Views and Experiences of 4th Grade Pupils in Primary Schools Regarding the Implementation of the Inquiry-based Science Education(IBSE) Method in Science and Social Studies

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Summary: A survey has been carried out on the views and experiences of 4th grade primary school pupils regarding the implementation of the IBSE method in Science and Social studies. Pupils from 4 experimental classes (86 of them) have studied the content of Science studies (mainly the physical phenomena) following the principles of IBSE. The results have shown that the teachers have been using the method correctly thus the students have been expressing, explaining and exchanging their ideas and suggestions regarding the problems presented. 82, 56% of the students involved in the survey, found the experiments interesting and 39, 53% prefer to search for the solution of a problem by themselves. The survey shows that the pupils enjoyed the experiments that involved doing something practical (a car moving on its own, a submarine, the lighting in a doll house, the winking owl, a rocket balloon etc), that had elements of game and competition (a car race and 'the Electric Hand'), and those that had the element of 'magic' (a candle that 'burns under water', a staple that floats on the surface of water or a glass turned over, put on a piece of paper that doesn't leak water). Experiments that the pupils found as demotivating or boring were the ones they found too easy or too hard. According to the data gathered, it can be concluded that there is great interest in this method and that both the teachers and the pupils are motivated to see the continuation of the implementation of the IBSE method in the Science and Social studies.

Key Words: The IBSE method, Science and Social studies, the views of the pupils.

INTRODUCTION

In our county, the IBSE method is systematically used only with an optional course '*Ruka u testu – otkrivanje* sveta', while with all of the required courses in Science studies, it is left to the teachers and their own affinities and enthusiasm, whether or not to choose to include the method.[2] Serbia is a part of the EU-FP7-FIBONACCI project which is focused on dissemination and systematic implementation of the IBSE (*Inquiry-Based Science Education*) method in the Science studies curriculum in primary schools. [6][8][9][10] This study is one of the ways of implementation of the IBSE method in required courses such as Science and Social studies for the 4th graders of primary schools. Pupils from 4 experimental classes(86 of them) have been studying Science (mostly physical phenomenon) for two months using the IBSE – Inquiry-Based Science Education methods.[5][7] One of the

instruments of the research was a survey with a purpose of gathering the data on the views and experiences of the pupils regarding the use of this method. The survey consisted of 11 questions out of which ten were of a closed type and one question of an open type, where pupils could include their own opinions on what they liked or disliked during the experiment.

THE RESULTS AND THE DISCUSSION

The IBSE method begins with the introduction into the phenomenon that will be the subject of the research (inclusion) and then turns toward the phase of revision (if the data need be revised, excluded or given more thought). This phase consists of: planning and designing, formulating new questions, making preliminary conclusions, implementation, organization and the data analysis. The third phase consists of a synthesis of the knowledge gathered and the final conclusion which is made by the whole class (the drawing of the final conclusion). In the fourth phase, pupils from one group present their results to the rest of the class (communication). [5]

It is very important for the success of the method, that the teacher constantly encourages pupils to exchange and elaborate their ides and to except and search for better solutions within a group. The results show that the teachers involved in the experiment followed these principles diligently.

98, 84% of the pupils answered positive when asked if the teacher was eager to know more about their ideas on solving the problem given, while a small percent (1,16%) claims otherwise, most presumably because they were not paying attention to the lecture or thought that the questions were not directed towards them. (Image 1)





- Extremely high percentage of the pupils that answered positive when asked if the teacher was eager to know more about their ideas on solving the problem given (96,51%).
- ◆ 98, 84% of the pupils claiming that the teacher accepted their ideas and suggestions for solving the problems.

As shown in the results above, the teachers were diligent in making the students elaborate and express their ideas in class while giving them the opportunity to test them in practical use.

The following set of questions regards the activity of the pupils within a group such as the exchange of ideas and considering ideas and suggestions of other pupils.

- ✤ A vast majority of pupils (95, 35%) claims that they had a chance to talk and exchange their ideas with the rest of the group while only 4, 65% claim otherwise.
- All students (100%) claim that they were stating their ideas during the group work. Since there are always some pupils in a class that are inactive, it can be concluded that the pupils were highly motivated to work with this method during Science and Social study classes.
- It is interesting to state that a huge number of pupils (94, 19%) were actively listening and thinking about the ideas and solutions for the problems given by their fellow pupils. Namely, experience tells us that children as many adults, often do not listen to the speaker or even think about what they might have heard. Such a result shows that group work was a part of the curriculum in these classes before the start of the experiment and that the pupils are used to it. [4]



IMAGE 2. Pupils work in groups while experimenting with the lighting in two of the doll house rooms

Next group of questions regards personal experiences of the pupils on some of the elements specific for the IBSE method such as prediction, checking, unsuspected results, and finding a solution by themselves.

Answering the question on whether they like finding solutions on their own or not, 39, 53% of the pupils answered positive, while 60,47% answered negative. (Image 3) It is obvious that most pupils feel more comfortable reproducing the answers already given rather than searching for them. Such result was expected considering that the IBSE and other similar methods that encourage search for knowledge are not dominant in our school system.



IMAGE 3. Percentage of pupils that enjoy finding the solutions on their own

- Most pupils (77, 91%) enjoy predicting what will happen in an experiment and later check their predictions, while 22, 09% don't. Predicting at that age is based on guessing and has elements of play and competition which motivates the pupils even more.
- 39, 53% of the pupils claim that it bothers them when the result is not what they expected it to be, while 60, 47% of them claims that it doesn't. These results are considered satisfactory because children their age see the unexpected results as failures which demotivates them. [1][3] Pupils need time to accept the fact that every result is a good result and bears a lesson for them.
- Most pupils (82, 56%) claim that the experiments were interesting, while 17, 44% claim the opposite. (Image 4) Such high percentage of pupils interested in lectures after only two months of the implementation of the IBSE method in Science and Social studies can be considered a good result.



IMAGE 4. The percentage of the pupils that found the experiments interesting

In the last question, pupils stated what they liked or disliked during the experiments. It should be noted that every pupil wrote a comment, some more elaborate, some short. A part of the answer regarded which experiments they particularly liked and based upon the answers, on image 5, favorite experiments of the pupils and the percentage of the pupils that liked them are shown. According to the answers, it can be concluded that the pupils' most favorite experiment were the ones that included constructing something interesting or practical(a car that moves on its own, a submarine, the lighting in the doll house, a winking owl, a compass, a rocket-balloon), those with the elements of play and competition (a car race and 'the Electric Hand'), as well as those with th element of 'magic' (a candle that 'burns under water', a staple that floats on water or a turned over glass on a sheet of paper that doesn't leak water). Speaking of what they disliked, some pupils stated ' too hard experiments' for which they could not find solutions, or ' too easy experiments' which were boring to them. It should be stated that the number of these experiments which needed a certain skill to be successfully solved or experiments on a phenomenon that ,to them, didn't appear to be well explained or too complicated to understand. On the other hand, usually the understanding of an 'too easy experiment' was required in order to spot ,more easily, certain physical phenomenon and processes that were more complex and that way prepare the pupils for the harder tasks.

The second part of the last question regards the method itself, during the experiments. A huge number of pupils claim that they enjoyed finding the solutions themselves and the fact that they were experimenting. Here are some of the typical answers:

- "My favorite part was when we had to do things on our own."
- "Experimenting and discovering different things was my favorite part."
- "The best part was when we did the experiments without the help of a teacher."

As some pupils were ecstatic about doing experiments on their own, a certain number of them responded quite negatively to it. Here are some of the answers to illustrate the point:

- "I didn't like it when I had to find solutions on my own."
- "... and the rest of them I didn't like because I had to think a lot. "
- " I didn't like it because I don't like searching for answers in Science and Social studies, I prefer geography and history. "

The last answer should suggest a fact that some pupils have more affinity towards social sciences.



Experiments:

- 1. Air as fuel a self-moving car
- 2. Owl with glowing eyes
- 3. A construction that can both float and sink- a submarine principle
- 4. Magnetic potential of materials
- 5. Construction of a rocketballoon
- 6. Lighting in two room of a doll house
- 7. Electric Hand; Floats/sinks in different types of liquid; the existence of air-the candle that 'burns under water'.

IMAGE 5. Experiments that pupils liked the most

Besides aforementioned typical answers, here are some interesting and isolated examples:

- "I enjoyed working in a group."
- "I liked all of the experiments because I learned a lot!!! "

To conclude the analysis of the views and experiences of 4th grade pupils in primary school regarding the implementation of the IBSE, here are some humorous answers:

- "I didn't bother to think."
- "Most of all, I liked the owl that blinks with the help of electricity and men."
- "I didn't like it because I couldn't say what I wanted to say because Vasilisa wouldn't let me."

Data gathered through this small survey serves as a significant feedback. On one hand it represents an encouragement to implement the IBSE method in Science and Social studies in primary schools, on the other, a way to reform and enhance the school curriculum.



IMAGE 6. Pupils constructing a blinking owl

CONCLUSION

It can be concluded that, during the experimental period, the teachers were using the IBSE method correctly; hence the majority of the pupils were expressing, explaining and exchanging their ideas and suggestions for solving the problems involved. Most pupils (82, 56%) found the experiments interesting but only (39, 53%) enjoyed searching for the solutions on their own. The survey shows, directly or indirectly, that the group work has been involved in the class curriculum before, even experiments to some extent, while the IBSE method was entirely new for both the teachers and the pupils. On the other hand, a great motivation and enthusiasm exist with the teaching staff and the children involved, for the continuation of the use of IBSE method in Science and Social studies.



IMAGE 7: Pupils examining the principles on which a submarine works

Looking at classes and experiments, in particular, the survey shows that pupils were most interested in experiments that included constructing something interesting or practical (a car that moves on its own, a submarine, the lighting in the doll house, a winking owl, a compass, a rocket-balloon), those with the elements of play and competition (a car race and 'the Electric Hand'), as well as those with the element of 'magic' (a candle that 'burns under water', a staple that floats on water or a turned over glass on a sheet of paper that doesn't leak water), while they were demotivated by experiments they found too easy or too hard. Using this survey as a basis ,a conclusion can be made that although the structure of the experiments can be altered slightly, 'too easy' or 'too hard' experiments bear a methodical significance and therefore cannot be excluded from the method.

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