



LEARNING OBJECTS: THE BRICKS AND MORTAR OF SELF-LEARNING MATERIALS FOR DISTANCE EDUCATION

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Abstract

Distance education induce passive mode of teaching-learning system. The pedagogy of distance education is built mainly on the syntax and semantics of Self-Learning Material (SLM). SLMs are mainly learner-centric and self-motivating. Hence, these should be structured in a way to facilitate the learners attaining the learning objectives successfully. Moreover, developing quality SLMs involves high costs, and this cost recurs and may also consume considerably much time, as works of content developers may sometimes be duplicated.

A Learning Object (LO) is a chunk of content structured to support learning through the possible inclusion of educational objectives, content, resources, activities and assessment. They may be exhibited in the form of digital or non-digital chunk of content, though it is more familiar in digital environment. LO shows certain attributes which may enhance construction of instructional contents.

In this paper it has been studied how the structural, and cost and time-involving challenges may be overcome if the SLMs are built based on small units of learning objects (LO).

Keywords: Learning Object; Self Learning Material; Distance Education; Open and Distance Learning



1. Introduction

In the changing scenario of technology, the methods of designing instruction in the field of education are continuously changing. The objective is to enhance learning performance. The instructional materials play an indispensable role to achieve this objective, particularly to distant learners. So it must have some inherent attributes and specific structure which would be helpful in self learning process of distant learners. Instructional materials should be structured in a way to facilitate the learners attaining the learning objectives successfully. Having characterized with such certain attributes these are often called Self-Learning Materials (SLMs). The SLMs are mainly learner-centric, and hence should be self-learning and self-motivating.

Developing quality SLMs involves high costs, and this cost recurs when similarly structured components of the SLMs are happened to develop in varying contexts and platforms. Moreover, works of content developers are being duplicated. Thus, much endeavour is being wasted in getting the same intellectual output across different situations.

Both these, the structural and cost-involving challenges may be overcome, if the SLMs are built based on small units of learning objects (LO). The fact of evolving the concept of LO has caused the paradigm shift in the mode of designing and developing instructional materials, both for print and digital sectors. LOs have the potential to make instructional design systems more efficient through the use of existing materials. Wiley (2005)¹ argued “Once a collection of learning objects exists, and has been stored and catalogued in a digital library or other storage and indexing facility, instructional designers may select and aggregate LOs from within the collection”. Using learning objects are useful due to their attributes of cost-effectiveness, reusability, modifiability and adaptability. Reusable LOs are emerging as the “technology of choice in the next generation of instructional design, development, and delivery, due to its potential for reusability, generativity, adaptability, and scalability” (Wiley, 2000, p. 3)².

Hence, it is important to know how instructors and/or learners will be able to build an instructional plan at any moment by selecting and assembling LOs from a repository. Instant assembly of learning experiences would facilitate just-in-time learning and training. They will



access and work through the activities in LOs and improve their knowledge and skills and achieve learning outcomes. To achieve these benefits the LOs must be designed using proven instructional design techniques and should be based on learning theories.

2. Review of Literature

The focus of this study is whether the SLMs can be developed in the line of appropriate learning object orientation. The learning object characteristics and the structure and components of SLMs are therefore indispensable to review.

LOs can result useful in education, by decreasing production costs, exploiting experience and saving time (Littlejohn et al., 2003)³. Being able to fruitfully make use of LOs, however, require overcoming a number of issues of both conceptual and practical nature (Buseti, E, G Dettori, P Forcheri, et al. 2008)⁴. Not only are they a source of study materials, but can also give suggestions about teaching strategies. (Laverde, A. C., Cifuentes, Y. S., & Rodriguez, H. Y. R., 2007)⁵ Preparing educational materials suitable to be reused and easily adaptable to different learning situations, is rather a challenging task (Feldstein, M. 2002, Griffiths, J., Stubbs, G., & Watkins, M. 2007, Lehman R., 2007)⁶⁻⁸ requiring to split lessons into modules which are consistent and self-contained yet easy to articulate with each other.

COL handbook (COL, 2005)⁹ discusses about the structure, writing style and layout of contents of print and web-based instructional materials along with the structuring of self-assessment and study-guides, having the concept of ODL study materials untouched. Whereas in Indian respect, STRIDE handbook 5 (Koul, B.N, Chaudhary, S., 1989)¹⁰ discusses the principles and characteristics of ODL study materials, without referencing anything to the LO characteristics.

With the aim of improvement of teaching and learning, whether it is face-to-face or on the network, Wiley and others (Wiley, Gibbons and Recker, 2001)¹¹ present a framework for the consideration of LO granularity. The learning object design considerations have been presented in the light of this framework. Balatsoukas and others (Balatsoukas, P., Morris, A. and O'Brien, A., 2008)¹² reviewed and compared different theoretical accounts of aggregation level of learning objects and shows that an objectivist and instructional design-based approach to learning objects



can provide a more concrete understanding of the contents of learning objects by both humans and machines.

The structure of the model is hierarchical in the form of grains of contents following the specifications of the existing standards, such as LOM (IEEE Learning Technology Standard Committee, 2002)¹³, SCORM (Advanced Distributed Learning, 2004)¹⁴, etc. Wiley (1999)¹⁵ explains the meaning of ‘reuse’ in the concept of reusability of LOs and also discuss the hurdles of copyright issues in this regard. He shows that “open learning objects” may be the best potential solution for the purpose of reuse.

This study of literatures has shown that there are a handsome number of studies on LOs and their application. But standard guidelines for aggregation of LOs to design and develop SLMs for distance education have not been covered.

Designing LO oriented instructional materials (i.e. SLMs) have to deal with various aspects of LOs, such as classification, syntax and semantics, granularity, adaptability, reusability, interoperability, copyright issues, etc. Characteristics and structural components of SLMs and different aspects of LOs are discussed in the following sections.

3. Characteristics and structure of Self-Learning Material (SLM)

An essential component in the pedagogical methods of any form of distance education is its learning materials. SLMs are the prime instrument in any learner-centric learning environment, where the role of teacher or mentor is passive. Though the active interaction is possible in case of synchronous learning environment, the learning procedure has to be initiated and continued on learners’ own effort and of course on learners’ flexibility of time and space. So role of SLMs in such situations is very important.

3.1. Characteristics of SLM:

An effective SLM ought to have the following characteristics: (Freeman, 2005)¹⁶.

- **Self-contained:** SLMs are to be prepared exhaustively with the pre-designed curriculum/syllabus.
- **Self-explanatory:** the language is to be simple and lucid; ample no of examples, illustrations should be used to augment the perception of the learner.

- **Self-directed:** learning objectives are to be stated clearly and measures to be provided to get whether objectives are obtained; content is to be broken into smaller chunks for each single concept; rest/ gap is to be incorporated by providing evaluative questions/ quizzes/ practices.
- **Self-motivating:** presentation of content should draw the interest or curiosity of the learner to read voraciously; For this, the content should relate to some real-life situation wherever possible
- **Self-evaluating:** feedback after every short piece of content through providing practices, evaluative questions/ quizzes/ practices, etc

3.2. Parts/ Components of SLM

The objective of this paper is to examine how small units of learning objects (LO) can effectively be used to develop SLMs. In this regard it is necessary to understand the components of SLMs. Accordingly, we describe the components of SLM considering the benchmark practice prevalent in distance education institutions.

A general structure of SLMs as observed in those of IGNOU covers mainly three parts

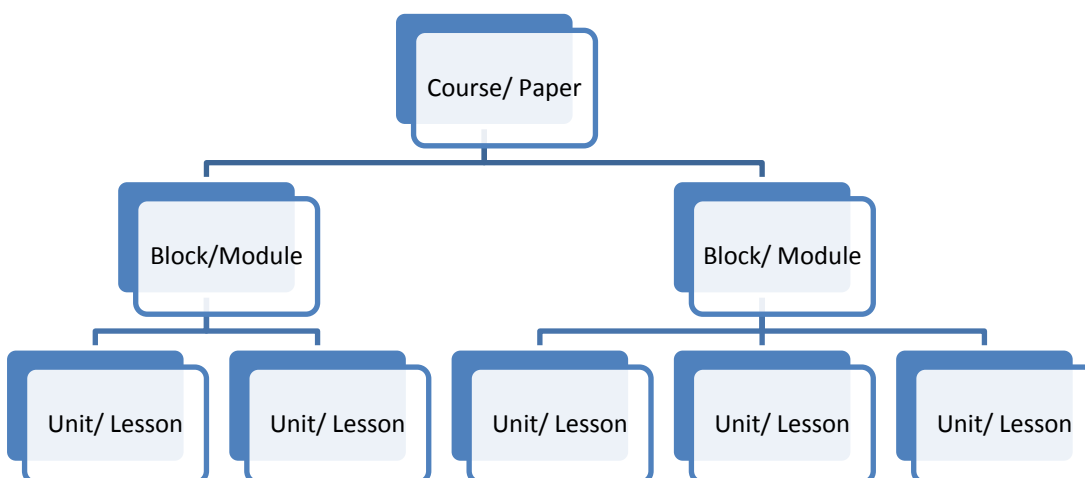


Figure 1: Parts / Components of SLM (adopted from STRIDE Handbook, 1989)

Each Unit has the following components as observed in different SLMs, especially SLMs of IGNOU and as taken from Session 3 of Wikieducator:

1. *The Title of the Unit*
2. *Beginning part of the Unit*



- Structure / Contents
- Introduction
- Objectives

3. Main Body of content

- Sections and Sub-Sections
- Illustrations
- Self-Assessment Questions (SAQs)

4. End Matters

- Summary / Let's Sum Up
- Glossary / Keywords
- References and Further Readings
- Answers and Feedback to SAQs

In the structure of a unit, there are four parts, viz. the Title of the Unit, the Beginning part of the Unit, the Main Body of content and the End Matters. The body of content is the focus of the SLMs. This part embraces the major part of the learning content and this should be structured judiciously to facilitate self-motivated learning. Use of LOs to design an SLM may enhance the structure of the unit to boost self-motivated learning, as well as the cost-effectiveness. We will examine in the next section the characteristic features and types of learning objects and how they can enhance the development of SLMs.

4. What Learning Object (LO) is:

Wayne Hodgins coined the term 'Learning Object' in 1994 with an explicit reference to Legos, keeping Gerard's view to children's mechano-sets and an implicit reference to object-oriented programming, where parts of computer code are reused for various software applications.

In 2006, the Institute of Electrical and Electronics Engineers (IEEE) quality assurance and standards body defined LOs as "any entity digital or non-digital, which can be used, re-used or referenced during technology supported learning"¹³.



According to Commonwealth of Learning⁹,

“A Learning Object is

- A chunk of content structured to support learning through the possible inclusion of educational objectives, content, resources, activities and assessment.
- Content designed to ensure reuse within different instructional settings.
- Content that can be stored within different digital learning management system (LMS), or used in many different delivery modes

COL validates⁹, “Learning Object is not a piece of text, or graphic, or a video clip, nor it is an entire course on a particular topic.” These are resources which support a LO and are often used to create LOs.

4.1. Characteristics of Learning Objects:

Learning Object must

1. have a learning objective, instructing the learners
 - a. a Task that a learner has to perform;
 - b. Learning Conditions towards completing the learning objective
 - c. Learning Criteria, if any (e.g. prior knowledge)
2. present content

Content in a learning object should be concise and pinpoint. Media-mix may facilitate the presentation of the content. LO Content should be consistent in regard to forms, formats and structural components, such as chart, flow-chart etc. to fulfill the learning objective set for that particular LO.

3. Provide opportunity for practice: A LO should incorporate lessons for practices.
4. Scope for assessment: Scope for self assessment must be included in a chunk of LO.

In addition to the above features, a LO should have the following characteristics,

5. Digital: Not necessarily in all cases, but LOs should be digital if to be used in present days’ technology supported learning;
6. Granular in size: No optimal size of LO can be determined, but it should have a single learning objective and be kept relatively small to increase the potential for reuse;



Apart from the aforesaid primary characteristics, learning Object should have the following inherent attributes:

7. Aggregation of content: being granular in size, LOs should have the property to be aggregated in different levels to develop other learning resources. Thus learning resources may be structured hierarchically aggregating LOs in different levels.
8. Reusability: LOs should be so created, that they remain context-free, stand alone and be easily isolated to function in different instructional contexts. Here reuse may signify reuse of the verbatim copy, revise, remix and redistribute;
9. Interoperability: LOs should be independent of both the delivery media and knowledge management systems so they can be used and transferred seamlessly between different technologies and institutions;
10. Flexibility: A well-designed learning object or a combination of several such objects, which are concerned with same topic, can offer access to knowledge through multiple modes of learning;
11. Accessibility: LOs should be tagged with descriptive information or ‘metadata’ so that they can be stored and referenced in a digital database or Learning Object Repository (LOR) and make retrieving easier

In designing any instructional materials, these characteristics of LOs will be

4.2. Classification of Learning Objects:

Daniel Churchill (2006)¹⁷ proposed a classification that contains the following types of learning objects: presentation, practice, simulation, conceptual models, information and contextual representation objects.



Table: Classification of LOs (Adopted from Churchil, D, 2006)

LO type	Explanation	Simple example
Presentation object	Direct instruction and presentation resources designed with the intention to transmit specific subject matter	An instructional sequence on classification of triangles
Practice object	Drill and practice with feedback, educational game or representation that allows practice and learning of certain procedures	Quiz question requiring a learner to use representation of a protractor to measure angles and answer a question regarding ratio between base and height of the right-angled triangle
Simulation object	Representation of some real-life system or process	Simulation of a compass allowing a learner to draw a geometric shape (e.g., equilateral triangle)
Conceptual model	Representation of a key concept or related concepts of subject matter	Representation that allows manipulation of parameters of a triangle, which in turn changes displayed modalities such as visual representation of a triangle, and numerical values of sizes of its angles and sides, and displays a graph showing changes in relationship between sides or angles
Information object	Display of information organized and represented with modalities	Representation that allows learners to change angles and sizes of a triangle and, based on configuration, to obtain information such as the type of triangle illustrated, a picture showing it in real-life and a short description of its properties
Contextual representation	Data displayed as it emerges from represented authentic scenario	Representation that shows real-life examples of triangles (e.g., roof of a building) and allows a learner to use representation of a tool (e.g., tape measure) to collect data about dimensions of these triangles

From the above classification it may be generalized that there are mainly three types of LOs that may be used in the instructional design:

- Integrated: tutorials, case studies and simulations with supportive information;



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- Informational: summaries, definitions, descriptions, demonstrations, models, examples, cases, stories, overviews;
 - Practice: problems, case studies, games, simulations, drills, review exercises, assessments;

5. Taxonomy of Levels of Learning Objects While Developing SLMs:

Wiley (2000) explained three components for implementation of LOs in an efficient way:

1. an instructional design theory,
2. a learning object taxonomy, and
3. “prescriptive linking material” that connects the instructional design theory to the taxonomy, providing guidance of the type “for this type of learning goal, use this type of learning object.”

SLMs can be better developed having the LOs in the base if the prescriptions given by instruction Design theories be followed properly. A designer of SLMs knows and analyses the requirements of the learner community, and then plan to design the learning content. In this process s/he relates different learning activities together to form a coherent unit to build the content from simple to complex. Finally s/he sets mechanisms for learning feedback to facilitate learners assenting their learning. The sequencing of activities then becomes a priority and a way of distinguishing and creating methods of learning through instructional design. LO designers may work in the same fashion on a complex object like a complete and automatic course with many elements, and prefer classifying objects according to granularity, since the dominant metaphors of LOs are building Blocks, Legos, or Atoms. The small chunks of LOs having single learning objective motivate learners in their self-learning. The aggregation of different granular levels of such small chunks of LOs finally constructs a complete unit of SLMs. Being interoperable and reusable the LOs used in one SLM may also be used in SLMs by others, if fits the context. If required, they may be modified or reused as it is in different interrelated disciplines. Thus, use of LOs in SLMs may improve cost-effectiveness and process efficiency



6. Challenges in Using Learning Objects

Learning Objects, by definition are not only digital object. But in use we mostly use them in digital environment; and reuse of digital materials has not yet been widely accepted in mainstream higher education and company training setting (Collis & Strijker, 2001). Again, LO implementation requires large amount of instructional content development efforts. However, implementing use of LOs may consider the following difficulties:

Standardization of Terminology: Selecting terms have proven to be problematic in the searching and reuse of learning objects. Problems of synonyms, homonyms, word-forms, etc. create constraints in retrieving LOs from within a learning object repository, when the designers are likely to reuse these for creating an instructional content. To overcome this problem a standardized metadata description is required.

Copyright and Modifiability issues in using LOs: As instructional designers attempt to use learning objects to develop instructional materials that may vary the context, copyright infringement may become an issue. Modification of learning objects can also present copyright challenges.

7. Conclusion

The use of learning objects (LO) in the field of education has the potential to improve the way instruction is delivered. However, they must be developed using sound instructional design principles, and learning theories. They must be designed in a way so that they can be reused in different lessons or courses and different instructional interventions or situations. And, an LO must be tied to a specific learning outcome so that appropriate content and assessment can be included, and the appropriate delivery medium can be identified.

Reviewing the characteristics of LOs it can be concluded that whatever may be the hierarchy of aggregation, a LO in its concept with single specific learning objective is a unit for an SLM as a whole. A LO is composed of combination of nearly a limited numbers of components, may be in various media formats, like text, images, graphics, etc.

Generally, issues on learning objects are discussed, very appropriately in the context of digital environment. But the concept may also be applicable when we think of designing printed



self-learning materials (SLM). The structure of the printed SLMs may much be coherent if be based on the concept of learning objects. Obviously, we have to ignore some of the essential features of learning objects in that case.

With careful, intelligent, systematic course design, with thoughtful consideration of the 'best fit' between LOs, and with focused reflection on their capabilities, LOs can be an effective tool for remediation, teaching of new content, review of old content, and even development of critical thinking. LOs are used to streamline and economize on education. the vision in many situations is that these may replace the teacher in the classroom, perhaps even the classroom itself and make the art and science of education dependent upon the design and quality of the LOs chosen.

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