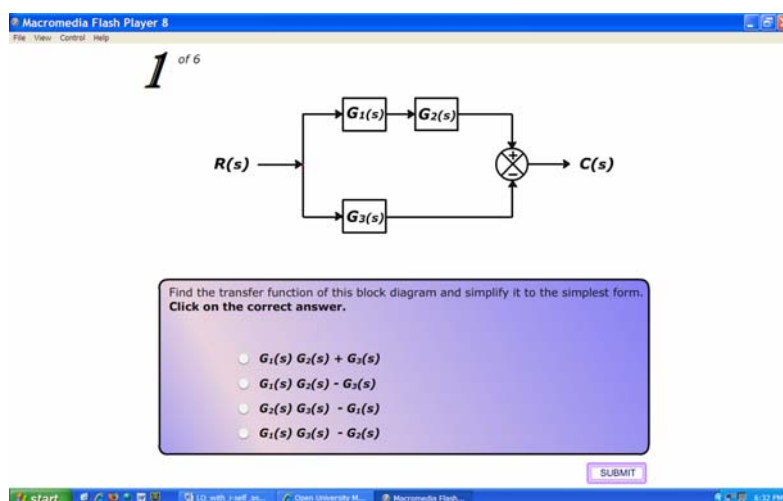


Figure 5 MCQ Self Assessment

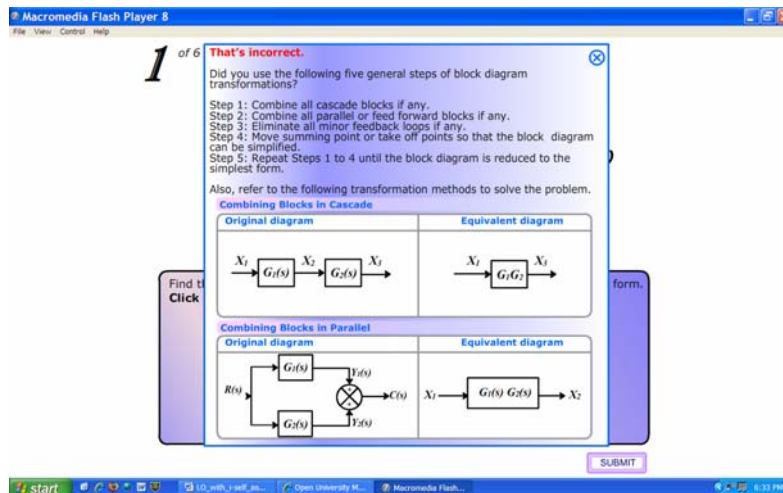


Figure 6 MCQ Self Assessment with JITTs

5. Conclusion

We have emphasized on the important of self-directed learning among the ODL learners. The learning materials developed for ODL learners need to be brief but informative, so as to support self directed learning and life long learning. We discussed the development of the interactive LOs with JITTs self assessment for Block diagram Reduction Method. While the interactive LOs materials motivate the learners to learn due to its smaller chunk and easy to understand presentation, JITTs self assessment gives the learners opportunity to evaluate their understanding of the LOs.

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