INFO-2002
Primljeno / Received: 2010-04-14

UDK : 37: 681.3:001
Stručni rad / Professional Paper

IMPLEMENTATION THE CYCLE OF SUBSTANCES IN SCIENCE EDUCATION BY PROJECT TEACHING

IMPLEMENTACIJA CIKLUSA MATERIJE U ZNASTVENO OBRAZOVANJE PUTEM PROJEKTNOG UČENJA

Jozef Macko, Dana Blahútová
Faculty of Pedagogy, Catholic University, Ružomberok, Slovakia
Učiteljski fakultet, Katoličko sveučilište, Ružomberok, Slovačka

Abstract
Several attempts to establish the new teaching methods using school experiment as a tool developing pupil's personality are known from history of science education. The goal of the reform of education system in Slovakia is to transform the traditional encyclopedic teaching for the creative and value education, which emphasis is on activity and personal freedom, the power to create its progressive, creative way of being to live in the new millennium. This could be reached by gradually introducing of the innovative elements of project teaching to the science education what should finally lead to the pupil's visions of the nature as a whole. It is important that the student is able to orient himself in the topic, to gather information, process it and sort and be well on its own original solutions and design. Our article refers to the possibility of using the project teaching in topic "the cycle of substances in nature".

Sažetak
Iz povijesti znanosti obrazovanja poznato je nekoliko pokušaja izrade novih nastavnih metoda pomoću školskih eksperimenata kao alata u razvoju učenikove osobnosti. Cilj reforme obrazovnog sustava u Slovačkoj je transformirati tradicionalnu enciklopedijsku nastavu u smjeru kreativnog i vrijednog obrazovanja, koje naglasak stavlja na aktivnost i osobne slobode. To bi se moglo postići postupnim uvođenjem inovativnih elemenata projektne nastave za znanost obrazovanja, što bi konačno trebalo dovesti do toga da učenika doživljava prirodu kao cjelinu. Važno je da se učenik može orijentirati na temu, prikupiti podatke, obraditi ih i sortirati i dati vlastita originalna rješenja i dizajn. Naš rad se odnosi na mogućnost korištenja projektne nastave na temu "ciklus tvari u prirodi".

Introduction

The mission of today's modern school system is to provide learners a form of teaching, enabling them to gain professional knowledge, skills and attitudes needed for practice and everyday life. Education and training has to support the natural desire for knowledge, learn how to learn, evaluate the presented information, further live their own lives, and find new ways to know themselves as unique individuals who are responsible for their actions and behavior towards their health, people and nature /**1**/. Formation of personality is a lifelong process. There is participating science nature education, which has undergone many changes in recent years. The main discussion at the beginning of the 20th century was how to manage and implement the idea of unification of scientific knowledge within the existing educational programs. Actual situation with unpopularity of science, particularly physics and chemistry is trying to solve the didaktics science. A possible solution is to gradually apply the appropriate integration of teaching subjects which largely emphasized the unified nature of reality under investigation in order to create in students the idea of nature as a whole /**2**/. If we use in this process everyday experiences of students, which can help make available the basic themes of science attractive forms in the educational process, it is more likely that education will become attractive. In this process of education is the teacher monitoring and communicating the true spirit of ethical and

moral principles of new scientific knowledge about science education, and pay particular attention to teaching students with exposure to the mind and the educational and psychological aspect /**3**/, /**4**/.

Educational - learning process as a project teaching

To implement creative and innovative approaches it is important, that teachers know better content, methods and objectives of teaching and became convinced obout the correctness and the need of use of proactive forms and methods of teaching, such as the use of project teaching with for example help of experiment, which is a fundamental cognitive, self-didactic method /**5**/. Project teaching is now devoted relatively great attention. Whether because of the students become individualist and can not work in a team or because of it is necessary to enrich traditional teaching by new non traditional methods, where the focus of work is shifted from teacher to pupil. Integrating of project teaching brings many benefits. This method leads students to tackle more complex the problem, either based on practical needs, or at least closely connected with the practice /**6**/. This teaching gives pupils, unlike many other activities, to benefit from higher-stage intellectual skills such as creativity, lateral thinking, evaluation, analysis and synthesis. Similarly, students could practice self-ability, learning ability, problem-solving skills and other general capabilities /**7**/. The project teaching is aimed at teaching pupil's work product, which may be visual, oral or written, for example the table, graph, illustration, video, map, diagram, drawing, painting, dance, computer program, advertisment, statue, picture puzzle, respectively contribution to the discussion, song text, lecture, or pupil‘s newspapers, diaries, letters, reportage in newspapers, magazine, guides, etc. It integrates the various teaching and learning methods such as programming, open, active remembering curriculum, authentic learning, cognitive demandingness of learning, compatible constructivism, synthetic model, regulatory mechanisms, learning difficulty, self-educated teaching with great emphasis on planning cognitive activities of students, on the structure their individual tasks and system operations, complemented by regulatory and self-regulatory mechanisms by using different forms of learning /**8**/.

Principles of project based learning:

- students have to have an influence on selection and specification of the project theme;
- the project should also contribute to out-school experiences of students. It should be a bridge between school and life;
- the involvement of students, their interest and internal motivation;
- facilitate an interdisciplinary approach, a comprehensive look at the real world;
- use cooperative learning;
- in adopting the relevant knowledge, skills, attitudes /**9**/.

Work on the project is similar to the scientific process. We can divide it into 4 stages:

1. Project initiative, the intention
- choice of project theme, its specification
- framework project task assignment
- setting out the main objectives
- determine the extent of solution
- literature studies
- discussion of the issues

The teacher has major role in this stage, who motivates students and gradually acquires them for the given problem.

2. project planning
- specification entered topics
- setting project goals
- treatment plan and assigned project deadlines
- collection of information available on the subject
- in group projects to ensure cooperation in the group

The initiative gradually take students, the teacher provides some specifying of the assignment and acts as an advisor and consultant.

3. project realization
- actual solution of designed tasks, design alternatives, selection of the optimal solution
- processing of documents and documentation

There is individual work of students, exchange of ideas, correction of their activities. The teacher acts as a consultant.

4. project evaluation
- publicity and advocacy of solutions
- analysis of solutions
- practical use

The teacher organizes the final phase to solve the tasks of all the other students to get the most new knowledge /**10**/.

Implementation of the water cycle to school project

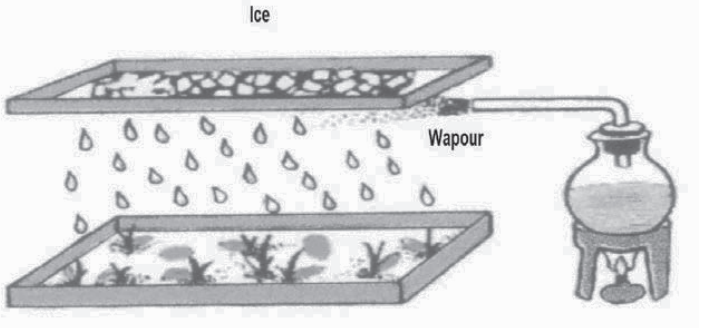
Water is the most widely used substance on the Earth. It is an essential component of the biosphere and has, except the soil, paramount importance to

ensure the nutrition of mankind. It is an essential component of biomass, the main means of transport of nutrients for their recruitment and deposition. For plant is a significant total ammount for the year, but the occurrence and distribution in the growing season due to their growth phase. For many animals, the water is directly their life environment. Each species is adapted to a particular composition of the water. For human has water many functions. It is used for personal use and consumption, for agricultural and industrial production, recreation. It is therefore an appropriate topic for science education by project teaching for all ages in the educational process. Students in primary and then also secondary schools acquire some knowledge about water from different disciplines (biology, chemistry, geography, physics), and are actively involved in solving a specific problem tasks, which are given by teachers according to the choice of topics such as: water and life , water and health, man and water, water in nature, healthy water, water around us, water as God's gift, water in the home and others. It is important to developed tasks and projects to be presented by various methods and forms of ICT in their teaching and learning activities using multimedia and computer technology in the learning process. Table 1 provides examples of an integrated approach in the implementation of practical work in the 8th and 9th class of elementary school.

Realization	Chemistry 8th cl El-Sch	Chemistry 8th cl El-Sch	Natural history 9th cl El-Sch	Natural history 8th cl El-Sch
Thematic unit	Acids, hydroxides, salts	Mixes	Fundamentals of Ecology	Getting to know the meaning and nature protection
Topic	Acidity and alkalinity of aqueous solutions, pH, neutralization	Water	Environmental Factors	The importance of nature conservation
Work	Physical characteristics of water	Chemical characteristics of water	Microbiological indicators of water	Biological analysis of water
Task	Determination of pH in water	Evidence of iron in water	Determination of intestinal enterokoks in water	Determination of abioseston in water

Tab. 1 Practical exercises with using the theme of water in the teaching of chemistry and natural science in elementary school from: Blahútová, Cejpek, Krúpová, 2009.

Individual experiments are selected to be directly applied in science teaching. Experiments are as easiest as possible to be implemented with the simplest tools. A good example for the project called Cycle of Substances in Nature is the execution of a water cycle experiment in laboratory conditions.
Following procedure was chosen for realizing the experiment. On the table lay the box with the seedling (Fig. 2). At a height of about 35 to 40 cm above the box, place a metal tray (gripping the handle rack) and put on it fragmented pieces of ice. Place the pot with water over the candle to steam between seedling and tray. The pot is a source of water like Earth. The water evaporates and rises up to the cold tray, which is like the upper layer of air above the ground, water vapor is cooled and condensed here and driping back to the plants like rain /**11**/.



Obr. 1: Simulation of the water cycle as a result of the project Cycle of Water *from:* Tolgyessy, Tomeček 1999

Conclusion

Although the project teaching has undergone relatively long-term development, it hasn't asserted in Slovakia to this time. Many teachers are more inclined to principles of traditional school /12/. In a traditional school we meet particularly receptive learning and extreme accumulation of knowledge, which is considered undesirable in project teaching. It is known, that supporters of traditional schools hinder project teaching because of the difficulty of preparation, which is related to financial and material costs, because many teachers resign and lose interest, especially when they lack the basic retraining as taught in the projects. In addition, teachers argue that the project requires a lot of teaching time, and it is then not possible to obtain all the official targets. The great importance in promoting of the project teaching has national project Infovek, through which more and more teachers begin to use project teaching /13/.

The article was created with according to project 2/0068/10.

References

/1/ Goga, M. 2001. Vzdelávanie a výchova – perspektívy a problémy. In: Zborník referátov Pedagogická profesia v kontexte aktuálnych spoločenských zmien (riziká, problémy, perspektívy). Prešov: PU v Prešove,.s. 323-326 ISBN 80-8068-037-X.

/2/ Baráth O., Feszterová M.,. 2006. K integračným snahám prírodovedného vzdelávania. In: Badania w dydaktyce przedmiotów przyrodniczych. Kraków: Akademii Pedagogicznej im. Komisji Edukacji Narodowej w Krakowie ISBN 83-85886-12- 5.

/3/ Stollárová, N., 2007. Interpretacja nowych biologicznych pojec w procesie wychowania i ksztalcenia. In. Profilaktika resocjalizacja rewalidacja pomoca rodzinie. Sandomierz – Stalowa Wola: KU J.PAWŁA II. w Lublinie, Filia Stałowa Wola s. 164-168 , ISBN 978-83-7300-795-6.

/4/ Uhrinová M., 2007. Príčiny školských neúspechov žiakov mladšieho školského veku zapríčinené osobnostnými a sociálnymi činiteľmi. Ružomberok: PF KU, s. 98, ISBN 798-80-8084-199-7.

/5/ PETLÁK, E. 1997. Všeobecná didaktika. Bratislava: IRIS, 270 s., ISBN 80-88778-49-2.

/6/ TÓTHOVA, A. 2006. Možnosti projektového vyučovania v predmete chémia na gymnáziu. In: Zborník z medzinárodnej konferencie Súčasnosť a perspektívny didaktiky chémie. Banská Bystrica: FPV, Univerzita M. Bela, 236 s. ISBN 80-8083-286-2.

/7/ PETTY, G. 2004. Moderní vyučování. Praha: Portál s.r.o., 2004. 308 s. ISBN 80-7178-978-X.

/8/ ČIPERA, J. a kol. 2005. Projektové vyučování – ICT-ON-LINE výuka v chemickém vzdělávání. In: Zborník PF Trnavskej Univerzity, Séria D-Vedy O Výchove A Vzdelávaní, 2005. Supplementum 1 – aktuálne vývojové trendy vo vyučovaní prírodných vied. Trnava: PF TU,. 386 s. ISBN 80-8082-049-X.

/9/ TUREK, I. 2008. Didaktika. Bratislava: Iura Edition. 595 s. ISBN 978- 8078-198-9.

/10/ PETRÁŠOVÁ, E. 2007. Projektové vyučovanie. Prešov: Metodicko-pedagogické centrum 84 s. ISBN 987-80-8045-463-0.

/11/ TŐLGYESSY, J; TOMEČEK, O. 1999. Environmentalistika pre šikovné ruky(1). Enviropňmagazín 1/99, SAŽP, Banská Bystrica s. 15 – 16.

/12/ ZENTKO, J 2009. Metody nauczania wybierane przez uczniów In: Nowe kierunki w badaniach i naukach o edukacji : materiały z Międzynarodowej Konferencji Naukowej / red. Sławomir Mazur. - Kraków : UKiP J&D Gębka.s. 169-179. ISBN 978-83-60837-41-2

/13/ Ibidem /10/

Literature

1. BLAHÚTOVÁ, D.,CEJPEK, K., KRÚPOVÁ, I., 2009. Voda a zdravie, ako integračná téma prírodovedného Vzdelávania na základných školách In : Zborník z medzinárodnej konferencie SÚČASNOSŤ A PERSPEKTÍVY DIDAKTIKY CHÉMIE II Donovaly 27.-29.05 2009. Banská Bystrica,. s. 121-124. ISBN 978-80-8083-751-8.
2. Plenković, Juraj; Krstulovich, Dinka. The Internet for the education // Technology and Education in Socio-Cultural Perspective / Furmanek, Waldemar ; Kraszewski, Krzysztof ; Walat, Wolciech (ur.). Rzeszow : University of Rzeszow, 2003. Str. 140-145.
3. Plenković, Mario; Hadžić, Slobodan; Plenković, Juraj. Istota czasu wolnego // Wartosci w pedagogice / Waldemar Furmanek (ur.). Rzeszow : Zaklad Dydaktyki i Techniki i Informatyki Uniwersytetu Rzeszowskiego, 2008. Str. 58-70.
4. Plenković, Mario; Hadžić, Slobodan; Plenković, Juraj. Society, science and technology // Technika - Informatyka Edukacja / Furmanek, Waldemar (ur.). Rzeszow : University of Rzeszow, 2008. Str. 29-37.