

# LEARNING OBJECTS FOR MOBILE LEARNING

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## ABSTRACT

Learning objects classification is outlined. Learning information objects and learning objects-tasks are reviewed. Different questions types are described. Recommendations for specific questions types usage in mobile learning systems are given.

## KEYWORDS

Learning objects, learning objects classification, questions types

## 1. INTRODUCTION

Nowadays a lot of attention is being paid to learning objects development. Many different repositories are being prepared. All the developers (usually, tutors, teaching material authors, etc.) try to work them out considering reusability feature. And as the mobile learning aspects become more and more popular it is worth to ensure the possibility to use these learning objects for such kind of teaching systems. The particularity of the tools that are used to support the learning process in this case (mobile phones, PDAs, tablet PCs) influence a choice of learning objects representation type.

## 2. LEARNING OBJECTS IN MOBILE LEARNING SYSTEMS

As to National Learning Infrastructure Initiative (NLII) learning object is “modular digital resources, uniquely identified and metatagged, that can be used to support learning” [3]. Actually, learning objects are small parts of a course that can be used and reused to improve teaching. Learning objects can be divided into two big groups: learning information objects and learning objects-tasks.

Learning information objects (LIO) can be classified as definition of a concept, rules of this concept using, example and explanation. All the LIO types can be an atom – small simple information portions, or combined from several atoms (<atom> | <atom> <atom> etc.). So, more formal

$$\text{LIO} = \langle \text{concept} \rangle | \langle \text{rule} \rangle | \langle \text{example} \rangle | \langle \text{explanation} \rangle \quad (1)$$

In case of mobile learning information, portions should be as simpler and smaller as possible because of constraints of a display (screen). Moreover the detailing of learning information depends also on students' knowledge and skills level and other characteristics from his/her model, which includes all the necessary information about the learner [1]. Examples and explanation detailing and showing itself also depends on the student model parameters. Some explanations as well as examples can be omitted or presenting more complicated situations for more experienced students with higher knowledge level.

For representing the information such possibilities as text, sound and graphic can be used. Also in some cases animation or small video clips may be included. The representation type depends on technical characteristics of a tool being used for learning.

As to learning objects-tasks, they consist of two parts: question and answer (Fig. 1). Question part consists of general element, which includes the question, and definite task (e.g. list of objects that should be processed). The definite task can be changeable for each student. Answer part includes the answer to the definite task and comments for each answer. Comments detailing depends on adaptivity and adaptability of a system. Adaptivity attribute ensures that comments will be shown according to student's overall knowledge and skills level. For more experienced students adaptability attribute can be attached. It means that student will be able to switch on or off comments and to define the detailing of them.

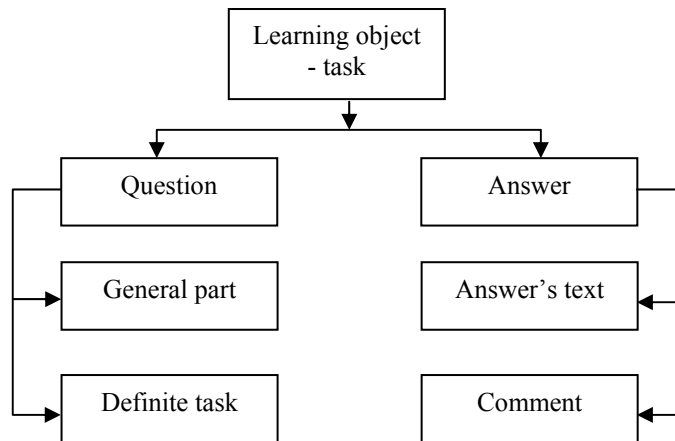


Figure. 1. Learning object-task structure

The question part of a learning object-task can be reviewed taking into account different types of exercises. There are known 14 types that are shown with according student activities in Table 1.

Table 1. Exercises types

Nr.	Type of exercise	Student activity
1	Menu	Choose one answer from many offered Choose several answers from many offered
2	Computation	Input integer or real number Input several numbers
3	Word	Input one or many words/letters (not consolidated in sentence)
4	Sentence	Input the whole sentence
5	Formula	Input formula
6	Accordance	Find/choose accordant answer to shown task
7	“Hot” points	Point a place on graphic, figure
8	Sequence	Input/choose activities/objects in right order
9	Hypertext	Choose a word, part from text
10	Sound	Input an answer after heard task
11	Modeling	Model object, system, world etc.
12	Memory exercise	Find appropriate pair (match) to a given object
13	Crossword	Guess crossword
14	Puzzle	Assemble picture, object etc.

Tasks should be laconic because of they should be seen on a screen while student answers it.

The type defining of learning object-task depends a lot on a tool that is being used for mobile learning: mobile phone, PDA or tablet PC. PDAs and tablet PCs are more advisable because of they have much more

advantages comparing with mobile phones [2]. But they are rather expensive in Latvia and therefore are not very popular and available.

Preparing learning objects (either learning information or knowledge control tasks) developer should take into account first of all used tools disadvantages [2]:

- small screens limit the amount and type of information that can be displayed;
- limited storage capacities, especially mobiles and PDAs;
- batteries require regular charging, and data can be lost on some devices if this is not done correctly;
- difficult to use moving graphics, especially with mobile phones;
- lack of common platform, so difficult to develop content that will work anywhere;
- lack of connectivity and interoperability;
- bandwidth may degrade with a larger number of users when using wireless networks.

Due to mentioned disadvantages of possible mobile learning tools there are constraints for several exercises types usage (Table 2: white – not usable, gray – manageable, grid – can be realized with restrictions).

Table 2. Exercise types usage possibilities

Nr.	Type of exercise	The tool		
		Mobile phone	PDA	Tablet PC
1a	Menu (one from many)	gray	gray	gray
1b	Menu (many from many)	grid	gray	gray
2	Computation	gray	gray	gray
3	Word	gray	gray	gray
4	Sentence	grid	gray	gray
5	Formula	gray	gray	gray
6	Accordance	white	gray	gray
7	“Hot” points	white	gray	gray
8	Sequence	white	gray	gray
9	Hypertext	white	gray	gray
10	Sound	gray	gray	gray
11	Modeling	white	gray	gray
12	Memory exercise	grid	gray	gray
13	Crossword	grid	grid	gray
14	Puzzle	grid	grid	gray

As to mobile phones there could be more constraints because of everything depends on a model of it, depends on possible lines number that could be shown on a display. If tutor decided to use “Menu” type “many from many” case than this “many” should be limited to 4 or may be even less. So “many from many” case of Menu is very inconvenience. The same refers to Sentence (it should be very short, but then it loses the sense of using this type) and especially “Memory exercise” (it is difficult to place many images on a screen of a mobile phone, keeping them understandable and meaningful). There are some phone models that can provide more possibilities to realize shown exercises’ types. For example, some of them allow to ensure crosswords and puzzle, but only those of bigger size could be useful for such tasks. And in this case another factor is important – what for the phone was bought. Not very many students want to use big phones, nowadays as smaller phone as better (psychological factor).

PDAs expand the possibilities of using additional exercises types. They allow to include in knowledge control and training Accordance, “Hot” points, Hypertext, etc. Not only owing to larger screen, but also considering such an advantage as stylus pen that makes a process much easier. Nevertheless PDAs are not suitable for such types as Crossword and Puzzle because of the screen size constraints. Tablet PCs can

support all the types realization. But PDAs and tablet PC are not available for everyone (e.g., in Latvia) because of their expensiveness. Therefore the most objective is mobile phones using.

Other disadvantages (lack of connectivity and interoperability, limited storage capacity, bandwidth degrading, etc.) also force to develop more simple learning object-tasks. But then one of the pedagogical principles – variety of tasks and exercises types – is not fully considered, because of the restriction of manageable types number. Nevertheless there are several types that can be realized for every tool, which is used for mobile learning organization – menu, computation, word, etc. (Table 2). So, developing mobile learning courses, these exercises should be included in a knowledge control to define students' knowledge and skills level as more completed as possible.

### **3. CONCLUSIONS**

A tool that is used for mobile learning determines learning object type and size. Depending on it's advantages and especially disadvantages learning information objects and learning objects-tasks should be developed. The smallest tool – mobile phone – has many constraints according to its screen size and other possibilities, what is the main reason why tasks should be as short as possible and only some of the exercises types can be realized in this case. PDA widens number of manageable tasks, but also can't support all of them. All the tasks can be implemented for tablet PCs. While preparing mobile learning courses, developers may use that exercises types, which can be used everywhere.

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