REALIZATION OF TEACHING METHODS
BASED ON INTERACTIVE MECHANISM FOR
THE IMPLEMENTATION OF PROJECT
WORK

Prof. Dr. Oleksandr Pushkar
Kharkiv National University of Economics,
Chief of Computer Science and Technology Dept.
Ukraine
aipvt@ukr.net

Nataliia Prybytkova
Kharkiv National University of Economics,
Teacher of Computer Science and Technology
Dept.
Ukraine
pribytkova@gmail.com

Introduction

The purpose of experts preparation
process of a direction «Technology of electronic
multimedia editions» is formation of a highly
skilled analyst who has modern theoretical
knowledge and practical skills in creation and
distribution of multimedia services. His forma-
tion provides harmonious development of abili-
ties to scientific, pedagogical and design activ-
ity. So, there is a necessity in formation of
above-stated competences in the course of
training on the basis of creation of such training
project which would include a scientific, peda-
agogical and design component.

Previous Experiences and
Publications

The basic questions devoted to the or-
ganization and structuring of training process
elements are given in works of many authors,
among which are G. A. Ball (the theory of edu-
cational problems) [1], L. F. Spirin (the theory
and technology of pedagogical problems) [2],
M. I. Mahmutov (development of problem train-
ing technology) [3] and others. At the same time
the researches on development and application
of interactive mechanisms in MTC for realiza-
tion of didactic methods haven’t found proper
coverage in the scientific literature.

Concepts

Research objective is to reveal existing
mechanisms for realization of didactic methods
in MTC, to make the structural analysis of the
training project as system, to classify basic in-
teractive mechanisms, to develop general rec-
ommendations about their application in MTC.

According to authors the effective ap-
proach to resolve such problem is creation by
students of multimedia training complexes
(MTC) which allow providing high level of pres-
etation of teaching material, activization of
educational activity of pupils, increase of educa-
tion motivation. In this connection there was a
necessity of formalization and systematization
of knowledge used for creation of such com-
plexes. One of directions of this process is
creation of universal base of mechanisms for
realization of the pedagogical problems which
use would allow creating effective, methodically
supplied MTC and to reduce essentially the
time for their development.

Hypothesis. All multitude of training pro-
jects collected for formation of MTC can be di-
vided into tasks presented by elementary learn-
ing situations which performance result can be
directed on competences support formed in
MTC (fig.1).

Each didactic method as the constituent
of a learning component is realized in MTC
through the certain interactive mechanisms
connected with performance of fixed set of di-
dactic operations. Having carried out the anal-
ysis of learning components it is possible to cre-
ate base of mechanisms which will be used fur-
ther for development of MTC. For each didactic
method certain set of didactic operations and
interactive mechanisms can be worked out and
then the creation of a learning component will
be carried out by formation of a set of such op-
erations and mechanisms for the set multitude
of didactic methods.
As a result of realization of learning situations within the limits of the training project implementation by students of the course «Technology of electronic multimedia editions» the threefold competence is gained which consists of pedagogical (created interactive mechanisms should provide certain didactic operation of MTC), scientific (training project adapts under certain architecture) and design (designing of a multimedia product) component.

Training project is realized on the basis of problem formulation, initial data for which are received as a result of learning situations of MTC analysis.

Scientific Bases for Creation of the Training project

For formation of abilities which will be necessary for solving by experts of a direction «Publishing and printing industry» of practical problems on MTC creation of any complexity, performance of educational problems which can be realized in practice in the form of training projects is necessary.

As the training project we will understand a multitude of learning situations connected among themselves which performance result leads to achievement of the design purpose and is directed on professional competences formation.
Each training project is developed with the account of realization features of a design method – educational technology directed on acquisition by students of professional competences [4]. According to authors of given article the use of design method is the universal approach for MTC creation.

For the realization of such approach it is necessary to consider functions, architecture properties, features and performance stages of training project.

The training project implements a number of functions:
- didactic – the project acts as a students’ tutorial;
- student creativity support – the project is the heuristic mechanism as students choose a design trajectory by themselves (a set and sequence of learning situations) for its performance;
- competence – students get professional competences on creation of multimedia projects.

Training projects with difficult structure will be considered as the system possessing following properties:

1. Synergy – an optimum coordination of all stages of the training project for educational purposes achievement.

2. Emergency – the result of performance of the training project has the new didactic and technological qualities rather than each separate stage of the given project.

3. Multiplicativity – efficiency of performance of the training project is a consequence of results multiplication of learning situations successful realization.

4. Purposefulness – the didactic project is directed on achievement of the certain educational purposes and competences formation.

5. Alternativeness of functioning ways and development – the heuristic approach to the learning task formation which resulted that the training project can have alternative realization ways.

6. Integrity – realization of learning situations totality leads to professional competences formation impossible at realization of each learning situation separately.

7. Structural properties – realization of the training project passes stage by stage, the result of performance of each previous stage (realization of an learning situation) is entrance data for the following one.

8. Hierarchy – the training project is a component of educational process and includes a set of learning situations, therefore simultaneously is both system and a subsystem.

9. Communicativeness – the training project should meet the requirements of academic subject, which constituent it is, and also its results can be used in following projects within the limits of the given discipline or in other disciplines.

10. Interaction and interdependence of system and environment – each training project is directed on resolving only a quantity of problems which are put before a training course. Content of the training project is dictated by the purposes, problems and formed competences of training course.

11. Adaptability – creation of the training project occurs according to the universal technology which input parameters are formed according to requirements to a training course.

System approach allows generating the universal architecture of the training project specification. Actions of the student on realization of such project will consist in maintenance of requirements to properties of the training project and its architecture with use of the creative approach.

**Features of the training project** consist in the following:

- the training project represents integral work as the result of which the end-product received in the course of new competences acquisition is estimated;
- the training project is difficult multi-stage work which assumes performance of multi-aspect tasks but at the same time united by the common idea;
- an obligatory component of the training project is practice presence;
- as input data of the training project acts the primary information, as the result of its processing the student gets practice of construction of his own conclusions;

- the training project has game elements which helps to strengthen motivation of the student.

Each training project consists of following stages:

1. Preproject preparation. The given stage includes formation of an educational problem, purposes of the project and competences definition which will be generated as a result of project performance; definition of a design trajectory; formation of design group if necessary; references analysis on a project theme.

2. Designing. At the given stage intermediate and total elapsed time of results granting of the project are defined; the basic functions and properties of an end result are formulated; the design trajectory is specified; the choice of multimedia technologies for project realization is carried out.

3. Organizational and research stage. The given stage assumes consecutive realization of all learning situations of the project.

4. Results representations. The given stage includes results publication process of the training project in MTC; check of a correctness of didactic operations realization of learning task of MTC by means of design result; revealing of merits and demerits of the received result and also the process of the project performance; a performance of the duties estimation by working group of the project.

The basic components of the training project on MTC creation are: the educational purposes, forming competences, methodical supply, a set of learning situations, learning task, technical supply, software.

Within the limits of the given research the concept «the learning situation» has dual character: on the one hand the learning situation is considered in the frameworks of the training project and on the other hand it is created by means of MTC for resolving of educational problems. Authors of article divide these two concepts according to the sense as in the first case the student is in a learning situation, and in the second - he creates by himself.

Within the limits of given research MTC will be considered as system of learning components (LC) which structural elements are represented in the form of tuple:

\[ LC = \langle T, \{A\}, \{LS\}, \{DM\}, \{DO\}, \{IM\} \rangle, \]

where \( T \) – learning task, \( A \) – aims of task performance, \( LS \) – learning situation of MTC, \( DM \) – didactic method realization of which is provided with learning situation, \( DO \) – didactic operations, each of which is realized with the help of definite interactive mechanism (IM).

The set of MTC learning situations and didactic methods is formed according to the destination of MTC. Didactic method following the author of work [3] will be understood caused by a method concrete action of teacher or pupil which is characterized by completeness and conducts to achievement of the nearest educational purpose, to the decision of training private problem.

Realization of didactic method occurs by means of didactic operations. As didactic operation we will understand logic action which is directed on reception of private result within the limits of general didactic problem resolving. When all didactic operations are finished learning situation of MTC is considered to be realized.

Each didactic operation is realized by means of the certain interactive mechanism which most meets the requirements of MTC learning situation. Interactive mechanisms represent totality of means given to the user for change of MTC filling [5]. Interactivity of MTC is realized via many interactive mechanisms \( I=\{IM_1, IM_2, \ldots, IM_n\} \).

As the result of interactivity analysis were found base interactive mechanisms in MTC (Table 1).
Table 1. Base interactive mechanisms used in MTC.

<table>
<thead>
<tr>
<th>Name of IM</th>
<th>Definition of IM</th>
</tr>
</thead>
<tbody>
<tr>
<td>«Keyboard entry»</td>
<td>Keyboard input of didactic task resolution</td>
</tr>
<tr>
<td>«Hot keys»</td>
<td>Keys or keys combinations for fast access to the MTC functions</td>
</tr>
<tr>
<td>«Click»</td>
<td>Click to chose the decision</td>
</tr>
<tr>
<td>«Click and confirmation»</td>
<td>Totality of clicks on right answer and on bottom of result choice confirmation</td>
</tr>
<tr>
<td>«Drag transfer»</td>
<td>Drag transfer of object by mouse to the definite segment of working area</td>
</tr>
<tr>
<td>«Drag transfer and confirmation»</td>
<td>Totality of drag transfers of object by mouse to the definite segment of graphical interface and click on bottom of result choice confirmation</td>
</tr>
<tr>
<td>«Input and confirmation»</td>
<td>Keyboard input totality of didactic task solutions and bottom of result choice confirmation pressing</td>
</tr>
<tr>
<td>«Event-trigger sound (sound response)»</td>
<td>Event-trigger sound on made action</td>
</tr>
<tr>
<td>«Accompanying sound»</td>
<td>Sound accompaniment of made action</td>
</tr>
<tr>
<td>«Graphical supply»</td>
<td>Graphical supply of made action</td>
</tr>
<tr>
<td>«Movable response»</td>
<td>Video and animation accompaniment as the result of made action</td>
</tr>
<tr>
<td>«Movable accompaniment»</td>
<td>Video or animation accompaniment of task</td>
</tr>
<tr>
<td>«Moving direction»</td>
<td>Definition of object moving direction with the help of cursors on the keyboard</td>
</tr>
</tbody>
</table>

Also authors have allocated the most widespread didactic methods used in MTC and have put in their conformity didactic mechanisms (Table 2).

Table 2. Didactic methods used in MTC and corresponding to them interactive mechanisms.

<table>
<thead>
<tr>
<th>Didactic method</th>
<th>Interactive mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the principle of visibility</td>
<td>Graphical supply; Movable response</td>
</tr>
<tr>
<td>Repetition of action</td>
<td>Click; Graphical supply</td>
</tr>
<tr>
<td>Imitation</td>
<td>Click and confirmation; Drag transfer and confirmation; Graphical supply; Moving direction</td>
</tr>
<tr>
<td>The prevention of an incorrect choice</td>
<td>Sound response; Accompanying sound; Movable response</td>
</tr>
<tr>
<td>Comparison</td>
<td>Click; Click and confirmation; Drag transfer; Drag transfer and confirmation; Graphical supply; Moving direction</td>
</tr>
<tr>
<td>Giving to the training project of a kind of a real practical situation</td>
<td>Drag transfer; Drag transfer and confirmation; Graphical supply; Movable response; Movable accompaniment</td>
</tr>
<tr>
<td>Association of objects from different</td>
<td>Drag transfer; Drag transfer and confirmation; Graphical supply</td>
</tr>
</tbody>
</table>
Didactic methods presented in Table 2 can be used both in separate discipline and for intersubject communications that provides universality of interactive mechanisms application.

It should be noted that the majority of interactive mechanisms are directed on influence of visual, audio and kinesthetic representative systems of human. So the use of metaphors can be one of organization ways of the interactivity in MTC that allows generating concept about new object through an establishment of similarity with already known and thus influences an increase in efficiency of didactic methods realization and also helps to avoid an information overload of the pupil which can appear during MTC development.

**Results of our Work**

As an example of practical realization of the offered approach authors have chosen training projects on creation of illustrations for the multimedia edition.

The project purpose is creation of animated illustrations for realization of the interactive mechanism «movable response» of MTC. As a result of performance of the given project students get the competence on designing and creation of animated illustrations and also on use of such illustrations as interactive mechanism of MTC.

The result of the training project should possess a set of properties (didactic and technical) and to implement a set of functions. Didactic properties of animated illustration can concern such as informativity, ergonomics, clearness [6], structural properties, diagnostics, problematical character; and technical – interactivity, dynamism, extensionality, chromaticity, reality, sketchiness, decorative effect). The basic functions of the given animated illustration will be: supply of perception completeness of the information and transfer of considered object emotional component.

In Table 3 there is design trajectory of the training project executed by students of Kharkiv National University of Economics within the limits of discipline «Multimedia publishing house» which includes a set of learning situations and intermediate results.
### Table 3.

Realization of project trajectory learning situations.

<table>
<thead>
<tr>
<th>Learning situation</th>
<th>Result of learning situation implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forming concepts for future illustration, definition of its qualities and functions.</td>
<td>Creation of animated illustration concept.</td>
</tr>
<tr>
<td>Sketches and storyboards of future project (fig.2).</td>
<td>Drawn by hand drafts and scene storyboards.</td>
</tr>
<tr>
<td>Development of separate illustration elements (creation of characters and decorative elements) (fig.3).</td>
<td>Separate characters and decorative elements, made in style of modeling and plasticine.</td>
</tr>
<tr>
<td>Transformation of illustration fragments in digital form.</td>
<td>Digital images of characters and decorative elements.</td>
</tr>
<tr>
<td>Installation of separate illustration elements and their animation (fig.4).</td>
<td>Digital storyboards of animated illustration made in Adobe After Effect.</td>
</tr>
<tr>
<td>Illustration publication in MTC.</td>
<td>Video of animated illustration.</td>
</tr>
</tbody>
</table>

**Fig. 2. Fragment of training project scene selection**

**Fig. 3. Development by students of animated illustration characters (modeling with plasticine)**
As a result of design trajectory realization multimedia illustration has been published in MTC as the interactive mechanism «movable response» for learning situation of MTC realization presented in Table 4. To provide learning situation of MTC with support of all necessary interactive mechanisms students should execute training projects on their creation. Thus, as a result of performance of some training projects the base of interactive mechanisms of MTC will be created.

Table 4.

Example of training project in MTC result realization.

<table>
<thead>
<tr>
<th>Task</th>
<th>Learning situation</th>
<th>Didactic operation</th>
<th>Didactic method (DM)</th>
<th>Interactive mechanism realizing DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image stylization.</td>
<td>1. From the given figures create as much as possible different stylized images</td>
<td>Creation of stylized images with the help of geometric figures.</td>
<td>- using the principle of visibility;</td>
<td>- graphical supply;</td>
</tr>
<tr>
<td></td>
<td>2. To chose one image for stylization.</td>
<td></td>
<td>- comparison;</td>
<td>- click; drag transfer;</td>
</tr>
<tr>
<td></td>
<td>3. To form stylized image of first level.</td>
<td></td>
<td>- search and acceptance of decisions;</td>
<td>graphical supply;</td>
</tr>
<tr>
<td></td>
<td>4. To form stylized image of second level.</td>
<td></td>
<td>- repetition of action;</td>
<td>- click; graphical supply;</td>
</tr>
<tr>
<td></td>
<td>5. To estimate received resulted.</td>
<td></td>
<td>- motivation.</td>
<td>- sound response; accompanying</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>sound; graphic supply;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>movable response.</td>
</tr>
</tbody>
</table>
From the table it is clear that the result of training project performance carries out support of such didactic method as motivation.

**Conclusion**

Approbation of the approach offered by authors for the organization of training projects has allowed proving in practice existing hypothesis and providing formation of elements of scientific, pedagogical and design competences of students of «Technology of electronic multimedia editions» preparation direction.

During research the structure of training project representation has been generated, the structure of learning situation of MTC is defined, law of its components interaction is revealed, some base concepts of investigated area are specified, and interactive mechanisms of didactic receptions realization are classified.

Results of research allow developing further the principles of MTC designing on special disciplines and generating concepts of MTC construction for special didactics applied in a statement of technical disciplines for students of engineering specialities.

**References**


At creation and use of interactive mechanisms it is necessary to consider perspective developments in the sphere of information technologies and multimedia that will allow forming new qualities of MTC and using increasingly the didactic methods based on communications between subjects, developing communicative abilities of the student. It is necessary to note the prospect of development of such interactive mechanism as input of the vocal information for acknowledgement of actions of the user.

Formed structure of the training project and structure of learning situation of MTC representation on the one hand will allow formalizing process of creation of multimedia training programs, and on the other hand - creating the tool of abilities formation for practical activities. Formalization and structurization of knowledge used for creation MTC allow passing to creation of multimedia training environments (such as «multimedia class», «multimedia university»).