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THE USE OF SIMPLE EXPERIMENTS IN TEACHING PHYSICS TO THE CHILDREN WITH SPECIAL NEEDS

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ABSTRACT: This paper deals with inclusive teaching to the children with problems in intellectual development and sand-blind children. In the Republic of Serbia children with special needs are included in regular classrooms in the Primary schools and that is called inclusive teaching. Inclusive teaching strategies are of great importance in order to help children with special needs to attend classes with the children of the same age. Their difficulties in the learning process require special developed curriculum custom to them. In teaching physics the use of simple experiments could be of great help. While conducting simple "Hands-on" experiments, children become active participants in teaching process and also it helps their socialization with their classmates. It is very important to choose adequate simple experiments so child can be included in its conduction, despite of his or her problem. It is necessary to create a friendly atmosphere in the classroom. When sand-blinded child is included in conducting simple experiments, his or her classmates must sometimes describe phenomena and compensate their friend's inability of observation. Usually classmates will not be able to help their friend with problems in intellectual development to understand how experiment should be conducted. In this case, the teacher will have to provide additional assistance in conducting the experiment and also in the process of drawing conclusions. Teacher must be careful in creating groups for conducting experiments, so regular students will accept their classmates with special needs. In this paper, a suggestion of some adequate simple experiments for teaching physics to the children with special needs is given. Experiments in the fields of motion, pressure, density, heat, electromagnetism and sound are proposed.

Key words: physics, simple experiments, special need children

INTRODUCTION

The process of inclusion is based on the assumption that every student has equal rights regardless of the capabilities and individual differences. The inclusion of children with special needs in regular classes of general education and vocational schools requires some adjustment of the educational system to their needs (Alper & Ryndak, 1992; Clark et al., 1995; Hunt et al., 1994). The education system should be directed to the individual abilities of children enabling the participation of children with special needs in everyday life in schools and local communities. To achieve this, the necessary changes are not only within the school system and its adaptation, but also in society. Inclusive education needs to ensure active participation and learning of children with special needs, as well as identifying, reducing or eliminating barriers to their participation and learning. Barriers to inclusive education can be: *psychosocial* that are a result of lack of information about people with disabilities

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and result in negative attitudes and intolerance, as well as ignoring and social rejection; *physical obstacles* such as a lack of adaptation of the entrance to the building, not adapted public transport for persons in wheelchairs, lack of audio signals and tactile paths, pavements with high side banks...; *institutional barriers* that illustrate the way in which social institutions contribute to isolation or exclusion of inclusive person from various forms of social life (Logan et al., 1997; Logan & Malone, 1998).

Education of children with disabilities and difficulties in development took place in special educational institutions. Defectologists dealt with education of children, their development and rehabilitation. In recent years, children with difficulties in development can attend a regular school, under the supervision of professional pedagogical and psychological services. Children with disabilities and developmental disabilities and persons with disabilities are given the possibility to access to equal education and training, enabling them to develop their abilities to the maximum. The basic question in the context of inclusive education is the way to organize the regular classes that should meet the educational needs and specificities of children with disabilities and other children in the class. Characteristic of inclusive schools is encouraging of each student to learn and progress according to his/her abilities (Hay, 1997). A new way of thinking during the formation of the inclusive school states how school should better organize classes, and teaching and learning processes. Educational activities should adapt to the needs and abilities of children with disabilities and other children. Teachers prepare for classes individually for each child with special needs with occasional consultation with the pedagogical - psychological services. It is necessary to work on creating the most favorable social and emotional climate in the classroom. For the realization of this teaching approach, it is necessary to organize individualized lessons and to enable a greater communication between students. In the ordinary education there is no systematic support and adaptation to the special educational needs of students, because of that their achievement is minimal, so many children repeat a grade or drop out. Teachers in classes with great number of students are not sufficiently prepared nor motivated to working with these groups of children. Most regular schools are largely unprepared for the education of children with disabilities and developmental difficulties because they are not prepared in regards to teaching staff, programs, technical and physical support (Wisniewski & Alper, 1994). Various studies suggest that teachers are not willing to work with students with special needs and conditions are unsatisfactory for the inclusion of these children in regular schools. The aim of this paper is to show the importance of the application of simple experiments in physics teaching in elementary schools, which allow students with special needs to acquire knowledge about physical phenomena and processes in a simple way. The experiments are appropriate for students with reduced intellectual ability, students with difficult orientation in space, visually impaired students and the students with any developmental disability.

APPLICATION OF SIMPLE EXPERIMENTS IN INCLUSIVE EDUCATION

Contemporary teaching in schools should be directed towards improving and rewarding thinking. It is imperative in education today to overcome the classical teaching of physics, which stimulates the "correct" answers, which are often a repetition of definitions and memorizing without understanding the term, by stimulating individual thinking and the use of experiential knowledge. Since the spontaneous organizing concepts acquired through experience does not use scientific methodology based on experimental verifications, the existing empirical knowledge of students is mainly different from scientific knowledge, and the answers that are based on it are often wrong. However, on the culture of thinking such responses should be encouraged, corrected, and even awarded and used as a basis for further intellectual development of students. The introduction of the basic concepts of natural science since the first grade of compulsory education refers to the importance of systematization of empirical knowledge of the students and the gradual development of concepts depending on the level of knowledge and level of development of the students. Simple experiments have an important role in the process of acquiring knowledge through thinking. They allow the student to check their own hypotheses about the studied phenomena, as well as the application of theoretical knowledge in practical situations and solve new problems. The student, alone or in group, can find in his conceptual model of phenomena detail which leads to disagreement with observation, as well as the way it should be adjusted to achieve agreement between assumptions and actual events.

Simple experiments are of particular importance when it comes to inclusive education. The teacher's role is to act as a mediator, carefully selecting experiments, to direct students with developmental disabilities and enable them to independently carry out experiment. In this way, in addition to understanding the physical phenomena, which is demonstrated by experiment, students' manual skills are developed; we promote self-reliance, individual thinking and stimulate the use of experiential knowledge to develop awareness of their own knowledge and skills (Maker et al., 1994; Sindelar et al., 1989).

The treatment of teaching themes

With students are treated different themes: motion, pressure, heat, electricity and magnetism... Simple experiments that are conducted are adapted to the specific needs of each student.

For treatment the theme "motion" is proposed an experiment available to sand-blind students, called "How to make a cup to slide faster?" The goal is to show the impact of the slope and the properties of the contacting surfaces of the body and the substrate on the speed of motion of the body. The material needed for conducting experiment is a thin board length 1 - 1,5 meters, clear plastic cup, hot and cold water and a few books. Students form an inclined plane by settings it on several books. They set a slope of the board to make cup slide down on an inclined plane. Then alternately immerse the upper end of the cup in the cold and into the warm water and noticed when cup more quickly slide down the board. In order to make cup to start sliding down the inclined plane it is necessary to place slope at adequate angle. Sand-blind students have the opportunity to change the slope of the board, feel if objects are moistened and to distinguish hot and cold water. With one hand they hold cup, and with other hand they are waiting to cup slides off. Independently conducting experiments the student can understand that speed of cup depends on angle of inclined plane, as well as friction, which reduces by immersing the upper end of the cup in cold or warm water. In working with sand-blind student a metal plate, that will make a sound effect when object slides down, should be placed, that allows the student to determine easier time of motion and it helps them to clarify the characteristics of motion.

For treatment the theme "pressure" are proposed experiments by which the dependence of the pressure on force or surface is observed. The material required for conducting experiments is graphite pen with a pointed tip, modeling clay and sand. If student press with fingers the pen from both ends in the same way or with the same force, finger which acts on the tip of pen will hurt students. Of equal amounts of modeling clay students make different body shapes (rectangular, cube, shape of the letter T ...) and posed them on a sandy substrate. Based on the touch sand-blind students perceive that objects with smaller surface leaves deeper traces, that is the pressure is greater if the surfaces of the body is smaller. This experiment requires students' manual activity, so it is recommended for students of reduced intellectual ability. In order to illustrate the effect of the atmospheric pressure can be conducted experiment "How a straw reserves the juice?" Material needed is a straw, and a glass of juice. Straw is placed in the juice and with mouth air is extracted until the juice is not lifted to half of straw. The upper end of the straw should be closed with finger so that air can not enter into it and straw is pulled out of the glass. Juice remains within the straw because the air pressure acting on all sides equally (acts as well on the bottom) does not allow the juice to leak. This experiment is recommended for working with students with intellectual disabilities and sand-blind students.

Experiment "Obedient bubble", on the basis of which it is possible to check the Archimedes' law, is suitable for treatment the theme "density". The required material is: balloon, salt, paper clips, larger pot and water. The balloon is filled with water so that in it there is no air, then should be tied the knot, balloon made heavy with paper clips and put in a pot of water. Since the gravity acting on the balloon is greater than the buoyancy force $\vec{Q} \rangle \vec{F}_p$, the balloon sinks. If we pours salt in the water, solution density is increasing and in the case $\vec{Q} = \vec{F}_p$, the balloon floats and for $\vec{Q} \langle \vec{F}_p$, balloon is floating on the surface. Students with intellectual disabilities visually tracked that with adding salt balloon is made to float. Thus, they concluded that adding salt increases the density of water, and because of that the balloon can float. Sand-blind student is independently conducted experiment, so he is adding salt with one hand and with the other hand he felt how the balloon started to float.

For treatment the theme "heat" in order to students understand the process of transferring heat, for example conduction, through different materials it suitable to conduct the following experiments. In the three containers is poured water of different temperatures, cold, medium and hot. If the left hand is placed in a cold, right into hot water, and then both in medium water, feeling in hands is different. With his left hand he feels that the medium water is warm, and with the right hand he feels that the medium water is cold. Students conclude that this happens because the heat is transferred from the warmer to the colder body. The process of heat conduction can be demonstrated by the use of sticks of different materials (wood, plastic, metal), rice, margarine and containers with hot water. At each stick with margarine is glued rice and sticks were placed in a heated water. After a while the rice falls of the sticks, because margarine melted. Students can easy see that the metal is the best conductor of heat.

Treatment of the theme "sound" requires the introduction of the basic concepts that characterize it: the occurrence and intensity of sound, pitch and timbre.... By the use of experiment "Produce the sound of chicken" can be shown that the sound occurs as a result of vibration of some items. For conducting experiment is required: a plastic cup, woolen string, paper clips, paper, nail scissors and water. A nail is used to pierce the bottom of the cup and pull through the woolen string, so that the one end of string is hooked up to paper clip which is located at the bottom of the cup, and the other end of string hangs freely. Paper should be fold and moisten with water and then holding a glass in one hand with the other hand sudden short multiple pulling up and down the paper on the string. Vibration of the string would be noiseless without the cup. Going through the cup vibrations propagated and amplified, causing the sound. The sound is generated by the flow of the air across the string. This experiment is a simple and interesting so that students have a greater desire to understand the way in which

sound is produced. Students with low intellectual abilities and sand-blind students can follow the performance of the experiment and understand it. In order to sand-blind student understand the creation of sound, must include the sense of touch and sense of hearing. The experiment was interesting to students because of its characteristic sound of chicken.

For conducting experiment which shows that the sound pitch depends on the length of the air column is required glass bottle and water. Of particular importance is to direct attention to students on essential elements by asking adequate questions. If the sound produced by gently blowing air over the side of the bottle (close to the opening of the bottle), then the sound is a consequence of the oscillation of the air column above the water. Adding water to the bottle, the height of the air column is reduced and the sound becomes higher. If the sound is produced by pounding metal spoon on the bottle wall, glass wall oscillation is transferred to water, which oscillating produces sound. Adding water to the bottle length of water column increases, and the sound becomes lower! If the experiment is performed with sand-blind students it is suitably to take two bottles with different amounts of water in them and sand-blind students can assess in which bottle is more water by shaking them. The experiment is a problem for students of weaker intellectual abilities because they can not determine the appropriate distance from the lip to the bottle to produce sound.

CONCLUSION

Inclusive education allows students with special needs the same education as other children have. This paper is an attempt to easier students with special needs to learn about the natural phenomena, from the aspect of physics and physical processes. Simple experiments, by which we can demonstrate the physical processes and phenomena, have a highly motivational character and contribute to the greater interest of students. If you adjust them to students with special needs, simple experiments become sometimes the only source of knowledge on the basis of which they can realize and understand content that is processed.

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