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EVALUATION OF LEARNING OBJECTS

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Abstract

Open educational resources are digital materials that can be re-used for teaching, learning, research and more, made available free through open licenses, which allow uses of the materials that would not be easily permitted under copyright alone. This material is available in different formats. Different forms of OER have different characteristics and uses. Learning objects is one of the important form of OER. The need to take classroom-based instruction, materials, and information to create a low-cost, high quality instruction in a web-based format has given way to the concept of Learning Objects (LOs). A learning object repository provides faculty, teachers, curriculum developers and students with easy access to a large storehouse of content/ learning objects that can be shared and used within and across schools, colleges and universities, and state agencies.

In the repositories the learning objects are stored according to their disciplines with metadata as title description, type, author, creation date, updated date, technical requirements, copyright information and keywords for search. To select appropriate learning object for students it is essential to evaluate the quality of learning objects. In the present study an attempt has been made to determine quality of available Learning Objects.

Keywords: Learning objects, quality, evaluation rubric

Learning Objects:

Learning object is a digital learning material. It is one of the important form of OER. It aims to enable a learner to acquire knowledge and skills on a specific topic or theme. A learning object is a collection of content items, practice items, and assessment items. All these items are combined and based on a single learning objective. Learning objects are a new way of thinking about learning content. Instead of providing all the material for an entire course or lecture, a learning object provides material in short chunks, for a short period of time. This time ranges from 5 to 15 minutes. Once the learning object is developed it can be reused several times by teachers and learners.

Definitions of learning object:

Learning object is defined as, any digital recourses that can be reused to support learning. The term learning objects generally applies to educational materials designed and created in small chunks for the purposes of maximizing the number of learning situations in which the resource can be utilized. (Willy, 2000)

The following are the Learning Object's structural components:

- Objective: A statement describing the intended criterion-based result of an instructional activity.
- Learning Activity: an element of the instruction that teaches to an objective.
- Assessment: an element that determines if an objective has been met.

Learning objects are used to teach particular skill or concept, or to provide stimulating thinking and learning experience for the learner. For teaching and learning purposes, effective learning objects use documents, interactivity, graphics, sound, animation, simulation, video and other multimedia tool that go beyond static text book. These feature of learning objects provide learners engaging real world learning experience.

Key characteristic of learning object:

- Accessibility
- Reusability
- Interoperability
- Granularity
- Tagged with metadata

Learning object repository:

The term "repository" is often used to refer to a content storage system for learning objects. A learning object repository provides faculty, teachers, curriculum developers and students with easy access to a large storehouse of

content/ learning objects that can be shared and used within and across schools, colleges and universities, and state agencies.

In the repositories the learning objects are stored according to their disciplines with metadata as title description, type, author, creation date, updated date, technical requirements, copyright information and keywords for search.

To select appropriate learning object for students it is essential to evaluate the quality of learning objects.

Previous approaches to evaluating learning objects:

Nesbit, Belfer, Vargo (2002) developed 'A Convergent Participation Model for Evaluation of Learning Objects'. In this model representatives from stakeholder groups (e.g., students, instructors, subject matter experts, instructional designers, and media developers) converge toward more similar descriptions and ratings through a two-stage process supported by online collaboration tools. The article reviews evaluation models that have been applied to educational software and media, considers models for gathering and meta-evaluating individual user reviews that have recently emerged on the Web, and describes the peer review model adopted for the MERLOT repository. The convergent participation model is assessed in relation to other models and with respect to its support for eight goals of learning object evaluation: (1) aid for searching and selecting, (2) guidance for use, (3) formative evaluation, (4) influence on design practices, (5) professional development and student learning, (6) community building, (7) social recognition, and (8) economic exchange.

Vargas, Ortega (2006) proposed framework for Learning Object Evaluation (FLOE). In this model quality of learning object is studied through four aspects: positive quality, negative quality, delivery, and formative quality.

Leacock, T. L., & Nesbit, J. C. (2007) has given A Framework for Evaluating the Quality of Multimedia Learning Resources. This article presents the structure and theoretical foundations of the Learning Object Review Instrument (LORI), an evaluation aid. A primary goal of LORI is to balance assessment validity with efficiency of the evaluation process. The instrument enables learning object users to create reviews consisting of ratings and comments on nine dimensions of quality: content quality, learning goal alignment, feedback and adaptation, motivation, presentation design, interaction usability, accessibility, reusability, and standards compliance.

Kay and Knaack (2008) proposed 'A multi-component model for assessing learning objects: The learning object evaluation metric (LOEM)'. The purpose of the study was to develop and assess a multi-component model for evaluating learning objects. The Learning Object Evaluation Metric (LOEM) was developed from a detailed list of criteria gathered from a comprehensive review of the literature. A sample of 1113 middle and secondary students, 33 teachers, and 44 learning objects was used to test this model. A principal components analysis

revealed four distinct constructs: interactivity, design, engagement, and usability. These four constructs showed acceptable internal and inter-rater reliability. They also correlated significantly with student and teacher perceptions of learning, quality, and engagement. Finally, all four constructs were significantly and positively correlated with student learning performance. It is reasonable to conclude that the LOEM is reliable, valid, and effective approach to evaluating the effectiveness of learning objects in middle and secondary schools.

In summary, it can be said that existing models of learning object evaluation include a relatively comprehensive set of evaluation criteria, but the quality of individual elements is not taken into consideration. This can be done by using evaluation rubric.

Evaluation Rubric:

A rubric is a scoring tool and it is a set of criteria and standards linked to learning objectives that is used to assess a student's performance on papers, projects, essays, and other assignments. Rubrics allow for standardized evaluation according to specified criteria, making grading simpler and more transparent.

Heidi Goodrich Andrade (1997), a rubric's expert, defines a rubric as "a scoring tool that lists the criteria for a piece of work or 'what counts.'" Rubric also describes levels of quality for each of the criteria. These levels of performance may be written as different ratings (e.g., Excellent, Good, Needs Improvement) or as numerical scores (e.g., 4, 3, 2, 1). Rubrics are performance-based assessments that evaluate student performance on any given task or set of tasks that ultimately leads to a final product, or learning outcome. Rubrics use specific criteria as a basis for evaluating or assessing student performances as indicated in narrative descriptions that are separated into levels of possible performance related to a given task. Starting with the highest level and progressing to the lowest, these levels of performance are used to assess the defined set of tasks as they relate to a final product or behavior. Each level describes degrees of proficiency and each level is assigned a value that rates the degree of proficiency or student performance.

Rubric has a detailed and precise criteria and rating scale involves qualitative description of a limited number of aspects of a things that may help researcher/ teacher in analyzing learning object. Hence researcher has adopted a rubric for evaluation of Learning Object.

Educational Significance of the Study:

Evaluation of learning object can lead to improve quality of learning object. The developed tool in form of rubric will be helpful to teachers who wish to use the

learning objects. Learning object is self learning material hence, to select a complete learning object which, fulfill the students' need; rubric can be used. Teachers can use rubrics for selecting any learning object from the web. Teachers will know that, they are using learning object which, adds value to the learning. Hence, this rubric will ease the selection process and will also provide guidelines for developers to create an effective learning object. The learning objects can be selected by determining its quality.

Sample of the study:

Learning objects are the samples of this study. Learning objects were selected from following learning repositories they are wisc- online, learning about learning object, LORDEC and CIET. All the learning objects are available online. The sampling technique used was purposive sampling.

The sample size for this study was 8 learning objects. These learning objects were from different subjects. Those were Mathematics, science, English and Geography. Details of the learning objects (sample) are attached in annexure A.

Tool for data collection:

This tool was prepared considering all the points which contribute in the creation of learning objects which in turn helped in gauging the quality of the learning objects.

Preparation of the tool:

The researcher has prepared a rubric for evaluating learning objects. This will help to understand the loop holes and quality of the learning objects. Many repositories of learning object were explored by the researcher. All the features of the learning objects were noted down by the researcher.

Learning objectives:

Learning objectives must be clearly written. Learning objectives should reflect a measurable outcome. They must be achievable. They should be learner specific. The learning activities, content and assessments provided by the object should align with the declared learning objectives.

Content quality:

The content should be free of error and presented without bias or omissions that could mislead learners. It must be logically sequenced and presented in small chunks. It should be presented at appropriate level of detail and emphasize on key points and significant ideas.

Language:

To understand the concept it is essential to have correct and simple language. Slang language should be avoided. Language should be simple and appropriate for the target group as well as it should be free from grammatical error.

Design:

Color and text are element of the design. Contrast color of the background and text should make text readable. Font size and style should appropriate so that, .. will help learner to read easily. Text need to well organized with headings and subheadings. Along with this text and images need to be well placed and size of images, text should be appropriate to each other.

Graphics:

All the graphics should be relevant to the content and explain the difficult concepts with clarity. For better understanding all the graphics in learning object needs to be clear and should good and appropriately used in learning object. Graphics should play important role in education and betterment of learning.

Interactivity:

Interactivity can be defined as a function of the technology, in terms of the control made available to the user, as an expression of quantity or by assessing the quality of learning. This is the type of Learner to Computer (Software/Interface) where learner should interact clicking on the object, dragging and dropping the object. Also interaction should increase motivation and interest. It should give opportunities for learners to express their own points of view to explain the issues in their own words and formulate opposing or different arguments; also it should have been related to deep-level learning and the development of critical thinking.

Navigation:

All buttons and links should activate on every screen. Navigation should provide ease of moving through learning object and non linear navigation.

Questions:

Assessment is important component of learning object. For this questions are asked which need to be relevant and appropriate for target group. Also the clarity of instructions play very important role in determining the quality of questions asked in learning objects.

Feedback:

The feedback to the test items should be immediately provided after answering the test item. It should be provided with rationale. The feedback should be effective and appropriate.

Animation:

Animations can use to enhance and support learning. Animations are mainly used for process and procedure. They should be appropriately used with the content. The length and speed of the animation should be appropriate.

Sound:

Sound provided in the learning should be suitable and appropriate for the target group. User should be able to control the sound.

After deciding the criteria description for different level of each criterion was written.

Validation of tools:

The tool was sent for validation to experts. According to experts' comments changes were made in the rubric. Developed tool was then used for evaluating following learning objects. The copy of evaluation rubric is given in annexure B.

Learning Object 1: Triangle

Learning Object 2: Algebra- algebraic identities

Learning Object 3: Gas exchange

Learning Object 4: Refraction of Light

Learning Object 5: Modifiers Noun

Learning Object 6: Personal pronouns

Learning Object 7: Types of rainfall

Learning Object 8: Square root practice

Table 1
Score for Each Learning Object

Name of the Element	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8
Learning Objectives (out of 12)	3.5	12	3.5	3.5	3.5	3.5	3.5	3.5
Content (out of 12)	11	8	11	9	11	12	12	10
Language (out of 6)	6	6	5	5	6	6	5	4

Design (out of 9)	9	9	7	7	9	7	8	5
Graphic (out of 6)	6	6	5	3	6	4	0	2
Animation (out of 15)	12.5	12	5.5	6.5	8.5	7.5	9.5	9.5
Navigation (out of 6)	6	4	5	5	5	6	6	5
Question (out of 9)	0	9	9	8	7	9	7	8
Feedback (out of 6)	2	6	4	4	5	4	4	4
Interactivity (out of 6)	4.5	6	5	4	4	5	4	4
Sound (out of 3)	3	3	1	1	1	1	1	1
overall impression/rate (out of 3)	3	2.5	2	2	2	2	3	2
Total (out of 90)	66.5	83.5	63	58	68	67	63	58

From the above table presence of element in the learning object can be seen as follows:

- Except one, all learning objects lack in fulfilling the criteria related to learning objectives.
- In all learning objects content presented is error free, logically sequenced and in small chunks.
- The language used in all almost all the learning objects is simple and appropriate for the target group and free from grammatical error.
- Except one, in all the learning objects background color and text Color are complementary. Hence, text is readable. The font style, color and size are appropriate for reading.
- In 50% learning objects all the graphics used are relevant to the content and explain the difficult concepts with clarity.
- All the learning objects show high level of interactivity.
- In all the learning objects all buttons and links are activated and navigation is easy.
- Except one all the learning objects have provision for immediate and appropriate feedback.
- Only 2 learning objects have good quality animations
- Except one in all the learning objects the questions asked are relevant, clear and appropriate for target group.
- Only 2 learning objects have sound which is appropriate and can be controlled by the learner.

To rate the learning objects in terms of quality, researcher has developed a scale as follows:

- 1-15 ----- Poor
- 16-30 ----- unsatisfactory
- 37-45 ----- Satisfactory
- 46-60 ----- Good
- 61-75 ----- Very good
- 76-90 ----- Excellent

Table 2
Quality-wise Distribution of LOs

Range of score	Quality	Percentage
1-15	Poor	0
16-30	unsatisfactory	0
37-45	Satisfactory	0
46-60	Good	25
61-75	Very good	62.5
76-90	Excellent	12.5

Above table shows that all learning objects are of good quality and hence can be recommended to learners.

Conclusion: From the above description it can be said that selected open educational resources in the form of learning object available on World Wide Web are of good quality. Teachers can use developed evaluation rubric to judge the quality and accordingly select for his/her students.

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Annexure A

URLs of selected learning objects

http://www.ciet.nic.in/learning_object_maths/Triangle%20English.html

http://www.ciet.nic.in/learning_object_maths/Algebra%20English.html

http://education.uoit.ca/lordec/ID_LORDEC/gas_exchange/index.html

http://education.uoit.ca/lordec/ID_LORDEC/refraction_light/index.html

<http://www.wisc-online.com/Objects/ViewObject.aspx?ID=ABC201>

<http://www.wisc-online.com/Objects/ViewObject.aspx?ID=ABC1502>

<http://www.curriculumbits.com/prodimages/details/geography/types-of-rainfall.html>

<http://staff.argyll.epsb.ca/jreed/math9/strand1/squareroot.swf>

Annexure B Evaluation rubric

For given statement like 'all, some, and very few' approximately percentage has considered while evaluating the learning object. They are given below:

50 to 100% - all

25 to 50 % - some

Less than 25% - very few

No.	Criteria	Excellent 3	Average 2	Poor 1	marks
1	Learning Objectives				
	Relevance	All the objectives are relevant to the content.	Some of the objectives are relevant to the content.	Very few objectives are relevant to the content. Or objectives are not given.	
	specificity	All the objectives from learning object	Some of the objectives from learning object	Very few objectives from learning object	

		are clearly stated.	are clearly stated.	are clearly stated. Or objectives are not given	
	Attainability	All the objectives are attainable for the target group.	Some of the objectives are attainable for the target group.	Very few objectives are attainable for the target group. Or objectives are not given	
	Measurable	All the objectives are achievable at the end of the learning object.	Some of the objectives are achievable at the end of the learning object.	Very few objectives are achievable at the end of the learning object.	
2	Content				
	Accuracy	Content in the learning object is without any conceptual error.	Content in the learning object contain few conceptual errors.	Content in the learning object has many conceptual errors.	
	Scope of the content	Content is appropriate for 1 learning object and for the target group. Also content is appropriate and sufficient to achieve the learning objectives	Appropriate content is used for the target group but there is a chance to increase scope of the content.	Scope of the content is vast for 1 learning object; more than 1 learning object can be designed.	
	Sequencing	Throughout the learning object maxims of learning are used. Like content is sequenced from known to unknown and simple to complex.	Some of the screens have content which is sequenced from known to unknown and simple to complex.	Very few screens have content which is sequenced from known to unknown and simple to complex.	
	Learning time	Learning time of the learning	Learning time of the learning	Learning time of the learning	

		object is around 15 to 20 min.	object is exceeds up to 20 to 45 min.	object is exceeds more than 45 min.	
3	Language				
	Grammatical correctness	The text is grammatically correct throughout the learning object.	Throughout the learning object 1-4 grammatical errors are there.	Throughout the learning object there are 5 or more grammatical errors.	
	Appropriateness	Throughout the learning object language is simple and appropriate for the target group.	Throughout the learning object language is appropriate for the target group, but it could have been simpler for the target group.	Throughout the learning object language is very difficult for the target group.	
4	Design				
	Color	In all the screens- 1. The text color is in contrast with the background color. 2. Color combinations / themes are appealing and appropriate for the target audience. 3. Color combinations / themes are consistent	In some of the screens- 1. The text color is in contrast with the background color. 2. Color combinations / themes are appealing and appropriate for the target audience. 3. Color combinations / themes are consistent	In none or very few screens, 1. The text color is in contrast with the background color. 2. Color combinations / themes are appealing and appropriate for the target audience. 3. Color combinations / themes are inconsistent	
	Text	Font size and style is consistent Through out the	Font size and style is consistent throughout the	No consistency in font size and style throughout the learning	

		learning object. Appropriate size is used for heading and subheadings. Color of the font is pleasing to the eye.	learning object. Text is somewhat appropriate and color of the text is not readable.	object. More emphasis is given to the background and not to the text.	
	Layout and organization	Text is well organized with headings and subheadings. Screen is neatly organized.	Some of the screens have well organized text with headings and subheadings. Overall screen is not neatly organized	Very few screens have well organized text with headings and subheadings. Screen is neatly organized.	
5	Graphics				
	Relevance	All the graphics are relevant to the content and explain the difficult concepts with clarity.	Some of the graphics are relevant to the content and explain the difficult concepts with clarity.	Very few graphics are relevant to the content and explain the difficult concepts with clarity.	
	Clarity	All the graphics are clear. Images are good and appropriately used.	Some of the graphics are clear. Images are good and appropriately used.	Very few graphics are clear. Images are good and appropriately used.	
6	Animation				
	Relevance	All the animations used in the learning object are meaningful and relevant to the content and explain the difficult concepts with clarity.	Some of the animations are relevant to the content and explain the difficult concepts with clarity.	Very few animations are relevant to the content and explain the difficult concepts with clarity.	
	Accuracy	Animation used	Animation is	Animation is not	

		in the learning object is accurate. It is simple for the target group. In the animation objects are labeled.	accurate according to the topic and objects are labeled but they are not much simple for the target group.	much accurate according to the topic. Also objects are not labeled.	
	Zooming	All animations allow user to zoom wherever required.	Some of the animations allow user to zoom wherever required.	Very few animations allow user to zoom wherever required.	
	Speed	Speed of the animation is according to the target group. Speed is appropriate.	25 to 50% animations are according to the target group and speed is appropriate.	Less than 25% animations are according to the target group and speed is appropriate.	
	Repetitive	Replay button is provided for all animations, which are used for explaining concept. Or Reply button is not required, hence it is not provided	Replay button is provided for some of the animations, which are used for explaining concept. Or Reply button is not required, but it is not provided for some of the animation.	Replay button is provided for very few animations, which are used for explaining concept. Or Reply button is required, but it is not provided.	
7	Navigation				
	Hyperlink	All the links are labeled and connected to the right place. Learning object is very easy to navigate.	Some of the links are labeled and connected to the right place.	Very links are labeled and connected to the right place	
	Instructions for navigation.	For navigation instructions are given in the form of text or highlighting the object or using	Some of the screens have instructions for navigation in the form of text or highlighting the	Very few screens have instructions for navigation in the form of text or highlighting the	

		image or using animation or using sound.	object or using image or using animation or using sound.	object or using image or using animation or using sound.	
8	Question				
	Relevance	All the questions are relevant to the concept and learning objectives.	Some of the questions are relevant to the concept and learning objectives.	Very few questions activity are relevant to the concept and learning objectives.	
	Clarity of instructions	For all the questions; clear instructions are given in a simple language.	Some of the questions have clear instructions in a simple language.	Very few questions have clear instructions in a simple language.	
	Level	Level of all the questions in the learning object are appropriate to the target group. Also They match with learning objectives.	Some of the questions are appropriate to the target group also Some of the questions do not match with learning objectives.	Very few questions are appropriate to the target group also Very few questions match with learning objectives.	
9	Feedback				
	Frequency	All the questions have immediate feedback for every attempt.	Some of the questions have immediate feedback for every attempt.	Very few questions have immediate feedback for every attempt. Or no feedback is given.	
	Means of giving feedback	Sound and / or, graphics and / or text are used for giving feedback.	Graphics and text are used for giving feedback.	Only symbolic feedback is given. i.e. (√) (X) or only textual feedback is given.	
10	Interactivity				
	Levels of	Viewer interacts	Viewer interacts	Viewer interacts	

	interaction	by clicking on the object, dragging and dropping the object and putting the text on screen.	by clicking on the object and using drag and drop method. Or putting the text on screen.	only clicking on next button.	
	Simplicity of instructions for interactivity.	Instructions used for activity are short, clear and complete. Instructions are simple for the target group.	Instructions used for activity are fairly short, clear and complete. It could have been simpler for the target group.	Lack of instructions for activity and unclear for the target group.	
11	Sound				
	Appropriateness	Sound provided in the learning object is suitable and appropriate for the target group. Sound is clear and can be controlled by the user. i.e. volume control, mute.	Sound provided in the learning object is appropriate and pleasant, but it does not have any feature to be controlled by the user. i.e. volume control, mute.	Sound provided in the learning object is not appropriate Or Sound is not provided in the learning object.	
12	Overall Impression / rating				
	Overall presentation of the learning object.	3 Excellent	2 Average	1 Poor	

Total-----/90