Chapter #3

CURIOSITY AND STUDENTS' QUESTIONS
IN THE TEACHING PROCESS

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ABSTRACT
Within the framework of teaching communication the attention of the researchers was focused on the problem of symmetry. Due to the complexity of the symmetry phenomenon in teaching communication the research was narrowed to student speech, i.e. to student questions. By considering the student question from different aspects the authors of this paper single out as important the number of questions asked by students during one teaching lesson as well as the types of questions asked as regards the presence or absence of students' curiosity. Therefore, the analysis of questions asked by students in teaching process during which students acquire new teaching contents, has also been singled out as a problem of research.
The goal of this research is to establish symmetry (or asymmetry) of teaching communication and to analyse the questions asked by students. The results showed the constancy of asymmetrical communication in the teaching process in almost all the teaching units observed, and the lack of students' questions, resulting from their lack of curiosity. Symmetry in communication and the largest number of questions arising from students' curiosity were seen in teaching units where the principles of integrated learning were applied.

Keywords: curiosity, student question, teaching process, symmetrical communication.

1. INTRODUCTION

One of the key starting questions in this paper is directed at the question of whether communication between the teacher and the students should be symmetrical. Symmetry in relations implies such a level of equality and responsibility of partners as for it to be reflected in the quality of the process and in the consequences it has for individual and for the community (Juul, & Jensen, 2010). Symmetry of communication implies that the subjects of communication have equal status and competences, but teaching communication clearly includes unequal subjects where one subject leads the other to the goal. In the teaching process it is most frequently the case of verbal domination of the teacher who leads the student to the realization of a teaching goal. Teacher's speech is one of the sources of knowledge and a tool of education. One of the answers to the key questions is: the teaching communication is asymmetrical. From this point of view, asymmetry can be justified by the nature of the pedagogical relationship which is in principle asymmetrical and which arises as a help and support for the students' development of their abilities (Bašić, 2015). The second answer to the key question takes as a theoretical frame the interactive context of occurences in the teaching process, and from that point of view the inequality of positions in the mentioned relationship is questionable (Peko, Varga, Mlinarević, Lukaš, & Munjiza, 2014). The traditional approach, which

implies for the teacher to teach knowledge, and for the students to retrieve it points to the necessity and justification of the asymmetry. The approach that perceives the student as an active individual taking part in the construction of the aimed knowledge, capabilities and abilities implies and demands symmetry. Regarding the width and scope of teaching communication, and the diagnostics of symmetry, i.e. asymmetry, in communication, the authors of this paper are directed at the diagnostics of symmetry exclusively by monitoring students' questions.

Some research clearly indicates the asymmetry of teaching communication and the fact that a student asks one question every third day (Langer, von Thun, & Tausch, 1974). In thirty per cent of teaching hours not a single student question was registered. Jurić (1974), studying students' questions in classes, showed that in teaching there is verbal domination on the part of the teacher. The asymmetrical form of this communication has also been shown in other empirical research, and the domination always relates to the teacher's speech, whilst the student's speaking activity is negligible (Peko et al, 2014). Therefore the students' speech in the form of questions has also become the research matter in the empirical part of this paper.

2. QUESTIONS IN THE TEACHING PROCESS AND DEVELOPMENT OF STUDENTS' CURIOSITY

Since there has been language there have been questions. They have always been a fundamental part of conversations between two communicating persons. Their role is as important today as it has always been, but today people find more and more ways to ask questions in order to examine the areas we are interested in, as precisely as possible in order to gain the desired answers, which are often found below the person's level of consciousness. Thus, questions are not only part of informal communication, but they become a powerful tool in realizing a variety of goals.

People begin asking questions at a very early age. Although there is no golden rule as to when a child begins to talk, in most cases it happens between 18 and 24 months of age. By their third year, children begin to speak and become increasingly interested in learning about the world around them. Children at this age ask about 200 questions a day, and from that age questions become an integral part of children's everyday interaction with the world around them.

The family, as children's primary social environment, offers a specific setting in which they feel free to ask questions. However, the family and school are separate entities in society, which on the basis of their own specific characteristics influence the development of curiosity and asking questions. The very processes of learning in the family and school environments differ significantly. Communication in the family setting is characterised by spontaneity, flexibility, close relationships and natural situations. Communication in the school setting is conditioned by the curriculum, the time table and the limited time for conversation. Problems are determined in advance, there is visible distance in the relationship with adults, and the child's role as a student is stressed. Therefore, the didactic value of questions in the learning process is conditioned by the setting in which they arise, that is, the teaching process.

Seen historically, the value of asking questions has been recognized since ancient times. Questions were the basis of Socrates' dialogue method, by which, with the use of irony and then maieutic teaching, using questions first led the students to contradiction and then gradually to new, constructive knowledge and opinions. Although today Socrates' method of conversation is traditional but also a teaching system that is part of history,

contemporary teaching systems, such as heuristic methods, problem or project teaching, also give the search for an answer an important place. Over the course of history, questions as such have been part of the considerations of many scientists, such as Vygotsky, who stated that the theory and practice of learning should be founded on the idea of learning as an interactive, social process, in which teachers and students create situations in which they learn from one another. The basis of the process would be communication, cooperation and feedback. The question, according to him, is the first sign of active thought, and a student's question is one of the more important indicators of the level of development of thought and speech (Vigotsky, 1978). Piaget (1968) also talks about the importance of questions in an analysis of moral education (Is it good or bad? Why did I do that? etc.) whilst Bloom (1956) founded their entire revised taxonomy of cognitive goals on the question, "What do we want to achieve by specific teaching?" and they categorized it in 6 levels. So the first level, "recall", is characterised by questions, through which we obtain from students' reproduction of the original form of content. The second level is interpretation, with a question which enables students to notice and link main ideas and describe the course of events or processes. The third level of questions is aimed at resolving problems in new situations, whilst the fourth level requires the student to analyse and separate information into its constituent parts, in order to establish causes and effects, to present evidence and conclusions, and support generalizations. The fifth level are questions which give the possibility of evaluating and a critical relationship towards facts. The last level are the questions which offer students the possibility of forming new ideas, concepts and solutions (Vizek-Vidović, Vlahović-Štetić, Rijavec, & Miljković,2003). In the Republic of Croatia, Jurić (1972) has dealt most with a pedagogic and didactic analysis of questions in the teaching process. His research confirms that students' questions contribute to intensifying and extending their knowledge, depending on the character of the teaching material, and that students most effectively use their intellectual potential when they subject the teaching materials to questions.

Today, studying questions in the teaching process has become marginalized in a way. Even research dealing with the issue of questions in teaching is mainly aimed at the actions of teachers and their dominant position in the teaching process, since still today the teaching process is defined with a major degree of asymmetry in the activities of the teacher and the students. This of course also relates to the process of asking questions. One of the first pieces of research dates back to as early as 1912, in which Steven (1912) states that a teacher in school asks about 400 questions daily. Kerry (1982) in his research stated that during the working day a teacher asks students about 1,000 questions. Research conducted in 2016 in the Republic of Croatia showed that teachers on average ask 82 questions during a lesson (Kolak, & Markić, 2017). These results, although they do not give an exact picture of the work of every teacher, clearly show that the trend has hardly changed at all. Also, type of questions asked during the teaching process is extremely important. The basic division is on the basis of:

- the way in which the questions are formulated: open and closed questions
- the direction of the questions: convergent and divergent questions
- the level of the thought process initiated by the questions, which is related to the revised taxonomy of cognitive aims of learning: questions of higher and lower orders.

More important than the number of questions asked by the teacher, of course, is the type of questions teachers ask their students. But here too the results are discouraging, and testify to the domination of closed and convergent questions, aimed solely at the level of recall of information, which do not offer students the opportunity for creative or critical

thinking. For instance, in the research by Pate and Bremer (1967) it is said that 69% of questions asked by a teacher relate to verifying knowledge and understanding of content, whilst only 10% are aimed at developing the students' opinions. The results from Kolak and Markić (2017) showed how the ratio between the teacher's convergent and divergent questions aimed at students was 1:8 in favour of convergent questions.

This domination of teacher's questions results in the impossibility of the students developing their own creative, reflexive, analytical and creative or critical thoughts. On the one hand, the teachers' reasons mentioned in research (Biddulph, & Car, 1992; Holt, 1982, Woodward, 1992, Watts, Alsop, Gould, & Walsh, 1997) are, for example, the teacher's inability to cope with a large number of questions, the lack of necessary knowledge, the lack of time, the focus on content and planned teaching, insecurity etc. All this may be manifest in the teaching process by ignoring, mocking, or disregarding students' questions, and similar undesirable but existing behaviour by students. On the other hand, the basic education policy documents (The Strategy for Education, Science and Technology, the National Curriculum Framework, laws etc.) explicitly and implicitly promote the principles on which the educational process should rest. The theoretical basis for promoting this educational and training philosophy is the theory of social constructivism. The postulates of social constructivism in the teaching process clearly emphasise the position of the student, where he/she becomes an explorer, who, with the support of the teacher, explores by him/herself and interprets his/her environment and constructs knowledge (Nacionalni okvirni kurikulum za predškolski odgoji i obrazovanje te opće obvezno i srednjoškolsko obrazovanje, 2011). In the light of this, one of the fundamental points of the National Curriculum Framework relates to the fact that the use must be ensured in the teaching process of various relevant sources of knowledge which promote the students' participation, observation, independent research, discovery, drawing conclusions and curiosity. Of all the above, curiosity is the initiator of activity which directs the teaching process towards the student. It is also the initiator of student questions, and therefore in this paper we will pay particular attention to it. The concept of curiosity was originally presented in psychological literature by William James long ago in 1890, when he defined it as one of the primary instincts of mankind. In this paper, curiosity as a need, a thirst and a wish for knowledge is regarded as one of the fundamental determinant of student's motivation. It is one of the fundamental concepts in motivation. Berlyne (1960) stated that curiosity is a motivational prerequisite for exploratory behaviour. The concept of curiosity therefore may be understood as a description of specific behaviour, and also as the hypothetical construct which explains that behaviour.

For the purposes of this study, the authors of this paper define student curiosity as the emotional reaction of a student as a response to a powerful cognitive, emotional and active need for knowledge, feelings and action, which is relieved by its realization. It occurs when a desire exists for a goal, which the student values as important. In the teaching process, this may be seen when a student wants to do something, achieve or realize something, and as a result begins to interact.

From a pedagogical point of view, the authors of this paper differentiate two basic types of curiosity in students: not feasible and feasible which reflect significantly on teaching process. Not feasible curiosity is characteristic of students who ask an extremely large number of questions and hinder the teacher in management of the teaching process. These students are most often too focused on themselves and are not able to cope with unfulfilled desires, even if they include the desire for knowledge. Such specific situations significantly undermine the teaching relationship, whereby the teacher, as a mature individual, has the task of achieving a pedagogic goal for the purpose of educating and

training the students, which mainly takes place on the basis of a directive from society. Feasible curiosity in students is related to activities within the teaching process and/or content of the lesson. To a competent teacher, the students' curiosity seen in this context becomes the starting point for planning the teaching process. Since students' curiosity, in a classroom where they are comfortable and secure, arises spontaneously and unforeseen, it requires from the one managing the teaching process a higher level of flexibility, and deviation from the originally planned form and course of the lesson. One of the mistakes that occurs in response to students' curiosity on the teacher's part is giving the student specific, prepared answers, instead of leading the student through a thought process in seeking the answer to the question asked. Loewenstein (1994) said that students' curiosity may be extinguished at the moment when the student becomes aware of the gap between what he/she knows and what he/she wants to know. The teacher should then pay particular attention to the workload he/she is imposing on the student since student's motivation diminishes if the task set is not a sufficient challenge or if the task is too difficult. Almost the same implication applies to students' curiosity in the teaching process. If the student is offered an appropriate dose of freedom and enabled to explore, his/her curiosity will be maintained, and in the end it will be the key motivator in achieving the desired goal. The research mentioned earlier by Loewenstein (1994) has strong implications for the didactic work of the teacher, especially bearing in mind the differences in the individual potential of curiosity in individual students. The individual level or potential of an individual's curiosity may be considered in two ways: The first is the one that defines the level of curiosity as an integral part of the individual's personality, and then we can talk about personality characteristics (exceptionally curious students). These students usually show signs of extrovertism and are bold in interaction, whilst others show signs of resignation or passivity. Passive students may have a need and be curious, but due to their own passivity, they do nothing to satisfy that need. The passivity of students may be caused by various factors, such as fear (of mockery by the teacher or students), previous negative experiences, insufficiently clear content, their status within the class (isolated, rejected) etc. There is then no feedback to the teacher, and curiosity in the teaching process is in the end most often extinguished. The other way is when curiosity is seen as an individual's condition which may be influenced. In the second case the need and necessity is emphasized for the teacher to possess pedagogic and diagnostic, or didactic and methodological competence to be able to plan, programme and manage the lesson, as part of the teaching process, in a way that arouses, recognizes and maintains the students' curiosity towards the content being taught. The students' behaviour, by which they clearly demonstrate their curiosity, may serve as feedback for the teacher. Maw and Maw (1964) listed the following student behaviours, by which the level of their curiosity may be recognized:

- they react positively to new, strange, incongruous or mysterious elements in their environment by moving toward them, by exploring them, or by manipulating them.
- they exhibit a need or a desire to know more about themselves and/or their environment.
- they scan their surroundings seeking new experiences.
- they persist in examining and exploring stimuli in order to know more about them.

From all the elements regarding curiosity that have been singled out in this paper the authors, in the empirical part, place a special focus on the students' questions through the analysis of presence or absence of students' curiosity.

3. METHOD

In dealing with the problem of symmetry of teaching communication, the problem of this research is closely directed at that part of teaching communication which analyses the questions asked by students during the teaching process at the teaching lessons aimed at acquiring new teaching contents. It is expected that the students are most open for asking questions in those teaching lessons that aim at acquiring new teaching contents. The goal of this investigation is to determine the symmetry (or asymmetry) of teaching communication, and to analyse students' questions on the basis of the criteria mentioned in the introductory considerations of this paper.

From the aim of the research two specific research questions emerged:

1. Does the number of questions asked by students confirm the symmetry of teaching communication?
2. Does classroom communication encourage the students' curiosity by asking questions?

The sample for analysis comprises teachers (N=5) and their students (N=124). The elements for analysis of teaching comprise video recordings of lessons in a time sequence of teaching units when new teaching content is being learned.

In formation of the sample, the principle of voluntary consent of the teacher was the critical criterion. The age of the students was in the range from ten years to twelve years, in the fourth to sixth years of compulsory elementary school education. The type of lesson in all the teaching situations observed was equivalent. The dominant form of work was the teacher's free choice, and in the sample it ranged from a dominant, frontal form of work, then a combination of frontal and group work, strong use of group work in guided exploratory teaching, to integrated teaching.

The students' and the teacher's questions in the first research question are expressed in frequencies, and in the second question in frequencies and descriptively.

Table 1.
The structure of the observed sample.

STRUCTURAL ANALYSIS OF LESSONS - THE SAMPLE					
Teaching situation observed	**Class**	**Teaching subject**	**Dominant form of work**	**Type of lesson**	**No. of students**
Teaching situation 1	*5*	*Mother tongue*	*Frontal*	*Learning new teaching content*	*19*
Teaching situation 2	*5*	*Biology*	*Group work*	*Learning new teaching content*	*25*
Teaching situation 3	*6*	*Geography*	*Group work*	*Learning new teaching content*	*30*
Teaching situation 4	*4*	*Class teaching*	*Integrated learning*	*Learning new teaching content*	*22*
Teaching situation 5	*4*	*Class teaching*	*Frontal/group*	*Learning new teaching content*	*28*

4. RESULTS AND INTERPRETATION OF THE RESULTS

In the search for an answer to the first research question, teaching situations, focusing on the teacher's speech and the students' speech were considered. In reply to the research question set, we were helped by the number of questions asked in the observed lesson, and their ratio (teacher's questions in relation to students' questions). In the speech of the teacher and the students focus was exclusively on the questions asked by the teachers and the students in communication during the lesson. Questions are expressed in terms of frequencies, and on the basis of the proportion of questions asked, the level of symmetry was established, which in this research was in a range from extreme asymmetry (ratio 1:20), asymmetry (1:7; 1:4.5) to symmetry (1:1.4; 1:1.8).

Table 2.
Answers to the first research question.

ESTABLISHING THE SYMMETRY OF TEACHING COMMUNICATION BY MEANS OF THE QUANTITY OF QUESTIONS			
Teaching situation observed	**Teacher's questions**	**Students' questions**	**Degree of symmetry of teaching communication**
Teaching situation 1	*103*	*5*	*Extremely asymmetrical*
Teaching situation 2	*77*	*17*	*Asymmetrical*
Teaching situation 3	*41*	*22*	*Symmetrical*
Teaching situation 4	*28*	*20*	*Symmetrical*
Teaching situation 5	*58*	*8*	*Asymmetrical*

Examination of the results of the research shows the asymmetry of communication in most teaching situations. The most asymmetry was seen in Teaching situation 1, where the ratio of questions asked was 1:20 in favour of the teacher. This lesson was extremely controlled and the teacher's speech was visibly dominant. The students' questions were not an expression of the students' interest, but related to the lack of clarity in the instructions the teacher gave to the students. By insight into this teaching lesson one can confirm the implicit pedagogy of the teacher who would define this pedagogic relationship as asymmetrical, whereas at cognizing new teaching contents the teacher's speech would be singled out as the most secure way to reaching the goal. The analysis of this teaching lesson points to the importance of education content and to the diminishing of the student's activity and speech. Similar results were achieved by Ritz-Frolich (1973) who established the teacher's large verbal participation in the teaching process, i.e. that the teacher is verbally active during two thirds of the monitored teaching time. These results have also been confirmed by Vukanović (1980) and Grubišić-Peko (1988) who have established the dominance of the teacher's verbal activity, although they monitored it in different teaching areas, which is also the case in the sample of this research. They also found out that students' activity was negligible, and that the monitored teaching process most frequently followed the asymmetric form: the teacher speaks, while the students listen, or there is interaction between the teacher and one student. Peko, Mlinarević, and Gajger (2008) report the results of the protocol of frequencies by which they noticed the questions of teachers

and students which confirmed the asymmetry ratio of 40:11 in the fourth year of schooling, and of 35:7 in the sixth year, in both cases in favour of the teacher.

Symmetry in teaching communication in Teaching situation 4 is diagnosed and partial symmetry in Teaching situation 3. In view of the fact that Teaching situation 4 was the only one to use the principles of integrated teaching, it may be assumed that integrated teaching encourages symmetrical communication. The spatial and social factors of integrated teaching significantly contribute to symmetrical communication, because it can be applied even in relation to the students' movement. Students' movement around the classroom was equally present as the teacher's movement, in contrast to Teaching situation 1, where the teacher moved around the classroom, whilst all the students remained seated. The teaching situations observed opened up many new areas for research. The first is aimed at studying integrated teaching and its possibilities for development of symmetrical communication, the problems of movement by students, and the level of physical activity. Another direction is aimed at the time period of waiting for answers, the emotional reaction of fear in students when asking questions, and an analysis of teachers' speech (time and content).

Table 3.
Answers to the second research question.

STUDENTS' QUESTIONS AND CURIOSITY			
Teaching situation observed	**∑**	**Z**	**Description**
Teaching situation 1	*5*	*0*	*None of the questions was an expression of the students' interest. All questions were focused on a lack of clarity in following the teacher's instructions or seeking permission for a certain activity.*
Teaching situation 2	*17*	*1*	*Only one question was an expression of the student's curiosity as the result of lack of clarity in the teaching content*
Teaching situation 3	*22*	*4*	*The students' questions were the result of the teacher encouraging the students' curiosity*
Teaching situation 4	*20*	*8*	*The students asked questions in their activities which were the product of their curiosity. The content of the teaching unit was suitable for their interest/curiosity (The central topic of integrated learning: "If trees could walk").*
Teaching situation 5	*8*	*1*	*The student's interested question was an expression of the student's personality.*

∑ Total number of students' questions in the teaching situation observed
Z - The number of questions which are an expression of the students' interest related to the content

The students' interest is an excellent indicator of the students' position in the lesson. It relates to the answer about whether the students' role is active or passive, and which values are encouraged in the class. It also gives an answer to the question whether a receptive relationship in the students is supported in the lesson. If our aim is for students to develop into capable, active and responsible individuals, their position in the classroom is important. By responding to the students' needs related to their desire for knowledge, we aim the lesson at the students and bring them into an active position. A student's curiosity, formulated as a question, has a very small part in the observed sample. It is most visible in the teaching situation aimed at integrated teaching. In the practice of integrated teaching there are attempts at realizing constructivist principles which are manifested in the work directed at the student, based on sensation and experience, on linking various areas and sources of knowledge, on interaction, communication and cooperation, on respecting

democratic values, in the work which is accompanied by pondering upon the achieved goals, which is challenging, founded on reflective and contemplative processes, on the knowledge that is being enriched with new experiences and applied in an authentic manner (Čudina-Obradović, & Brajković, 2009).

The authors of this paper assess that the very content of that teaching unit was suitable for developing interest and that the implicit teaching method of the teacher running the class was aimed at encouraging and developing the students' interest. In that class, the atmosphere itself was assessed as being stimulating, pleasant and relaxing. Education through responsibility and not obedience was visible. In the third teaching situation the students' questions arose only as a response to stimulation on the part of the teacher and were not a sign of the students' curiosity. The authors of this paper presume that students' curiosity intensifies when working in pairs and in group work. In the remaining teaching situations, the students' curiosity was completely or almost completely lacking. The students had a visibly passive role and relationship where the teacher taught and the students were taught. Similar results have also been reached by Peko, Mlinarević, and Gajger (2008) who, by analysing the contents of questions put to students, have demonstrated that the majority of the questions put by students to teachers are not connected with the teaching contents nor are they the products of students' curiosity, but are rather related to permitting the students perform certain activities or check if they have understood the given tasks.

The answers to the second research question opened up new research areas related to the connection between various forms of work and symmetry in communication, as well as the atmosphere in the classroom and the implicit pedagogics of educational workers and their connection with symmetry in teaching communication.

5. CONCLUSION

The results of this research show the asymmetry in teaching communication. It is visible in the domination of questions asked by the teacher. The students' position, in terms of the observed quantity of questions asked and students' interest indicates passivity. Teacher-led activities leave little room for the opportunity for self-construction of knowledge by the students, or a desire for knowledge which goes beyond the framework of the given school curriculum. The teacher's feeling of responsibility is also visible, to respond to the requirements of society and "pass on" the teaching content to the students (sociocentristic approach), along with the teachers' lack of freedom and autonomy to help students in construction of knowledge, and in so doing to focus on the student and not the content (pedocentristic approach). The focus on the content and achievement puts an end to the development of the students' curiosity. Students' curiosity gives rise to a feeling of insecurity in the teacher in managing the teaching process, because changing the planned lesson requires a higher level of teacher competence.

From the results of the research we may point out some factors that could have influence on students' curiosity like the teaching methods and social forms of work, which may contribute to either stimulating or smothering it. This research was undertaken in different subject areas but the equivalent types of lessons were considered. The research opened up many other research questions, and the subject of the research may be linked with the classroom atmosphere, the students' emotional reactions, the quality of questions, the amount of time given for answers and the implicit pedagogics of educational workers. The authors of this paper uphold the suggestion of authors who point out the great importance of pedagogic questions and pedagogic answers in the process of raising the quality of the teaching process (Bowker, 2010).

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