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SHOULD CHILDREN IN PRE-SCHOOL INSTITUTIONS LEARN ELEMENTARY MATHEMATICAL OPERATIONS OF ADDITION AND SUBTRACTION AND HOW THIS SHOULD BE DONE
(NEW TEACHING METHODS WITH ASPECT OF CROSSCULTURALITY)

Abstract: In the Republic of Macedonia the curriculum for mathematics in pre-school education does not comprise the introduction of elementary mathematical operations of addition and subtraction.

This paper will deal with the arguments for and against this. We will answer the question: Why is it easier for children to add than to subtract. The practical experiences of the new teaching methods that the authors applie in working with students will be presented. These teaching methods are from the field of pre-school mathematics and are in the function of improving the quality of mathematical knowledge of children at the age of 5 or 6.

Key words: addition, subtraction, child, pre-school institution, mathematics.

Modern way of life requires a more qualitative mathematical education in order to successfully introduce children to the world of computers. The foundation of computer science and application lies in mathematics and hence comes the need for proper and more qualitative mathematical education.

In the republic of Macedonia at the moment a great change in the educational system is taking place, a nine-year elementary schooling is being introduced. This will cause obligatory acceptance of 6 year old children into pre-schools and schools. However, this change also dictates changes in curricula for all educational areas which will be taught in the preparatory class.

One of greater changes in the curriculums for mathematics is the introduction of mathematical operations of addition and subtraction on an elementary level. This change could be partly considered "revolutionary" because of the following reasons:

1. The existing curricula for mathematics made by the Bureau for the development of education as well as the projects that are being realized in a number of pre-schools in Macedonia, e.g. "Step by step" and "Through reading and writing to critical thinking" not only do not treat the problem of introducing these elementary operations into older groups but they clearly prohibit it.
2. The introduction to arithmetic of natural numbers now finishes with the recognition of numbers from 1 to 10 or possibly counting, counting off or counting down.

3. A great part of textual problems the solving of which boils down to elementary mathematical operations of addition and subtraction were not taught, which in turn prevented the development of creativity of children's minds and their mathematical talent.

In the literature about teaching methods there are a number of arguments why this way of gradual presentation of mathematical contents without introducing operations with numbers was accepted. One of the reasons is the high level of abstraction which is needed during operations with numbers on an elementary level that is not necessary at the age of 5 or 6. This is partly acceptable but during discussions about some problems it is possible to introduce spontaneously and naturally the elementary operations of addition and subtraction. For example, how a child will pay for a bar of chocolate that costs 7 denars, how much change will be given to him/her if we know that there are coins of 1, 2 and 5 denars and the smallest banknote is 10 denars.

This and many similar problems that we encountered with in our work with students during their practice in pre-schools made us think about the use of new teaching methods in mathematical educational work.

An extra argument was our intention to make mathematics acceptable, fun and useful and to use a great deal of the children's creative potentials.

One of the methods that has been successfully used in the USA for years is the Aesthetic Realism Teaching Method which is based on the principles stated by Eli Siegel:
1. The purpose of education is to like the world through knowing it.
2. The central cause of the inability to learn is dislike of the world, a contempt for it. Contempt the "disposition in every person to think he will be for himself by making less of the outside world"
3. In the following principle is the means to oppose contempt, defeat it—and see the exciting, friendly meaning every subject in the curriculum has: "The world, art, and self explain each other: each is the aesthetic oneness of opposites."

This principle - used with documented success for over a quarter of a century -is the basis for teaching subjects from reading to algebra to history. It enables teachers to show how every fact has in it the aesthetic structure of the world and of themselves: the oneness of opposites. Young people see that a mathematical equation is NOT an enemy to keep out, but an exciting friend. And the result is: Students welcome the facts of reality into their minds, and learn!

One possible approach to learning addition and subtraction with the Aesthetic Realism Teaching Method

We will show through a lesson on subtraction, how children in our partner kindergarten "Vera CiriViri-Trena" in Shtip, learned this difficult subject with pleasure and simultaneously became more interested in having a good effect on each other. It was based on this scientific principle stated by Mr. Siegel: "The world, art, and self explain each other: each is the aesthetic oneness of opposites."

The students in the class come from different social backgrounds; some have already met religious and ethnic prejudice in their young lives. Some of their families are middle class, but others are poor. A big thing affecting children today, which they see and

feel first hand at the dinner table or while shopping with their mothers, is the brutal effect of the profit system. Many children see their parents working very long hours under tremendous pressure, having two or more jobs to pay the rent, buy food, and get proper health care. Some families live with relatives because the parents cannot afford to provide homes of their own for their children.

We noticed that some children who were in the same kindergarten class the previous year tend to be exclusive and they don't accept new children into their circle. Quite the contrary, they look down on them and behave snobbishly. There were also cases of children not fluent in Macedonian as they came from other ethnic groups which made them feel different so they would push and hit other children in order to compensate for this.

Usually, in kindergarten, children learn about addition and subtraction using friendly, colorful objects: unifix cubes, small plastic teddy bears, wooden cusinaire rods. We learned that in addition different things, sometimes numbers, are brought together to make something that is *more* than any of the others are separately--such as one teddy bear plus one teddy bear equals *two* teddy bears. The children liked this very much.

We have learned from Aesthetic Realism that *adding and subtracting are opposites and they are everywhere, including in ourselves.*

Because of the nature of the method, the lesson will be described as it was actually realized.

So we come to subtraction. Like many teachers, we have seen that this is a subject that children have a particularly hard time with; they often see addition as good and subtraction as bad. We wanted my students to see that both are present all the time and together make for something beautiful. We began by telling the class: "Today we are going to learn how to subtract for the same reason we learned how to add: to know the world." In subtracting, we take a part of something away say, one teddy bear from a number of teddy bears. We saw how when we add things together, the outcome is that something gets bigger; when we subtract things, the outcome is that something gets smaller.

We had a wonderful time looking to see if these opposites, addition and subtraction, are together in the world, and in things we had already studied: how a tree grows, the water cycle, etc. Using the method of conversation, to the question if a tree needed to add things to itself so it could grow big, the children gave some very interesting answers: a tree needs water, it adds sun...To the question if a tree subtracted things from itself, the answers were also interesting: trees subtract apples and give us food, the leaves fall off and give the dirt vitamins, the trees subtract seeds and help make new trees...So the children came to the conclusion that it was good for the world the way trees add and subtract.

Similarly, we spoke about how addition and subtraction worked together in making rain. The answer was that the steam drops of water added and made a cloud and they got too heavy and fell down as rain. Rain in turn helps the world: we can take a bath and get a drink of water, we can clean our plates and cups, rain helps flowers and trees grow. We were seeing this exciting fact: we *need* subtraction because it's good for the world for some things to be less, and other things to be more! So we saw again that good things happened from addition and subtraction.

This is *so* different from the way a child can feel he or she is adding to oneself by lessening, wrongly subtracting from the feelings of another child.

After this, the children were ready to see how *numbers* can be subtracted from each other. We think this as a tremendous victory since so often subtracting numbers is a source of fear and the reason has not been understood. Today, there are so many workshops on how to teach math, some of which we have attended, trying to have the subject seen as friendly to children.

Children can not want to subtract because it means doing *with exactitude* something they have wanted to do any way they pleased: make less. And also they are afraid of the thing in them that wants to lessen the world. The inner tumult about wanting to lessen things and the deep, good fear of doing so can make for great discomfort when they meet the subject of taking away, or subtraction, in a mathematical unit. We feel this understanding is so kind and respectful of what goes on inside a child.

During the lesson, we sat in a circle and we gave each child a basket filled with 10 unifix cubes. Using a clave, we tapped a number for the children to "build" 5. After they put together 5 unifix cubes, we wrote "5" on chart paper for them to see. Then, we introduced the subtraction symbol (-) and wrote it next to the 5. We asked them to listen for the smaller number we were going to subtract, take away, from 5, called the *subtrahend*. We tapped a 3, and after giving the children time to count, and to take away three cubes, we asked, "How many cubes are left when you subtract 3 from 5?" The children said 2; and as we wrote the number they were thrilled to see and read the completed equation with us "5-3=2". They liked seeing how subtraction works, and were also excited to see this wonderful thing, that as they were subtracting, they were also adding as they first "built" the larger number, called the *minuend*! We solved many equations together including 5-4=1, 4-1=3, 6-4=2. After doing this, we asked the children, "Can you think of how adding and subtracting which are in numbers and the world, are in ourselves, and in things we do every day?"

Again the answers were interesting: we lose baby teeth and grow new ones; when we are a baby, we don't have hair, then we grow it, and then cut it; every time we go to sleep, we subtract our shoes and clothes and add our pyjamas; we subtract dirt from our faces when we take a bath; when we play outside, we subtract ourselves from the classroom and we add ourselves to the playground etc.

Many of the children said that the lesson was fun and that they liked it.

The children in the class learned to add and subtract with ease, and exactitude.

We love the kind, comprehensive principles of the Aesthetic Realism Teaching Method which understand and meet the hopes of children everywhere.

Conclusion:

We have tried to check if and with how much success, applying new methods among which the presented Aesthetic Realism Teaching Method, children of 5-6 can be introduced to the abstract world of addition and subtraction. The result was positive.

Although there are arguments against this, we still think that it is good for the children in the preparatory class to be introduced to mathematical operations on an elementary level, which will help them to develop their creativity and practice their concentration.

In future, we will continue to work with our students at the Pedagogical faculty in Shtip, R. Macedonia, in the direction of accepting and creating new teaching methods, which will increase their success in working in kindergartens.

Literature:

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[2] Programs for work in the preschool education in RMacedonia;