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Using of active educational strategies and methods - the way to improve the quality of science education

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Abstract
There are various problems in most countries with the quality of science education. One of the reasons on this situation is that the secondary school and university teachers sometimes do not manage properly the system of modern teaching methods to get the good level of student's knowledge and skills. In this work the modern system of active teaching and learning methods is analyzed. This system consists of different parts: educational methods, active strategies for the problem solving, pedagogical tools for modern evaluation and assessments, the computer educational software and Internet, modern textbook and another parts. The proper use of this system by teacher allows them to get necessary level of student's knowledge and abilities.
Key words: *active methods, science education, quality*

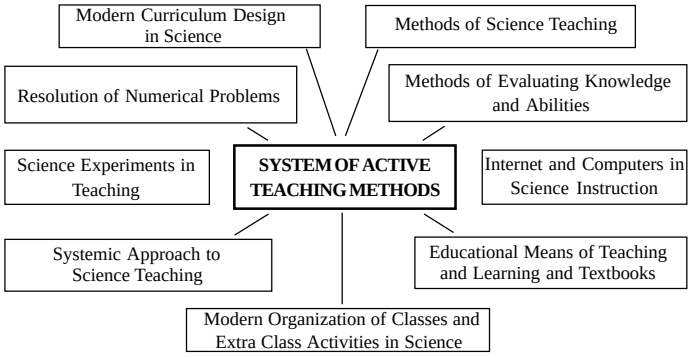
INTRODUCTION

It's known that the teaching of natural sciences is a very important aspect of education in the secondary and university levels of any country. Physics, Chemistry, Biology, Mathematics occupy the predominant place among natural sciences because they represent the base for the present and future development of industry as well as other parts of society. For this reason, the quality of knowledge and abilities in science of the students in the secondary school and university is very important, not only for their own success but also because it has a direct impact on the solution of environmental, industrial, cultural, and other key problems of modern life.

METHODOLOGY AND RESULTS

The educational practice shows that natural sciences are difficult for students and one of several reasons for this situation is that the teacher must use a range of appropriate teaching methods from the different national and international educational approaches in the classroom to achieve effective learning and he/she does not always have the necessary methodological bases to use these methods. Another problem of science instruction is that the teacher must teach students how to use modern learning methods in their systematic individual and group work to reach the required level of knowledge, abilities and skills (ORLIK, 2005).

To fulfill the modern requirements in pre-service and in-service science teacher preparation for the secondary school and university the following system of modern active teaching and learning methods is recommended (ORLIK, 2002):



The system is developed on the base of rather long author's professional work as a teacher of science and chemistry in different educational systems in Europe and some American countries (ORLIK, 2002).

The main objective of this system is to provide science teachers of the secondary school or university with the necessary summary of modern strategies and methods of teaching and learning. They can explore and adapt then to their students. We know that the principles and general methods of this subject are the same for the high school and the university. For example, for both levels we use explanations, the resolution of problems, laboratory and class experiments, the blackboard, computers and other methods and means. Clearly the science methodology has essential differences in the two levels of instruction and in the depth of courses, but not in main educational goals and objectives. Also, the basis for the general methods is the same.

The most essential parts and subsystems of this system are:

1. Modern Curriculum Design in Science

In many educational centers, teachers design their own science curriculum, so knowledge of the basic principles of this design and the corresponding examples can be very helpful in improving their teaching. For instance a very important problem for science teaching is analyzed: the place of the traditional curriculum and traditional methods in teaching and learning.

2. Methods of science Teaching

The most successful of the traditional and modern teaching methods must be used: active methods of teaching, asking questions, discussions method, investigative, heuristic and problemic methods, modeling and analogies, active methods of learning, principles of the motivation of the students and homework in teaching and learning.

3. Resolution of Numerical Problems

There are the different parts of the numerical problems solving methodology: typology of numerical problems in Physics, Chemistry and Mathematics: mathematical knowledge to solve problems, general resolution methods of problems, use of the different kind of calculations in solving, use of algorithms, visual algorithms and heuristic methods in the solution of problems.

4. Methods of evaluating knowledge and abilities

The contents of this subsystem is: the objectives and needs of the assessment and evaluation of knowledge and abilities, traditional methods of control, evaluations tests, evaluation of high level skills, the portfolio, open book exams and exams at home, short exams, use of the computers for evaluation and self-evaluation, qualitative methods and the integral strategies and so on.

5. Science Experiments in Teaching

The are different part of this subsystem: safety in the Physics, Chemistry and Biology teaching, methods of doing the science experiment in the classes, types of the experiment (demonstrative, student experiments in the teaching, minilaboratories, etc.), different types of traditional and modern

forms of laboratory organizations, computers in science laboratories, amusing and mental experiment, and so on.

6. Internet and Computers in science Instruction

This is the modern and attractive part of the system: use of the calculators (including programming calculators) in teaching, different types of educational software for teaching (software for laboratories, for solving problems, for evaluation and self-evaluation, animations and simulations, educational games, and so on), different ways and modes of Internet use in the teaching, basic principles of educational software creation, problems of the development of mixed methods without and with computer, problems in teaching educational informatics for teachers and students are analyzed.

7. Systemic Approach to Science Teaching

There is the general ways of using the systemic approach and structuring of the teaching material: visual methods and models of knowledge, schematic structuring of teaching information, different types of schemes in science teaching (program schemes, schemes of educational content, schemes - algorithms), design of the schematic visual materials by teachers and students, methodology of the use of the schematic visual materials.

8. Educational means of teaching and learning and textbooks

The subsystem of different educational means of teaching (audiovisuals, transparences, slides, films and videotapes, natural objects, collections, chemical substances, models, glass apparatus) and methodology of their elaboration is very important. Modern textbooks and different means based on printed materials with some examples, and composition of systems of different educational means of teaching are analyzed.

9. Construction of knowledge and history of chemistry in teaching

In this part the constructivist approach, the influence of the previous knowledge and matters of Chemistry history in the teaching are analyzed.

10. Modern organization of classes and extra class activities in Science

The organization of different forms of classes is in this subsystem: (collective work, conferences, workshops and seminars, extra classes, virtual classes, excursions, courses of special interest), educational games, active methods of art, literature, poetry and music, amusing material and humor in the classes, physical, chemical and biological theatre performances, schools and societies of the science youths and the investigations of the students, science Olympiads in their different levels.

CONCLUSIONS

The system of modern and active teaching and learning methods is based on the experience of different educational centers in different regions and various educational approaches. Using of this system can be useful for the difficult but vitally important work of improving knowledge and abilities of students in science subjects in different countries.

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The Gender Issue in the Teachers' Professional Development

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Abstract

This paper present some of the persistent gender issues that cause inequities in teachers' professional development and keep women away from heading up to the different levels of educational administration, although the majority of teaching personnel. The interest focuses on the under-representation of female teachers in leadership positions and the discussion argues on the barriers witch stall female advancement and exclude women from the main "leadership pipeline". The basic rationale is that women's role is crucial in order to face the new demands of school in a dramatically changing society carrying out a different style of leadership.

INTRODUCTION

In order to understand the recent changes in the professional status of teachers in Europe it is essential to consider the contribution of women to teaching and teacher education noting the proportion of women has always been high.

Education has traditionally been a "feminine" job/profession (similar to mother role, caring role, etc.) in Europe and western world. However the percentage of women pursuing and holding positions of leadership is extremely low and also declines at higher level of education.

The school demands have dramatically changed following the changes in society of late modernism. As a result the demand of the teaching profession has changed equally. New roles and skills/competences are required by the teachers, in all levels; they have not initially been trained for and new models of training should be fulfilled too. The teachers' professional development is a long and demanding process that requires individual and institutional involvement.

There is a variety of issues to be considered under the perspectives of the new challenges in education. Some of them are not new ones, such as gender equity and inclusion but others such as integration of ICTs in education and multiculturalism have relatively recently emerged.

This paper argues some of the persistent gender issues that cause inequities in teachers' professional development. The interest focuses on the under-representation of the female teachers in leadership positions (head teachers/ school principals/ supervisors/ counselors/ super intenders/ administrators/ policy-makers and decision makers) and the discussion argues on the barriers/ obstacles (external and internal) which stall female advancement in educational administration since it is assumed to have multiple effects on different levels.

"WOMEN TEACH – MEN MANAGE"?

It is disconcerting to think, throughout the years, issues of gender equity have virtually been ignored and therefore ultimately remain unresolved. The widespread rhetoric approaching the issues of gender equity within the arena of education administration masks a number of underlying assumptions that serve to maintain the status quo. For example, it is generally taken for granted that women make better teachers and men better managers, in other words, "women teach and men manage" (GOLD, 1996).

These assumptions or commonly held beliefs, are so embedded and nested, they generally remain unquestioned and unchallenged, resulting in taken- for- granted and unconscious behaviour patterns that become verified as "universal truths". In these assumptions inheres a world perception according to which the gender and equity issues are no longer considered to be a problem. It is assumed that organizational manifestation of equality, equity, fairness and honesty are the norm and that citizens are protected by the enactment of legislation, policies and mandates. This world perception/ view has made the issues of gender equity invisible (HYLES, 1992) and does not accurately portray the reality of women faced with impediments to success in the field of education administration.

The following table and figures (1 - 2) of quantitative data present the proportion (percentage) of women and men holding leadership positions in Primary and secondary education in Greece and demonstrates the