

STRATEGIES OF DIALOGUE IN MEDIA-AIDED BIOLOGY EDUCATION

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Abstract

Forming biological and environmental competences in students in the contemporary world of the media assumes application of specific strategies, and hence the methods and techniques of work with students. The theoretical part of research focused on the modules of the teaching strategies' choice. The modules were connected with the patterns of situations for learning through communication, learning through experiencing and learning through action. In the practical part of research the application of the selected teaching strategies supporting multiple feedback during media-aided biology lessons was attempted. The research issue has been focused around the influence of the various media on students' biological skills in the field of new sources of scientific information. The research results were used for preparation of theoretical basis for formulating the main assumptions for media in biology education and evaluation of dialogue's strategies in ethical aspect of teaching contents and objectives. 240 high school students of experimental and control classes participated in the research (lessons, survey, cards of activity). The data were interpreted in view of the new concepts of teaching and learning and point to the fact, that the development of media creates a possibility to shape views; however, it is dialogue, creative attitude and critical knowledge that are the basic conditions for the scientific approach to information.

Key words: *biology education, media, methods of learning, strategies of dialogue.*

Introduction

In the process of education one may not neglect the fact the influence of media on knowledge and attitudes as well as the need for forming the axiological attitude – the ability to make a selection of values as the axis crystallizing personality. Depending on the kind of medium transmission and reception vary: transmission may be individual and recipient may be a group/mass or the other way round, mass transmission and individual perception. Media can be characterized by transience of the communication but when they are recorded or printed they acquire the features of being long-lasting and repeatable at any given time.

According to McLuhan (2004) *medium is a message* but also *medium is a massage* because it affects one not only intellectually but also physically, one's senses. Short, aggressive communications influencing selected senses precisely are called by McLuhan 'hot' and comprehensive, not intensive, not demanding co-participation, affecting many senses are called 'cold'. Media are classified according to various criteria. In school education most often the so cold educational media are used, such which in accordance with the sender's intent are to play this function. In education outside school

artistic or practical kind of transmission is more often preferred. A not very efficient information user can accept as a criterion of selecting information a kind of code and choose attractive images rather than verbal transmission. In self-education the dominant selection criterion appears to be the topic that is the part of reality which communicating applies to (e.g. Darwin's theory, a mathematical formula or kinds of diets).

Gajda (2003) gives various definitions specifying communicating as an unilateral process (transmission – stimulus – reaction – interpretation) and as a bilateral process (understanding – exchange – sharing – relation – behavior – interaction). The mentioned aspects of communication constitute a starting point for the research described in this article.

In view of the requirements of the increasing pluralism of contemporary civilization the most appropriate strategy is considered to be developing axiological culture that is the ability for discursive uncovering the internal structure of the compared systems of values and free discussing them (Wieczorek, 2000).

In biological and environmental education dialogues strategies may be an alternative for the attitude of outlook and axiological syncretism as well as the support for improving cognitive and metacognitive competence in students and a step between the theory and practice for example the education for sustainable development or shaping the attitudes towards application of new technologies in medicine and agriculture.

Theoretical background

The theoretical part of research focused on the modules of the teaching strategies' choice (Table 1, I-III). The modules were connected with the patterns of situations for learning through communication, learning through experiencing and learning through action (Table 1, 1-3) and the teaching techniques (Table 1, A-F). Every teaching strategy was realized according to the idea of critical thinking understood as diverse class of concepts and techniques to help students think better about complex subjects matters, make better decisions, undertake a dialogue and just learn in a more active way.

Table 1. The modules of the teaching strategies' choice in media-aided biology education (I-III teaching strategies, 1-3 patterns of situation: 1 - learning through action, 2 - learning through experiencing, 3 - learning through communication, A-F teaching techniques: A – modeling, B – didactic games, C- ecological footprint, D- active techniques facilitating asking questions, E – diamond ranking, F - technique of Ball Bearing, type of media: a: hot, b-cold, c-monologue, d-dialogue, e-media of mass information, f – media of mass communication).

I. problem solving						II. project						III. Situated learning					
1		2		3		1		2		3		1		2		3	
A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F
critical thinking																	
b	e	c	a	f	d	a	f	d	b	e	c	e	f	b	a	d	c

It was assumed that modeling interdependencies that are the subject of discussion enforce cognition of numerous interdependencies occurring between particular elements of the object as well as regarding further relations occurring between various objects and their social and natural environment.

Diamond ranking is a technique serving the forming and practicing such skills as: ability to analyze the situation, verbalizing thoughts and feelings, presentation of own attitude and its defense,

selection of appropriate arguments, effective communication, persuasion, team work, creative problem solving, acceptance of a different point of view or system of values etc.

‘Ecological footprint’ is a tool allowing measuring and understanding how much we take from environmental resources. The footprint i.e. a need for space matching our lifestyle includes various categories of human consumption; a tool for moving towards sustainable development. The students could present the result of their calculations in public and discuss possible ways of decreasing the footprint together.

The Ball Bearing technique is based on work on several different parts of the subject in groups with different tasks. The decisive phase of work is understood as presentation and explanation of the evaluated/summarized information in „face to face” situations.

The numerous examples of computer-aided teaching techniques, proposed by various authors in teaching science refer to the method of didactic games, frequently applied in biological education successfully. Learning on the basis of experiences (games) means learning of action in new conditions in relation to action undertaken within some specific case. The relations between types of media used in the research are illustrated on Figure 1.

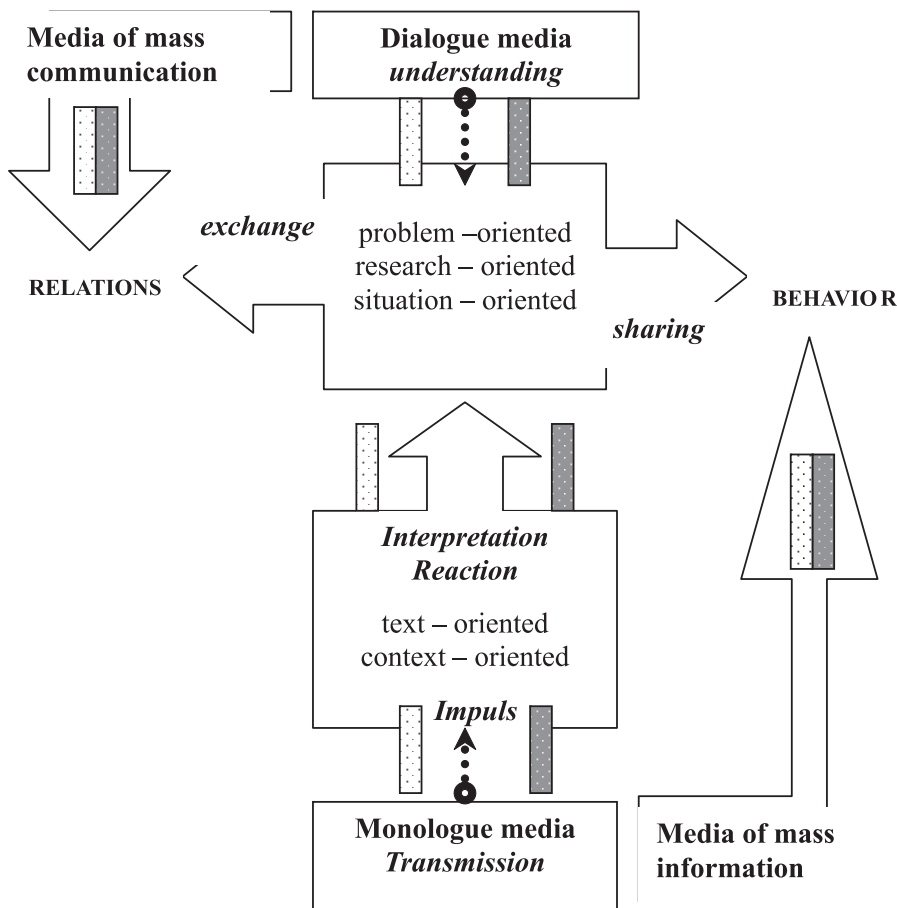




Figure 1. Relations between types of media used in the research
( hot media,  cold media).

Selection of learning strategies depended on educational objectives regarding the formation of particular skills in students (Table 2).

Table 2. Students' biological competence connected with communication and information skills.

Communication skills	Information processing skills	Information creating skills	Biological competence
ability to use new communication technology	searching and selecting information	database formation	visualization of results (modeling and simulations)
learning through action			
present own point of view	divergent thinking and learning in cooperation with others	transmission of ideas	treating elements of knowledge as a source of motivation and one of the possible 'ways of cognition'
learning through experiencing			
supporting with arguments	searching of relations and interactions	transformation of the inflowing information	discovering meanings and creating ethical views in connection with experienced reality
learning through communication			
effective communication with other people	using both verbal and nonverbal language	transmission of emotions	use the acquired knowledge and skills in everyday life

Methodology of Research

The following research objectives were assumed:

- specifying relations between the assumed strategies of educational dialogue and students' competence creating Spencers' iceberg (cognitive objective),
- developing a universal model of teaching and learning in which the mutual element is feedback between the participants of educational dialogue and the variety of learning methods and techniques allows the choice of strategies depending on situational context (practical objective).

The model of levels of cognitive activities connected with the different kinds of media correspond to educational priorities in media-aided education and refer to Spencers' iceberg model (Spencer & Spencer, 1993). The top of the iceberg are knowledge and skills and they constitute qualifications. What can not be seen and forms the base of the iceberg are: own personality conception, motive, effort, enthusiasm, values, standards, professional ethic and moral criteria. Only all these together decide about competence, which is so often given as the quality of school work (Figures 2 & 3).

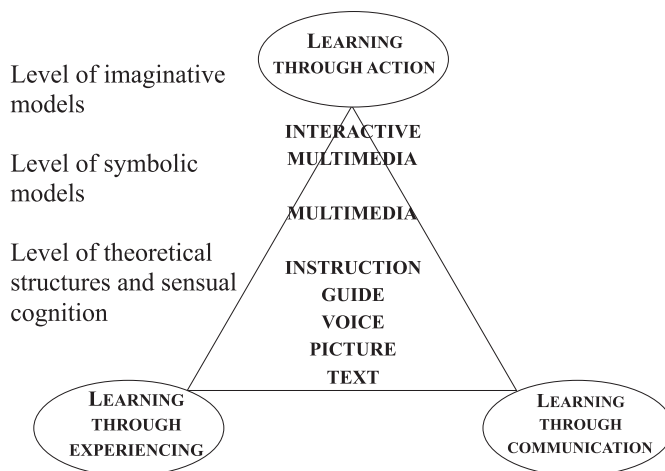


Figure 2. The levels of cognitive activities connected with the different kinds of media.

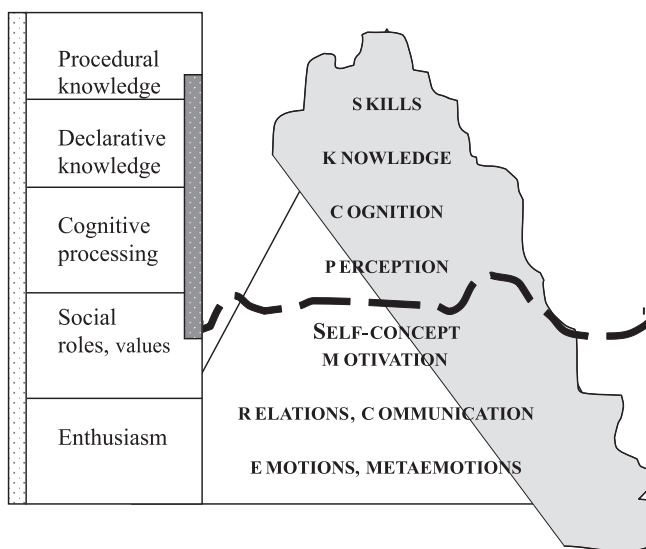


Figure 3. Educational priorities in media-aided education (■ hot media, □ cold media).

Basing on the presented theoretical assumptions the following research issue has been formulated: What kind of media supports educational dialogue strategies affecting students' skills? It has been assumed (research hypothesis) that learning is a function of activity and situational context, under which knowledge is acquired and biology teaching supported by not overheated dialogue media facilitates educational dialogue and learning through action, experiencing and communicating.

As a research method the pedagogical observation was applied. The following research tools were used: cards of lessons' observation, cards of students' activity and survey (in case of the technique 'ecological footprint'). The research was carried out in 3 experimental and 3 control classes (40 students each). 18 lessons in experimental classes and 18 lessons in control classes were observed. Altogether 240 students participated in the research. In experimental and control classes the same teaching strategies were applied but in control classes without media-aided and without the specific methods and techniques of learning.

Results of Research

Table 3 presents the modules of teaching strategies which were chosen in experimental classes.

Table 3. Modules of teaching strategies which were chosen in 3 experimental classes: E1-E3. (I-III teaching strategies: I – problem solving, II- project, III – situated learning, 1-3 patterns of situation: 1 - learning through action, 2 - learning through experiencing, 3 - learning through communication, A-F teaching techniques in experimental classes: A – modeling, B – didactic games, C- ecological footprint, D- active techniques facilitating asking questions, E – diamond ranking, F - technique of Ball Bearing.

Teaching strategies' choice	Modules of teaching strategies					
	1		2		3	
	A	B	C	D	E	F
I.	E2	E1	E3	E1	E2	E3
II.	E2	E3	E1	E3	E2	E1
III.	E3	E1	E1	E3	E2	E2

Table 4 presents the number of students' activities undertaken during biology lessons in different educational and situational contexts. Every student participated in 6 lessons realized twice in specific strategy (I-III). Number of undertaken activities was specified according to the students' activities cards connected with the tasks. Lesson activity card contained 10 tasks, four of them were obligatory.

Table 4. Number of students' activities in experimental (E) and control (C) classes. 120 students of experimental and 120 students in control classes participated in the research (symbols as in Table 3).

Teaching strategies' choice	Number of E classes students' activities (number of tasks which were solved)					
	1		2		3	
	A	B	C	D	E	F
I.	298	178	164	240	340	322
II.	214	262	312	280	204	123
III.	198	245	318	246	287	158
Altogether	710	685	794	766	831	603
	1395		1560		1434	

The data (Table 4) allow stating that in both cases (hot and cold media) the students' activity was comparatively high (in class E1 and E2 the students solved average 6-7 tasks during problem solving strategy, in class E2 and E3, 5-7 tasks during work on project, in class E1 and E3 students solved 6-8 situational tasks), but their activity was higher in case of less overheated media (Table 4, I.1A, II. 2D, III. 3E). The mass transmission media support the realization of the project, so the E3 class students solved

average 6.5 task. E1 class students using dialogue media solved 7-8 tasks on average. Dialogue media-aided biology learning seem to be the most effective in case of situated learning strategy. Monologue media-aided biology learning allowed noting the least number of solved tasks in case all adapted strategies of teaching (Table 4 I. 2C, II. 3F, III. 3F). Most tasks were solved in accordance with learning through experiencing (Table 4; 2), the least during learning through action (Table 4; 1), which suggests the restrictive influence of media on students' activity in range of real verification of images relating phenomena and biological processes.

The number of the tasks solved by students in experimental classes during media-aided biology lessons in various strategies is presented on Figure 4. The most effective seems to be problem solving strategy (altogether 1542 solved tasks in class E1-E3), the least – work on the project (altogether 1395 solved tasks in class E1-E3). In control classes during 18 lessons, 120 students solved altogether 2415 tasks, it is on average 3 tasks solved by 1 student during 1 lesson (in experimental classes 6 tasks/1 student/1 lesson).

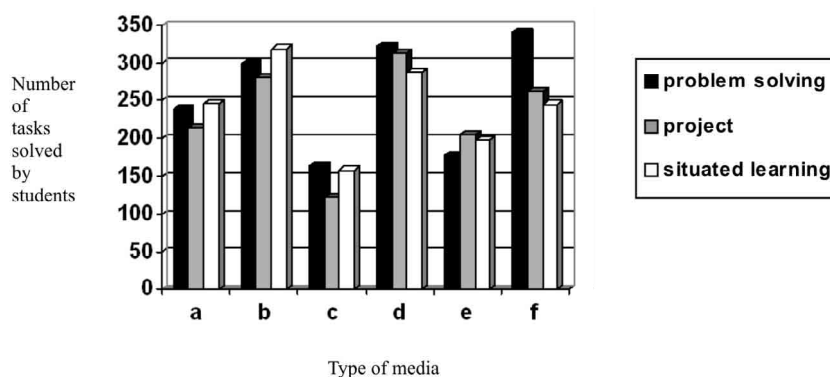


Figure 4. The number of tasks solved by students during media-aided biology lessons organized according to assumed strategy (type of media: a: hot, b-cold, c-monologue, d-dialogue, e-media of mass information, f – media of mass communication).

The research showed the insignificant influence of mass communication media on educational process as well as the need for improvements of methods and techniques of biology problems' communication. Communication in education is treated in connection with the tools, it does not put appropriate attention to the ways of scientific mediation and communication and the strategies of dialogue which promote transformation skills of scientific knowledge and using the procedural knowledge.

The tools of communication applied in associative strategies focus on the level of declarative knowledge and they do not influence students' competence formation.

The results allow the conviction that biology teaching supported by not overheated dialogue media facilitates educational dialogue and learning through action, experiencing and communicating (research hypothesis).

The results confirm the author's previous views that changes in the to-date ways of work and medial/information technology tools use in biology teaching and learning are necessary (Potyrala, 2007). Necessity of these changes is the consequence of psychical needs of learners in the situation of universal access to information. The changes must regard the content, form and range of information together with individual experience of the information user.

Conclusions and implications

The object of teachers' interest is communication behaviors viewed due to openness of expressed intention (directly – indirectly) and used means of expression (verbal – nonverbal) (Putkiewicz, 2002). The basic model of direct communication, most often used in school practice, beginning with the sender

(transmission creator), and ending with the receiver who decodes the communication and remains under the influence of its form and content, reduces to basic phases and elements the process which is transactional in its usual course. Media as means of communication facilitate such a course of this process in which participants of the transmission encode and decode meanings, use the information while also creating it at the same time.

According to Fisher (1999), the creative process is to a large extent reorganizing the possessed knowledge in order to realize what we do not know. In this context, the application of media helps form students' competences connected both with creative use of information and with its creation. Not every sender of information is its creator, but every user of information is its receiver. In school situation, users of information are all the people who use it in any purposeful way (Potyrala, 2007).

The aim of the computer-aided teaching methods introduced at biology lessons should be the ability of a student to use the knowledge and take advantage of it, so that it affects his/her mental development. Hence the student's knowledge should be evaluated according to what he/she can do and not to what he/she can say, emphasis should be put on the originality of performance and ability to solve practical situations that the student gained while solving the situation.

Teachers should thus apply suitable strategies and methods which will help students not only shape scientific views, but also use the information and skills they have at consecutive stages of education and in everyday life.

Currently the media are ever-present. The teacher must be aware of the influence of outside school interference and psychological barriers related to the communication process.

There is a necessity for better investigation of communicative position of class interaction participants as well as for research on students' motivation for effective information processing due to media.

Cultural value of medial communications is debatable. However, there is a consensus that they lead to integration of the society on the one hand, yet on the other they can deepen passivity and promote 'substitute reality experience'. Dialogue, creative attitude and critical knowledge that are the basic conditions for the scientific approach to information.

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