DISTANCE LEARNING IN TEACHER'S TRAINING

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Abstract: Pre-service training of physics teachers is simultaneous in physics and the second instrumental subject, pedagogy, psychology, didactics of physics and the second subject and school practice in the Czech Republic. There is lack of teachers of physics at secondary lower classes in Czech Republic now. We try to solve this situation with distance learning of teacher with another specialisation. Is this form of education properly for teachers of physics? What are advantages and disadvantages of this form of learning? Positive and negative sides will be discussed in contribution.

1 Introduction

Pre-service training of physics teachers is simultaneous in physics and the second instrumental subject, pedagogy, psychology, theory of education of physics and the second subject, foreign language, and school practice at universities in the Czech Republic. Preparation of teachers differs for lower secondary classes for the pupils from the age of 11 to 15 and higher secondary classes for the pupils from the age of 15 to 19. The first preparation takes 4 years, the second 5 years.

2 Content of physics teacher training

Physics teacher student have to adopt social skills and to mature in actual personality of teacher.

What can influence teacher student? There are many influences:

- *Persons* – university teachers, classmates, school practice teachers, university staff
- *Environment* – university environment, good atmosphere in lessons, supporting environment, school practice environment
- *Methods and forms of work* – discussion in groups during problem solving, laboratory work
- *Subject matte*r of physics, pedagogy, psychology, computer science
- *Activities in lectures* – students:
  - listen to the lectures – different types of *nonverbal and verbal communications* of lecturers
  - students see different *ways of presentation* of subject matter of physics
  - see the lecture with *real physics experiments as an integral part of teaching physics*
  - listen *innovation* in all parts of education
  - are drawn to attention to possible errors of *understanding, misconceptions*
  - can interact with lecturers immediately
- *Activities in seminars* – students:
  - *listen to reports* of different students
    - intelligible, unintelligible, dull – why?
    - structured an non-structured
    - interesting and non-interesting – why?
    - intelligible, unintelligible, dull
  - *discuss in groups* of students face to face – argumentations, results

All these activities and social skills of persons that student are contact with can serve as models for physics teacher student. These models can be acceptable or unacceptable to student; every student is special type of personality.
Diploma students master above mentioned competences by the way of present study at university and now using ICT by the way of distant study, too. Stress has to be given on decisive competences of teacher and prepare distance education with regards of these competences.
Physics teacher student have to

- *master in physics*
- *adopt social skills of teacher*
- *apply pedagogy creative way*
- *mature to actual personality of physics teacher*

Physics teacher student will play the role of real teacher all over the life, may be. The first models that student accepts or not comes from him or her experience when he or she was pupil at secondary school. Without face to face education at university cannot accept new models by the way of imitation models given at secondary school.
Experiences from the school practice are:

- the first step of teaching
  - imitation of his or her teachers
- the second step of teaching
  - theoretically based teaching of physics

3 Demands on teaching/learning process in present and distant education in teacher training

The main demand on courses for physics teacher students is to provide good understanding of course subject matter to the individual learner. The second demand that lays on this course is to support the whole personality of individual student. These demands concern the present and the distant form of physics teacher preparation.

We will follow how we can develop individual student as concern creativity, multiple intelligences, using constructivism, collaborative, co-operative learning and inquiry-based learning.

3.1 Creative education

Creative education is the complex theoretical and experiential pieces of knowledge in the area of aims, methods and implements which direct to developing creativity to formalization creative personality in education.

Methodology is based on psychological and pedagogical effective system of methods, forms and strategy of work for teacher that ensure development of creativity.

There are two levels conception of creative education. Narrow sense of creative education makes up system of adequate conditions and doctrinal substance for evolution of creativity of individual person. Broader sense of creative education arises from processes of humanization and democratization of school.

Creativity is peculiar to all mental healthy individuals.

Basic principles of creativity are: Creativity is characteristics of process, creativity is developed by activities, it isn't useful expect immediate social profitability from creative

activities of individual but has great meaning for many-sided development of personality, the first forms of development creativity is change exercise non-creative type to creative and convergent type of exercise to divergent one, creativity must arise from learning aims, subject matter and run to interaction with complex the others learning activities of individual.

Methods of developing creativity go from change of convergent exercises, situations and processes to divergent ones. There are four groups of basic methods for developing creativity.

a) Methods in field of complex development cognitive functions that are finished at the top by creative thinking,
b) Training methods that are connected with creative thinking processes: training of creative perception, developing of ingeniousness by training against rigidity of thinking, perceptions and attitudes, developing of fantasy, developing quantity, variety and originality of thinking,
c) Complex methods on base heuristic procedure,
d) Methods which are related to personality character that support creativity, motivates creativity and makes it possible: cognitivisation (teaching plan creativity for individual in process of solution problems), axiologisation (right value orientation of individual), socialisation and certification.

Creativisation is process whereby subject, social relations and conditions are become creative.

3.2 Multiple intelligences

"Intelligence is the ability to solve problems or to create products that are valued within one or more cultural settings" claimed Howard Gardner in *Frames of mind* (1983). All human beings have multiple intelligences. These multiple intelligences can be nurtured and strengthened or ignored and weakened. Each individual has nine intelligences. When these intelligences will look at in eLearning programmes the understanding and learning process of individual is deeper.

These intelligences of individual are nine as follows from theory of multiple intelligences:

1) *Verbal-Linguistic Intelligence* can be supported by activities or tools that incorporate recording or playing elements of audio and text multimedia (online encyclopaedias/reference books) as well as collaborative elements such as web-conferencing, e-mail, chat-room, multi-user domain, etc. that allow discussion and discourse.
2) *Mathematical-Logical Intelligence* can be supported online by the inclusion of interactive activities that promote critical thinking e.g. puzzles online calculation tools, web quests, online graphing software etc. with interactive elements such as assessment scripts that give feedback on progress.
3) *Musical Intelligence* can be facilitated online by the inclusion of activities that allow the learner to create record, play or decompose audio, music and video combination.
4) *Visual-Spatial Intelligence* can be facilitated online through the inclusion of drawing tools or presentation tools where learner actively creates maps or charts, web development tools, timeline makers or simply browsing the net etc.
5) *Bodily-Kinaesthetic Intelligence* can be supported online through using or creating electronic fieldtrips in which the learner engages in interactive activities.
6) *Interpersonal Intelligence* can be supported online by the inclusion of group activities and group discussion, by the inclusion of chat-rooms, discussion forum, e-mail, web-based conferencing, peer-tutoring etc.
7) *Intra-personal Intelligence* can be supported by the inclusion of self-paced activities or self-reflection activities (concept maps) or hypermedia.

8) *Naturalist Intelligence* can be supported inclusion of recognizing and categorizing plants, animals and other objects in nature.
9) Solving deep questions about human existence such as the meaning of life, why do we die, and how we did get here can support *Existential Intelligence*.

We can test dominant types of intelligences of individual. Dominant types of intelligences can be developed or non-dominant types of intelligences too – it depends on conditions that are advisable. Syllabus for distance education can be prepared so that individual can easy follow and facilitate his learning process. We engage various intelligences in distance education so that learner and tutor trigger and develop individual path of learning.

3.3 Constructivism

Constructivism has multiple meanings. In philosophy it is an *epistemological theory*, in cognitive psychology it *describes human learning*, and in curriculum it is a *set of design principles*. *Constructivism is overarching theory that can incorporate a number of teaching practices such as co-operative, collaborative and inquiry-based learning.*

Constructivism is basically a theory based on observation and scientific study about *how people learn*. It says that *people construct their own understanding and knowledge of the world through experiencing things and reflecting on those experiences.* When we encounter something new we have to reconcile it with our previous ideas and experience, may be discarding the new information as irrelevant. *We are active creators of our own knowledge.* To do this we must ask questions, explore, and assess what we know. These are possible in good prepared syllabus for distance education of physics teacher.

It means to use active technique supported by ICT (experiments, experiments in remote laboratory, modelling of experiments, real-world problem solving) to create more knowledge and then to reflect on and talk about what they are doing and how their understanding is changing.

Good method for information about our syllabus is testing. We test the entering understanding and the outgoing understanding and measure the access of knowledge. Now eLearning programme can offer different paths for individual after measuring entering knowledge – eLearning program has more different branches for different individuals.

3.4 Collaborative and co-operative Learning

Collaborative learning is a method of teaching and learning in which learners' team together explore a significant question or create a meaningful project. A group of learners discussing a lecture or learners are working together over internet on shared assignment are both examples of collaborative learning.

Co-operative learning is a specific kind of collaborative learning. Learners work together in small groups on a structured activity. They are individually accountable for their work and the work of the group as a whole is also assessed. Co-operative groups work face to face and learn to work as a team. Now it is possible to justify co-operative learning by ICT supported learning in distance education, too.

In small groups learners can share strengths and also develop their weaker skills. They develop their interpersonal skills. They learn to deal with conflict. When *co-operative groups are guided by clear objectives*, learners engage in numerous activities that improve their understanding of subject explored.

3.5 Inquiry-based learning

Inquiry implies involvement that leads to understanding. Involvement in learning implies possessing skills and attitudes that permit you to seek resolutions to questions and issues while you construct new knowledge.

"Inquiry" is defined as "seeking for truth or knowledge – seeking information by questioning". Individuals carry on the process of inquiry from the time they are born until they die. This is true even though they might not reflect upon the process. Infants begin to make sense of the world by inquiring. From birth babies observe faces that come near, they grasp objects, they put things in their mouths, and they turn toward voices.
The process of inquiring begins with gathering information and data through applying the human senses – seeing, hearing, touching, tasting, and smelling.
There is a question: Can individual use her or his senses – for example seeing - in the appropriate manner? I think that no. Try to demonstrate simple experiment and ask to describe what they saw. Repeat this experiment and ask individual to describe it again. You receive different answer. Individual have to learn the intentional observation. I think that distance education supported by ICT gives very good opportunity.

4 Conclusions

The explosion of distance learning is connected with eLearning. Elearning reflects the evolution to a more knowledge-base society in which organisational learning has become a continual process rather than a distinct event. Pedagogical paradigm is changing. "Tailored" education is possible to individual by means of distance eLearning. The roles of teachers are changing and the roles of students, too.
Proper approaches to creation of distance learning courses from the view of pedagogy and psychology are based on creativity, multiple intelligences, constructivism, collaborative and co-operative learning, inquiry-based learning.
New approaches of pedagogical and psychological theory have to be taken into account in developing distance learning programme for physics teacher students. Individually fitted education is the most important everywhere.
Physics teacher student will play the role of real teacher all over the life. The first models that student accepts or not comes from him or her experience when he or she was pupil at secondary school and university student. Models of education - face to face education and distance education have to be based on up to date theory using ICT.

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