Organization of the student’s self-study to build competences at the workplace

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Introduction

- New market conditions:
  - requirement from job applicant’s specific workplace competencies;
  - amount of information which is necessary to master increases dramatically each year;
  - critical limitation of the classroom hours;
- Building approach to transferring mastering of practical skills and competences at the workplace to the student’s self-study (TMCWP to SSS)
The competencies cannot be fully formed as a result of classroom work, but only through student’s self-study due to the growth of information in modern society and multidirectional learning in engineering degrees.
FUNDAMENTAL 1 (continue)

- Independent work in the classes (lectures, seminars, laboratory work);
- Independent work under the supervision of the teacher in the form of scheduled consultations, tests and examinations;
- Extracurricular independent work when the student overworks teaching assignments and complete creative tasks.
TMCWP to SSS: FUNDAMENTAL 2

Each of the competencies could be presented as a fixed set of components, which determine the method of the student’s self-work organization.
FUNDAMENTAL 2 (continue)

- Knowledge, "What?", "how", "why" is going on;
- Knowledge of "What should be?", "How to do";
- Ability to do so;
- Motivation, "Why";
- Information image of the result: an object, a decision the state of other actors;
- Knowledge of the application of the result, tools;
- Ability to discuss issues related to competence;
- Ability to assess the results of competence.
In the pedagogical design of the SSS it is necessary to solve some problems for managing working place competencies which mastering in the frame of each discipline:

- To define a competence profile
- To measure competence components it is necessary
- To select methods of separate aspects of the competence development with using of heuristic procedure of a choice the type of tools for the given competence within the frame of the discipline
TMCWP to SSS: FUNDAMENTAL 3

Process of the working place competencies formation could be presented as a multi-dimensional process and formalized in the matrix which includes

- Level;
- Stages;
- Components of competencies formation;
- Type of the student’s self-work.
# Competencies formation

## Matrix "Level of the competencies development - stage of competencies formation"

<table>
<thead>
<tr>
<th>Level</th>
<th>Stages of formation</th>
<th>Knowledge</th>
<th>Understanding</th>
<th>Application</th>
<th>Analysis</th>
<th>Synthesis</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Reproductive</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Creative</td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>

## Matrix - "Type of student's self-work - components of competence"

<table>
<thead>
<tr>
<th>Preparing for classes</th>
<th>Execution</th>
<th>Internships</th>
<th>Professional training</th>
<th>Preparations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>Labs</td>
<td>Practice</td>
<td>Individual assignments</td>
<td>Corse work</td>
</tr>
<tr>
<td>Knowledge positive</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge normative</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to do</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Motivation</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Information image of the result</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Knowledge of the application</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Ability to discuss issues</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Ability to assess the results</td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>
We assume following type of *self-work*:

- **in classes**;
- **out of the classes** under the supervision of the teacher;
- **extracurricular** work.
Professional competencies formation

Lecture №1. Methodological fundamentals of higher education engineering pedagogy

- Competencies (isolating an object and subject of scientific discipline, formulation of its goal, choice of a method, strategy, and paradigm of educational work: formulation of educational and professional competencies)
- Schedule of class (lecture form - introductory, time - 2 periods.
- Knowledge control requirements (list of control questions)

Preparation for the lecture (MTС)
- Main questions of the lecture
- Origins of pedagogy.
- Subject and object of the course.
- System of pedagogic sciences.
- System of pedagogic knowledge.
- Pedagogic methods.
- Structure of pedagogic processes.
- Strategy.
- Directions of development of higher education.
- Tasks of higher education. Students (bachelor, master).
- Strategy of change of content in higher education. Teacher

Lecture №1. Methodological fundamentals of higher education engineering pedagogy

- Knowledge about methodological principles, high school pedagogy, fundamental strategies and paradigms of higher education, competence approaches in education, conceptual apparatus of engineering pedagogy of high school.
- Multimedia projector, screen, laptop. Software for demonstration of presentations.
- Control assessment

Independent work. №1. Education as a sphere of social practice and subject of theory. Scientific approaches in engineering pedagogy (extracurricular and work)

- Necessity in advanced theoretical material and additional knowledge for practical work.
- Student
- Teacher consultations and methodic ensuring

Seminar №1. Methodological fundamentals of engineering pedagogy of a high school

- Competencies (analysis of scientific sources and formation of report structure, report of scientific research on the subject, definition of component parts of process of higher education, substantiation of choice of innovative events in educational process of high school)
- Seminar №2. Educational process in institution of higher education.

- Competencies of a profile of future specialist engineer on the basis of competence approach and definition of scientific approach to the teaching of engineering discipline.

Skills of analysis of literature sources by a given theme; getting verbal arguments and ability to compose a scientific discussion; component parts of higher education, overall characteristics of educational process in institution of higher education and innovative events in educational process in the high school.

2 academic hours 6 academic hours 2 academic hours

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Each level of the competences’ development determined by the achievement of educational objectives according to Bloom's taxonomy. (knowledge, comprehension, application, analysis, synthesis, evaluation)
TMCWP to SSS: FUNDAMENTAL 6

Levels of complicity

Creative level
- Micro project and creative tasks
- Year work (project)
- Scientific work (engineers tasks)
- ISRT

Reproductive level
- Laboratory works
- Practical works
- Seminars
- Testing
- Portfolio

Cognitive level
- Presentation section
- Analytical section
- Illustrative section
- Referential section

Levels of information detailization

Technological user’s tools

Working notebook

Musical-relaxation block

Software
The competencies approach realization mechanisms

1. The principle of the MTC content constructing: "Through the development and intensification of cognitive competencies to the formation of professional competencies"

2. Support reproductive and creative activity of student’s

3. Assignments are the products of training competencies

4. Portfolio of the discipline (in general and by topics)

5. Portfolio of the student on completed assignments


7. Formation of the competence motivational component:
   - Why to know it? - It's interesting to me
   - How? - I can and know how to do it
   - Where is it used? - I want to be successful
Some other skills which need to developed

- representing principles while studying topic or subject
- making forecast of the changing of the certain phenomenon, event, areas
- professional writing
- combining knowledge from different subject areas
- topic discussing on the professional language
- holding debates, summarizing separate elements of knowledge, topics, courses, the spheres of knowledge
## Didactic tools realized in EMC

<table>
<thead>
<tr>
<th>Preparations for the course studying.</th>
<th>List of references, through which students might look before course studying. It provides students with some ideas about knowledge sources to make them able consulting before the program start.</th>
<th>Students read information sources before the course studying.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanation of benefits that student might and should get out of studying of the particular instructive module.</td>
<td>Bookmark which allows understanding the benefits studying of the particular instructive module must accompanies each topic.</td>
<td>Formation of the motivational aim at studying of the instructive module.</td>
</tr>
<tr>
<td></td>
<td>Each instructive module must be provided with guidelines on what student should try to get out of each information source relevant to this topic.</td>
<td>Organization of the efficient work with topic materials</td>
</tr>
<tr>
<td></td>
<td>Bookmark with list of questions that might help student to make reading of the instructive module purposeful and search-oriented.</td>
<td></td>
</tr>
<tr>
<td>Assistance to student to get ready for level of course requirements.</td>
<td>Goal examples, studying results, assessment criterions, past exam questions.</td>
<td>Student preparedness for scheduled study results.</td>
</tr>
<tr>
<td>Formation of the feedback mechanism for those students who work with the package of preliminary course studying.</td>
<td>The package which contains information, references, set of tasks and practical training with answers for them.</td>
<td>Identified initial level assurance of course studying for the student group.</td>
</tr>
<tr>
<td>Review and prior experimentation.</td>
<td>Checklist of the preliminary course studying packages that contains required key concepts and statements from completed courses, notion and statements of the following course</td>
<td>Involve student into process of review and new ideas comprehending.</td>
</tr>
<tr>
<td>Teaching methods’ recommendations</td>
<td>Student-friendly guidance that directs how to begin course studying and possible difficulties which may arise.</td>
<td>Effective start of the course studying process that creates optimistic wave.</td>
</tr>
<tr>
<td>Formation of the course studying motivational mechanisms.</td>
<td>Positive comments on the topic and teaching techniques from past students.</td>
<td>Creation of the positive aim at topic studying.</td>
</tr>
</tbody>
</table>
Learning individualization carried out by using of mechanisms

- multimedia complex tuning regarding intelligence type of the student (by Howard Gardner);
- training speed differentiation;
- choosing task’s level of complexity;
- choosing tools of knowledge adjusting and skills development
Multimedia systems for SSS is based on the set of principles

- Self-study priority
- Communication and learning in a group
- Positive life experiences, practical knowledge and skills as a source of new knowledge formalization
- Individual approach to learning
- Electivity of learning realization
- Reflexivity
- Relevance of learning to the practical activities
- System in the education
- Mainstreaming learning outcomes
- Learner development.
TMCWP to SSS practical realization
Conclusion

Thus, the presented approach to the organization of independent work of students on the basis of the author's concept and with the principles of the adult education has been realized in the form of multimedia training systems specialty, which allows students to learn occupational competencies needed in the workplace.
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