Evaluating Interactive Learning Content
In a E-learning Environment

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Abstract:
The interaction between teacher and learner as well as the interaction between learner and content has a significant impact on the effectiveness of any learning process. In this paper, we discuss interactivity in the context of eLearning and we focus on the interaction between the learner and the content. The objective is to provide clear metrics to measure learner-content interactivity from the design perspective and at the level of learning objects. A series of tests is performed using our metrics on a set of different learning objects from various university curricula including English learning and scientific topics. The article presents suggested metrics, and summarizes findings concerning their interest and applicability.

Keywords:
Interactivity, metrics, e-learning, learning objects.

Researchers in the educational domain generally believe promoting interaction between teacher and learner and between learner and educational content has a significant impact on the effectiveness of the educational process [1], especially when the interaction is catalytic for the learner's capabilities of exploration and conclusion [2]. Despite the importance of interactivity researchers have yet to agree on a clear definition [3], which has led to the absence of clear-cut criteria to assist in measuring the impact on the educational process [4].

It seems the concept of interactivity in the learning process becomes more definable and measureable when it is narrowed down to specific areas. That is for example what happens when the traditional educational process—with its trinity of "learner, teacher, and educational content,"—is transformed into a new form, as in the eLearning environment. The greatest among its relations is the one between the learner and the educational content (the teacher becomes a tutor, who simply directs the educational process). Then, interactivity becomes easier to frame and measure because its scope is more specified. The

interactivity level between the learner and the educational content, which aims to serve the learning process, becomes the primary concern, and cannot be neglected during the educational content designing[6]. Such an issue was our primary concern when we evaluated the content of many educational programs at Syrian Virtual University.

Our objective is to provide a definition of interactivity and open the possibility of measuring it, in order to verify the added value offered to the learner within an eLearning environment. Measuring is performed through using a set of criteria designed to assess the educational content. This helps in assessing the efficiency of the educational content and how it meets the educational objectives, as well as its ability to provide information in a learner friendly and enjoyable manner.

What is Interactivity?

The discussion of interactivity within is only in the context of eLearning, and in the context of the relationship between the learner and the educational content, which we tested and dealt with when we evaluated the content of Syrian Virtual University e-Learning programs.

We begin with the fundamental question: What is the goal of studying interactivity? The answer is: To have an educational content that can deepen the learner's understanding of the educational material and meet its educational objectives.

We define interactivity in the eLearning context as an integral part of the educational content, offered by a set of methods and tools that force the learner to escape from the state of being a passive recipient of information and occupy him with a series of actions and reactions, which helps him to deepen the subject understanding through experimentation, learning from his mistakes, and dealing with unexpected events.

The Importance of Interactivity Assessing

Interaction methods and tools provide additional possibilities for the learner to deepen their understanding of the content, such as: tests in questions and answers format, simulators, and interactive objects (e.g., images and shapes require actions and reactions). In order to clarify the ideas contained within the learning content, many different aids such as images, animations, charts, graphs, videos, texts, and many other means are used for this purpose. But the use of aids and the interactions leads us to the question: Does any form of interaction (or even an aid) necessarily have a positive impact on learning?

Our inclination to give a certain and unambiguous answer does not hamper our natural tendency to answer "no." But, certainly we cannot answer "yes" before verifying a set of conditions, which must be achieved by the interactive object in order to positively affect the learning process. Among these conditions are the following examples:

- The interactive object must be compatible with the learner's intellectual and cultural level (age, level of education ... etc.).
- The interactive object should convey reality without causing any confusion in the learner's mind that might lead to an opposite effect.

The Relation between Educational Aids and Objectives

Before studying any learning material, we need to look at the desired objectives of such material. This is because we should –at the beginning- answer the obvious question: Why are we learning this?

Thus, defining the learning outcomes indicates the learning content objectives, and directs its chapters and sections. For example, students specializing in information technology would be required to take an "operating systems" course, which can be oriented to different students with different interests but built upon a common academic foundation. On one hand, students learn to identify operating system components and software structures, while the same course can be oriented for another learner looking for training in operating, managing and using a specific operating system or a set of computer operating systems. Whereas specific chapters of the material focus on developing the learner's analysis and synthesis capability, while other chapters enable the learner to master the use of certain tools.

As a result, identifying educational outcomes helps in determining the nature of interaction required to understand a complex idea in a simple way. For example, a video of "how to manage an operating system" could be very useful if the course is oriented to teaching how to use and manage an operating system. Alternatively charts depicting the structure of the operating system are useful for explaining the theoretical concepts of the subject.

Dealing with Interactive Learning Content

Learning outcomes and assessment criteria are usually the first step for authoring and developing the learning content, whether the content is for a traditional educational system or for an eLearning system.

At Syrian Virtual University, course evaluation process starts with a document regrouping the following items:

1. Prerequisites. The list of courses to be studied before the course within the program or specialisation.
2. Credit Hours.
3. Objective.
4. Syllabus. Often divided into chapters, first-level paragraphs, and second-level paragraphs reaching a small paragraph, which produces a reusable learning object [7].
5. Learning Outcomes. A set of actions is used to define outcomes:
   - Knowledge Understanding: understand, identify, and know
   - Intellectual Skills: analyse and assemble
   - Practical Skills: master and use
6. Assessment Criteria. The required results of each learning object according to specified classification in the course syllabus section and its corresponding assessment type (exam, assignment, discussion, etc...), usually presented as a table.

Interactivity Assessment Criteria. Depending on the course definition document, and the learning content provided by the university, we apply the following method of assessment:

- Identify learning objects.
- Define the criteria.
- Determine the elements and objects level of interactivity.
- Classify criteria.

The following table shows the interactive element's assessment criteria and the weighing factor values that are applied:

Part	**No.**	**Criterion**	**Values**					**weighting**
			1	2	3	4	5	
Communication	**1**	Required time for interaction, downloading and implementing,	Unacceptable	Fairly acceptable	Acceptable	Short	Very Short	2
	2	The effort required to deal with the interaction and access to any information in it,	Very big	Big	Reasonable	Relatively small	Small	1
	3	The estimated required time for waiting processing or download,	Unavailable	Generally wrong	Somewhat acceptable	Somewhat accurate	Accurate	1
	4	The interaction control level in terms of: forward backward, stop and follow-up, determine the location, and exit,	Very weak	Weak	Acceptable	Good	Excellent	2
	5	The visual quality in terms of: Adherence to the dimensions of the screen, showing the important information in style, use colors properly,	So weak	Weak	Acceptable	Good	Excellent	2

Reality	6	Expressions and metaphors used in the interaction are identical to those used in the traditional education with the same content,	Completely different	Inaccurate	Matches the reality sometimes	Often matches the reality	Perfectly matched	1
	7	Method built in compatible form with the familiar foundations of communication between man and machine [5],	No	Somehow Compatible	Reasonably Compatible	Most Compatible	Fully compatible	2
	8	Information displayed by the interaction are complete and cover all the concepts and ideas that the interaction is built for,	Doesn't cover	Covers few	Covers half	Covers most	Covers all	2
Errors handling	9	Interaction is built in a coherent and flexible form to deal with usage errors.	Stops as a result of usage errors	Overcome usage errors without explanation	Overcome usage errors with not clear explanation	Overcome usage errors with an explanation of the error is not sufficient	Overcome errors use with a clear explanation of the error	2
	10	Gives the learner correction; shows and describes when an error in understanding occurs,	No correction	Correction without explanation	Correction with useless explanation	Correction with not sufficient explanation	Correction with full explanation	2
Assessment	11	Interaction provides an assessment of the learner's level of achievement and understanding of the ideas,	No	Provides useless assessment	Provides not sufficient assessment	Provides acceptable assessment	Provides a complete assessment	1
	12	The interaction provides compatible assessment with the learning outcomes of the learning objectives and with the assessment criteria set out in the course definition document,	No	Somehow	Not enough	Acceptable	Excellent	2
	13	The interaction provides an assessment with understanding error corrections,	No	Useless	Not enough	Acceptable	Excellent	2

Conclusion

We presented a definition of interactivity and a presentation of tools and methods to achieve it; and we considered interactivity as an essential method in the eLearning environment, where the relation between the learner and the learning content is stronger than other relations. Interactivity is not only providing a tool to help deepen the learner's understanding of the learning content, but it is also considered a fundamental and vital issue in establishing the concept of self-learning within this environment.

To achieve our purpose we have developed a series of questions that form criteria to verify the interactivity of the learning object. By answering these questions we can adjust the interaction and ensure its validity and relevance to the learning process objectives. The presence of unframed interactive and not adopting clear standards in its construction and delivery will have a negative

impact on the learner, or at least will be an additional and unnecessary cost that will not improve the learner's understanding level of the educational material.

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