

# LEARNING PROGRAM ON “SOFTWARE PROCESS MODELS”

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## **Abstract.**

The paper studies some e-learning program development aspects. The main components (tutoring information quanta as well as questions and tasks frames) of such programs are shown. Dialogue scenario problem is outlined. The developed at Riga Technical University learning program on “Software process models” is described in details.

**Key words:** learning programs, dialogue scenario

## **1. INTRODUCTION**

Nowadays there are worked out many different computer-aided educational systems. To increase effectiveness of learning process various instruments are used, for example, such as presentations, reports, tasks for practical works etc. [5]. There are available miscellaneous tools as well as being developed new ones (e.g., Reabler in Riga Technical University, RTU, for estimating reliability of software using different models), and also testing and learning programs. A testing program is included in RTU teaching process. It allows students to control their knowledge on several Software Engineering topics: software life cycle, software design, testing etc in local network. More effective applications are made for Internet that gives a possibility for students to obtain knowledge and skills independently. Such an approach can be used in different forms of education – distance learning, life long learning and so on.

## **2. LEARNING PROGRAM “SOFTWARE PROCESS MODELS”**

There was developed an adaptive learning program on “Software process models” in Riga Technical University. It includes a set of educational information quanta and questions and tasks for obtaining knowledge and skills. The learning program is implemented for students of Bachelor sc. engineering in Computer Science and Information Technology.

The program includes description of 6 models: the waterfall model; exploratory programming; prototyping; the incremental model; formal transformation; system assembly from reusable components. Learning process begins from the waterfall model, other models can be studied in an order that a student will choose by himself. Such an approach provides an adaptation to a student needs.

The learning program “Software process models” consists of 70 frames: educational information – 14 and question and tasks – 56 (including 13 final control questions). For ensuring an adaptation to a student quanta of tutoring materials are described with different detailing level as well as there are developed examples. So, the developed program includes such known quanta types as [3]:

- main quantum that describes term’s meaning;
- example(-s) for illustrating the term using possibilities. Moreover example quantum can be developed in two levels that depend on detailing of given information – just an example

for students with higher knowledge and skills level and examples with particular description of each term for others;

- explanation that includes detailed description of the term.

There are used different possibilities for information representation, such as text, graphics, tables as well as multimedia presentations (made in MS PowerPoint) are created.

As well for learning program an author/tutor should prepare questions and tasks that will help student to obtain definite material and control his/her knowledge and skills level. For question frames there can be developed tasks of several types. Nowadays there are known 10 types that are described in [2]. “Software process models” course includes questions of 5 types: menu (61 %), word (5 %), sentence (5 %), accordance (16 %), sequence (13 %).

Including into learning program various types of questions and tasks conforms to pedagogical principle of variety and detailing level to adaptivity.

The developed learning program takes into account different frames parameters:

- tutoring information – knowledge level, skills level, topic significance, difficulty, average time for getting acquired a term;
- questions and tasks – knowledge level, skills level, significance, difficulty, average time for answering, allowed number of tries.

Using different types of tutoring materials quanta allows author to develop adaptive learning programs. According to a student model [1, 6] and taking into account definite parameters of the quanta and questions (such as complexity, significance, knowledge and skills level etc.) a dialogue scenario is being developed. Dialogue scenario can be represented by a graph, which vertexes are tutoring information quanta, questions and tasks, and edges show assumptive connections between them. Possible dialogue scenario is shown on Figure 1, where are such vertexes as:

**I<sub>m</sub>** – the main information quantum;

**I<sub>exm</sub>** – quantum-example;

**Q<sub>1</sub>** – question/tasks of average difficulty;

**Q<sub>2</sub>** – question/tasks that are analogical to Q<sub>1</sub>;

**Q<sub>3</sub>** – question/tasks of lower difficulty;

and edges meanings are as follows:

**C** – correct answer;

**I** – imprecise;

**W** – wrong;

**Exm** – example.

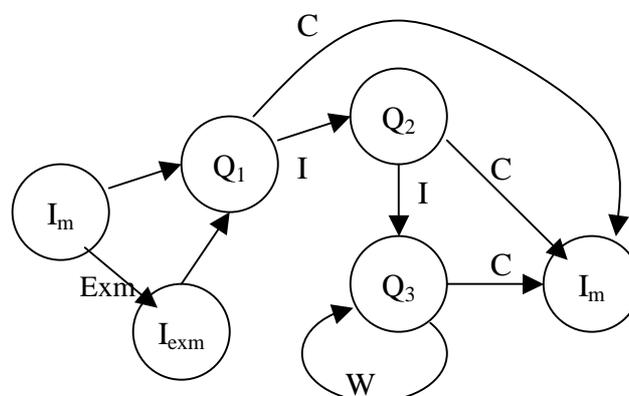


Fig.1. Possible dialogue scenario

So, for developing a learning program author can include two kinds of frames – information and question (accordingly, for tutoring materials quanta and for questions and tasks).

To represent information (either theoretical or questions/tasks) it is advisable to provide multimedia and hypermedia technologies possibilities using [4, 7]. According to a student model (especially such characteristic as representative system) a graphical, audio and video information presentation should be ensured. Multimedia and hypermedia can help to organize adaptive learning process as well to assure adaptability allowing a student to choose him/her appropriate information representation way.

Practical exploitation of developed course is planned from September for various student groups: Bachelor programmes (two different groups – Computer Science and Information Technology) and for college students. These educational programmes varies in knowledge and skills levels therefore such frame (information quanta and question/task) parameters as difficulty and complexity levels are considered as well as significance of obtainable information (term, concept) for each group of students is taken into account too. These aspects observation provides adaptive learning organization. Adaptability is organized by allowing students to change several educational information quanta as well as question frames characteristics (e.g., students will be able to try to fulfil more difficult tasks or get more detailed tutoring information).

### 3. CONCLUSIONS

The developed at Riga Technical University learning program on “Software process models” is a part of subject “Software Engineering”. It will help students to obtain knowledge and skills in software engineering process organization. The program “Software process models” satisfies adaptivity requirements by providing different technologies using (Curriculum sequencing, Adaptive presentation, Example-based problem solving etc.) as well as adaptability demands by allowing students to change some parameters of frames and to choose an order of them. Due to question frames are kept apart form educational information, they are reusable, ie., can be used exclusively for knowledge control.

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