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Małgorzata Czapla*
Adam Mickiewicz University, Poznań

Agata Rataszewska**
Adam Mickiewicz University, Poznań

Styles of teaching Science compared to job seniority and teacher's education. The student's perspective

KEYWORDS

teaching style, science education, primary school teacher, students

ABSTRACT

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The article presents the manner of work of science teachers on the basis of students' opinions. The research included 870 6th grade primary school students, whose teachers had different work experience and level of education. The authors used the diagnostic survey as the research method. Flander's analysis category system was used for the analysis of classroom interactions. In order to establish the relationship between the pairs of quality variables, the chi-square test of independence was used. It has been found that the teaching style is consistent with an adopted teaching model. There are two main types of teaching models: a model based on cognitive psychology and behavioural psychology. The model is reflected in the teacher's teaching style, which might be reactive or directive. In the students' opinion science teachers, particularly those with the shortest work experience, most often transmit their knowledge to students during classes (directive style). Those with more seniority and experience encourage students to perform certain tasks more frequently (reactive style). Science teacher's education does not influence the teaching style and the majority

* ORCID https://orcid.org/0000-0003-1781-8362.
** ORCID https://orcid.org/0000-0002-3883-6036.

of teachers prefer a syncretic style. Students of the teachers preferring a directive style revealed lower interest in science than those who were taught in reactive style.
As a result of this disinterest, the studied students only occasionally performed activities in direct contact with nature.

What is a teaching style?

A teaching style can be described by considering two types of teaching models. Firstly, a model based on cognitive psychology (constructivist philosophy), which in a complex way examines the emergence and developmental course of mental processes in humans, assuming that the result of learning is not a product but a process of acquiring knowledge. Secondly, a model based on behavioural psychology, which explains human behaviour in a simplified way (in terms of stimulus-response relations), according to which the aim of such teaching is a specific product. The models appear to be purely theoretical constructs. The research shows that teaching styles adopted by the studied science teachers are to, some extent based,on the above mentioned models, but never appear in a pure form (Czapla, 2012). These styles are situated on a continuum between extreme variants, which means in the space between traditional (directive) style and progressive one (reactive) (Escotet, 2018; Mieszalski, 1997; Wragg, 2001), or between the formal (frontal, closed) and negotiative (Gołębniak, 2004) and so called related and task style (Niemierko, 2007). There is also an indirect, blended approach to teaching. This approach often combines divergent and sometimes contradictory views on teaching, which can easily be seen in the analysis of the personal philosophies of teaching declared by science teachers. As a consequence, their teaching strategies are not based on typical transmission of knowledge or typical activation of students and communication in the classroom is based on both monologue and dialogue. Thus, some kind of syncretism in teaching can be noticed. The syncretic way of teaching is called a syncretic style (Czapla, 2015). It is revealed in approach to teaching due to tension and contradictions assigned to a teacher's role who is obliged to combine freedom and control, what is important to an individual with what is necessary to the majority; what is ideal with the plausible (Kwieciński, 1998). Increasingly, the need to build an empirically informed and eclectic style is emphasized. The concept of a teacher as a post-positivist practitioner, formulated by J. Kincheloe (2004), belongs to this style.

Semantically, a teaching style is an extensive phenomenon. Hence, it has been differently defined and used by scientists: Bales (1950), Benade (2016), Bennett (1976), Bentley (2010), Brzezińska (1999), Dale & Tanner (2012), Fenstermacher & Soltis (2000), Flanders (1970), Gołębniak (2004), Janowski (1980), Kincheloe (2004), Mieszalski (1997), Mizerek (1999), Niemierko (2007), Pyżalski (2007), Solomon & Kendall (1979), Wragg (2001).

Teaching style as a subject of research

In order to examine the types of styles used by science teachers in students' opinions the particular components of a style have been precisely described. Then the description of the styles used by science teachers have been made. It includes the choice of teaching strategies and means of teacher-student communication during science classes. It has been assumed that these components are consistent with personal teaching philosophy of the science teacher.

On the basis of research referring among others to teaching strategies (Palka, 1989; Kwieciński, 1991; Nalaskowski, 1995; Sowińska, 1996; Kwiatkowska, 1997; Piotrowski, 1998; Gołębniak & Teusz, 1999; Klus-Stańska, 2012; Michalak, 2004) two basically different teacher's educational approaches may be determined. They are described as transmission strategy fossilizing students' cognitive passivity and activating strategy in which the student plays a role of an active seeker of knowledge and autonomously, due to the undertaken mental and physical actions, creates their own understanding of the surrounding world. This view on educational strategies may result from negation of a teacher's way of working with students based on the transmission of ordered information and knowledge about the world. The student's role is limited to acquiring the information in the shortest time possible. Therefore, the teacher's educational impact is only the transmission one, characterised by imposing semantic schemes equating experience with interpretation, concentrating on knowledge resources instead of ways of acquiring it, limiting the research action of students; disconnecting the content of school subjects from daily life, minimising students exploratory activities to presentation of scientific knowledge as the best and based on indisputable scientific evidence, weakening cognitive curiosity and tendencies to creative thinking caused by the demand of reproduction of presented handbook knowledge without the requirements concerning research skills and operational knowledge, significant advantage of a teacher's over student's activity focused on passing knowledge in the shortest possible time, reinforcing it and testing (Michalak, 2004). The acti-

vating strategy based constructivist theory of learning and reflected in multilateral activity of a student appears as a counter strategy. The teacher acts as a reflective practitioner. "Critically reflective practice in professional teaching contexts is one such example, where openness means that people involved may experience vulnerability" (Benade, 2016). It is the teacher who has to decide how much he or she is willing to change the attitude towards teaching.

This role limits teacher's interruptions to constructive intervention adequate to needs and conditions of learning. The time of joint teacher and students meetings (the episodes of mutual engagement) create a context for cognitive development and trigger an action. During these meetings, an adult is actively engaged in broadening students' behaviour repertoire helping to grasp the new idea and raising the child to a higher level of surrounding management competence. Subjective style of interaction is characteristic for activating educational strategy mainly because due to the fact that it fosters the shaping of a fully active learner. The teachers builds "the scaffolding", "opens" the zone of the closest development in which the achievements and skills "wait" to be realized. They can be only gained by previously shaped skills and knowledge and joint actions of both a student and a teacher. The teacher plays a role of an active supporter and caretaker, who helps the student take the next steps on their path of development (Michalak, 2004).

Teaching style does not only include teaching strategies but also the way of communication. Hence the attempt to describe the characteristics of teacher-students communication during science classes.

During the course of education many directions of information flow among the participants may be noticed. Apart from the source of content and form of communication, the direction of information flow is equally important. It is the direction of communication which strengthened a negative stereotype in didactics, setting the teacher as the only sender of information and the learner as the only receiver. Despite some minor innovations of the process, the functions remain the same. Information coming from the students mostly involve the one based on teacher-induced questions and instructions in order to assess the understanding, accepting and following the received information. The merit of educational process is then a merit of the received teacher's information.

Andrukowicz (1999) considers interaction in communication referring Ann Lindgren (1962) and describes four typical patterns of interaction flow among the participants of educational process. The first pattern points out the lack of interaction based on mutual communication between the teacher and the students. The teacher is clearly dominant and the students play a static role, receiving the information passively from one direction only. The dominant teacher sends the in-

formation and is not interested in possibilities of its reception and comprehension, assuming that all the students are able to acquire, understand, accept and follow the content of the information in the form it was presented.. The situation could be referred to as a teacher's communicative monologue, which creates a distance between the teacher and an anonymous receiver without considering individual differences and subjective possibilities of students.

The second pattern, unlike the one previously described, contains the students-induced information. The teacher's role is still the dominant one and the information coming from students serve only to control and assessment of the effects of "teacher sending". The student is not totally passive though their communication activity depends on the teacher.

The situation in which there is a possibility of the flow of information between the teacher and the student and between two students, takes some features of a dialogue. The dialogue however is dominated by the teacher, the student is in complementary position, adding some colour to the main theme of the teacher's monologue. There is still the distance between the teacher and the students who try to gain the teacher's approval knowing what and what not to say. There is no freedom of speech. According to Andrukowicz, the dispute may refer only to the form not to the information gained outside the school environment, which sometimes might be of a higher value than the teacher's. Nevertheless, the teacher is always right, formulates the information in the best possible way and ,as the students described, tries to be the "judge", "prosecutor", "solicitor" and quite often "executioner".

In order to engage the students in the search for information, turn them on to confront their contradictory statements, provoke to discovering the truth, release creativity, encourage in expressing their own views and interests, the multi-directional flow of information and real dialogue between the participants of educational process are necessary. Then the factual arguments instead of the formal ones become important. Interaction based on mutual and balanced understanding encourages weighing logical and irrational arguments, scientific and non-scientific ones. Creative struggle with the content and form of thought transfer teaches humility, self-confidence and emotional control, releasing the states of higher emotions, cooperation and autonomous thinking. This dialogued-creative empowerment of scientific anticipations or depersonalization of educational process subjects' anticipation increases not only an individual care and responsibility for the effects of this process but also decreases the distance between the objective norm and subjective value, between the teaching and learning for grades and teaching and learning for themselves (Andrukowicz, 1999).

The style in which teachers and students function together seems to be extremely important for the educational process. A modern teacher does not need to be the information centre in the classroom. It is virtually impossible for them to know everything and on every subject. Infallibility of a teacher is currently an unsubstantiated and harmful dogma, and does not result from a deficit of basic information preventing rational decision-making.

Dilemmas

With the current state of development of information civilization, the following questions arise: what should the goals of education be? Which type of teachers do students need: a master, an expressive individual, an authority or a vivid model? Is such a person important and meaningful in their lives? Or, perhaps, do students need someone completely different? Do we really face a devaluation of the importance of the teaching profession? Is it still so obvious that teachers shape the mentality of individuals? Then, what type of teaching can be considered the most appropriate and useful, bearing in mind the needs of today's student community and the positive development of students? Is it possible for a teacher to stop being the traditional master, passively transferring knowledge to students?

One should also remember that "teachers are not only teaching information about the subject but also teaching learners how to think, write and speak like subject specialists" (Dale, Tanner, 2012: 13).

The proposed new educational methods encourage teachers to change their style of work, forcing them to adopt the roles of observers, advisers, mentors and inspirers of students' activity (Raczyńska, 2010: 167).

All these dilemmas inspire reflection in those who educate teachers, but also encourage them to listen to students' opinions about their educators. All participants in the educational process have to engage actively with each other. We all learn throughout life, and not necessarily from the older and wiser, which has been stressed by Marian Diamond saying that "everyone can teach someone" (Dryden, Vos, 2000: 452). We teach children and we learn from children. Learning is not a one-sided transmission. Learning means examining, discovering and asking basic and unexpected questions. It also involves developing the most effective learning strategies, which should be discovered with the help of teachers. "We (teachers) should help to try out other strategies so that they (students) have a wider choice and can choose the best strategies to suit them and their learning situation" (Bentley, 2010: 74). Teaching is a dialogue. It is the meeting of two individuals:

a reflective teacher and a freestudent. Dialogue means freedom of expression and action, as well as being listened to (Michalak, 2010). Almost every subject implemented in the course of school education, at every level of education in the educational process, can be arranged in a manner that promotes, among other things, the formation of social competence and citizenship. "Citizenship is one of today's expectations from education" (Nowak-Dziemianowicz, 2014: 90).

Teachers can rarely implement multiple variants of educational solutions. These solutions are introduced from time to time, so that education is not merely based on highly abstract material, but remains connected with real life. This approach may help to develop learning skills which may be "(…) applied across the curriculum. They are skills which involve learning how to learn and developing learner autonomy. They can artistic, cultural, linguistic, mathematical, scientific, social and interpersonal skills". (Bentley, 2010: 26). Students must see the meaning of the things they learn and learn in a way that will motivate and mobilize them. Such a pragmatic approach to teaching is highly profitable with respect to the efforts of students and teachers, their satisfaction with achievements and reducing their regret over their lack of achievements.

Method

Research approach and sample

In order to establish which strategies are used by teachers , the students were asked about the way they work during classes, which meant which methods were used by their teacher: are there mainly verbal or action based methods or perhaps both? They were also asked about the teaching aids such as boards, atlases and albums, films, inanimate natural objects, plant and animal cultures, models, laboratory equipment and microscopes. The responses were then categorised according to the teachers' seniority and education in order to check whether these factors influenced the applied strategies.

Students' opinions about communication in the classroom were analysed in relation to the possibility of pupils asking questions during science classes, the nature of questions asked by students, methods of seeking answers to these questions and forms of students' involvement. In addition, Ned Flanders's system to analyse interaction in the classroom was used. The students were asked whether the teacher encouraged their actions, rewarded them, used students' ideas, asked questions or passed loads of information, ordered and set the demands, criticised, showed discontent or disapproval and asked for silence in the classroom. The phe-

nomenon of communication was also analysed according to teachers' seniority and education.

Characteristics of students' sample

The survey involved **870 schoolchildren** aged 12–13 years. They were sixth-grade students of primary schools. The survey aimed at determining whether the educational background and seniority of science teachers has a significant impact on students' opinions about the working styles of their teachers. In order to carry out detailed analysis, the surveyed students were divided into subgroups according to their teachers' seniority and type of education. Then, the responses of **343** students taught by biologists, **210** students of geographers and **280** students of teachers with non-biological and non-geographical education were analysed. The author also analysed the responses coming from **260** students of teachers with seniority of less than or equal to 10 years, **317** students of teachers with seniority ranging from 11 to 20 years and **236** students of teachers with the longest work experience, i.e. longer or equal 21 years.

Instruments

The research method was a diagnostic survey. It was based on a questionnaire for a six-grade primary school student. The questionnaire contained, among others, the categories developed by Ned Flanders (Wragg, 2001: 57–59) in order to analyse classroom interaction.

Appropriate statistical methods were used for the development of the collected research material. Finding out and the description of regularities occurring in pedagogical reality require the analysis of the phenomena both from the quality and quantity points of view (Krajewska, 1999). The objective of the study was to formulate conclusions concerning science teachers' teaching styles on the basis of students' opinion relating to working styles during classes and also the ways of communication among the participants of the educational process. A chi-squared test of independence was used to find a relationship between pairs of qualitative variables.

Procedure

The questionnaire was handed personally to every six grade student of primary school during science class. The information about the content of the questionnaire along with thorough instruction how to fill it in was given. It took the students about 40 minutes to complete the task.

Analysis

The collected data were coded and served to construct database in Excel. The data were prepared with the use of appropriate statistical methods. In this case CSS Statistica was applied.

Teaching methods adopted by teachers in the opinions of students

Over 70% of sixth grade students of primary schools say that their involvement in science classes consists of listening to the teacher who thoroughly explains, clarifies and gives a lot of information (Fig. 1).

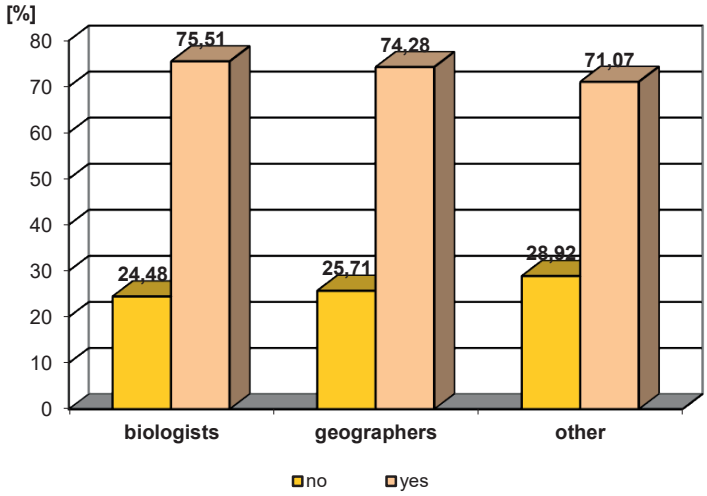

Figure 1. Involvement of pupils in science classes by the type of teacher education in the opinions of students: *the teacher thoroughly explains, clarifies and gives a lot of information*

Based on the declarations of students, it has been found that the involvement of pupils in science classes that consists in listening to the teacher has no relation with the type of teacher education.

Similar results have been obtained in the analysis of students' involvement in science classes depending on the seniority of teachers. Most of the students declare that their involvement in science classes consists of listening to the teacher, regardless of seniority. Reading information from a textbook and completeing exercises depend on the seniority of teachers. These types of activities were mostly indicated by students of teachers with the shortest work experience (Fig. 2).

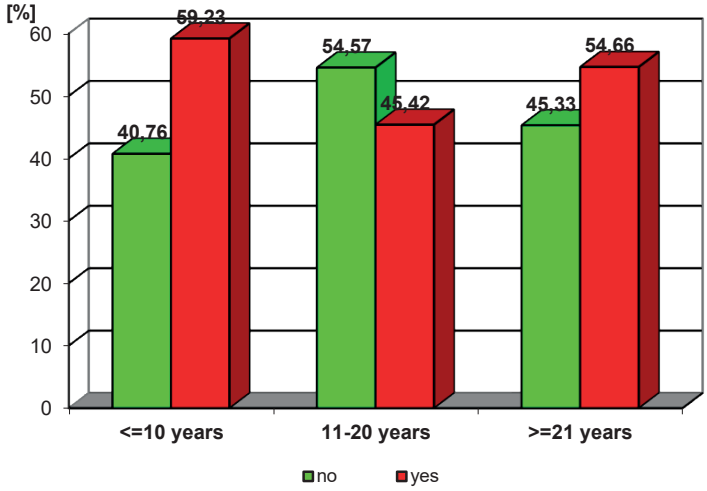

Figure 2. Types of students' activity during science classes by the seniority of teachers in the opinions of students: *students read information from a textbook and do exercises* ($p = 0.0031$)

Observing experiments performed by a science teacher in the classroom was most often indicated by students of teachers with seniority of ≥21 years – 23.42%, and least often by students of teachers with the shortest seniority – 16.92% (Fig. 3).

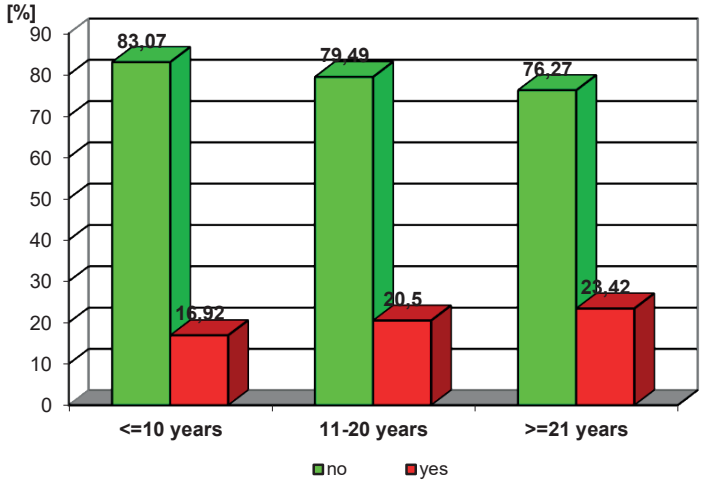

Figure 3. Types of students' activity during science classes by the seniority of teachers in the opinions of the students: *the teacher performs experiments and students watch*

The type of teachers education and their professional work experience are not correlated with scientific experiments being performed independently by students.

Most of the surveyed pupils declared that they did not carry out any experiments independently during science classes.

Independent observations, carried out by students during science classes, significantly depend on the length of teachers' work experience. Independent observations are most often performed by students of teachers with seniority of ≥21 years – 11.86% (Fig. 4).

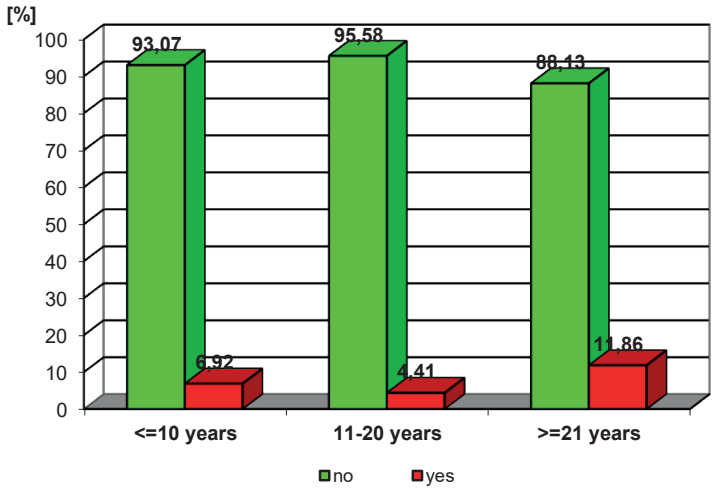

Figure 4. Types of students' activity during science classes by the seniority of teachers in the opinion of students: *students independently perform various typed of observation* ($p = 0.0046$)

There is a significant relationship between teacher education and teaching methods, such as science teachers conducting discussions with students and participants of classes exchanging information between each other. In the opinions of the surveyed students, geography teachers are least likely to discuss things with students, and representatives of other kinds of education are most likely to do so (Fig. 5).

Reading information from a textbook and completeing exercises are activities most often performed by students of geographers – 70.95%, and less often by students of biologists and other teachers – more than 40% (Fig. 6).

The teaching method based on showing students a variety of phenomena in pictures does not depend on the type of teacher education. Most of the students say that teachers did not show them any illustrations of various natural phenomena. Regardless of their education, teachers do not perform experiments that students could observe. It has turned out that 90% of sixth-graders do not carry out experiments during science classes.

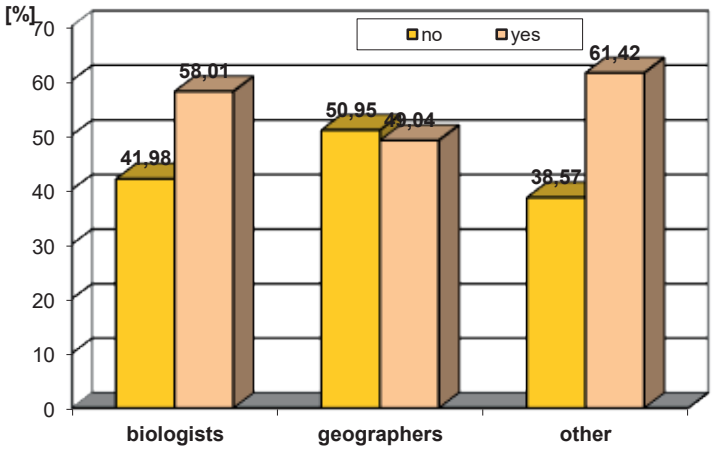

Figure 5. Types of students' activity during science classes by the type of teacher education in the opinions of students: *students discuss things and exchange information with the teacher* ($p = 0.0206$)

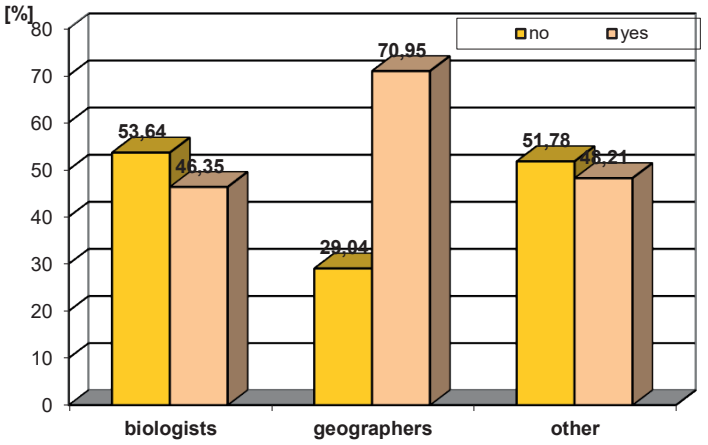

Figure 6. Types of students' activity during science classes by the type of teacher education in the opinions of students: *students read information from a textbook and do exercises*

Students also expressed their opinions about teaching aids used by their science teachers during classes. Their statements were analysed in terms of teacher education and seniority of teachers.

It has been found that there are significant correlations between the type of teacher education and the statements of students regarding the use of teaching aids, such as textbooks, atlases and albums of nature, journals of nature, inanimate natural objects, live plants or animal cultures and microscopes (Table 1).

Table 1. The use of teaching aids during science classes by the type of teacher education in the opinions of students

Teaching aids used in science classes	*P* for χ^2	Students of biologists [%]		Students of geographers [%]		Students of teachers with a different type of education [%]	
		No	Yes	No	Yes	No	Yes
Blackboard	0.4169	30,32	69.67	35.71	64.28	31.78	68.21
Textbook	**0.00003**	24.78	75.21	14.76	85.23	12.14	87.85
Atlases, albums	**0.0100**	29.15	70.84	20	80	20.71	79.28
Journals of nature	**0.00001**	89.50	10.49	82.38	17.61	76.07	23.92
Boards	0.2085	72.88	27.11	66.66	33.33	68.57	31.42
Films	0.2348	31.19	68.80	33.33	66.66	35.71	64.28
Software	0.3179	88.92	11.07	85.23	14.76	86.42	13.57
Inanimate natural objects	**0.0403**	42.27	57.72	52.85	47.14	43.57	56.42
Live plant or animal cultures	**0.0002**	77.25	22.74	72.85	27.14	63.92	36.07
Models	0.0732	61.22	38.77	70.47	29.52	62.85	37.14
Laboratory equipment	0.6493	59.76	40.23	56.66	43.33	60.71	39.28
Microscopes	**0.0000**	42.56	57.43	64.76	35.23	44.64	55.35

Students' opinions about the use of certain teaching aids in science classes are related to the seniority of teachers. These teaching aids include boards, atlases and albums, films, inanimate natural objects, plant and animal cultures, models, laboratory equipment and microscopes. About 80% of students declare that textbooks were the most common teaching aids used by science teachers, regardless of their seniority. More than 86% of students claim that teachers in all categories of seniority do not use software in science classes (Table 2).

Table 2. The use of teaching aids in science classes by the seniority of teachers in the opinions of students

Teaching aids used in science classes	*P* for χ^2	Students of teachers with seniority of ≤ 10 years		Students of teachers with seniority from 11 to 20 years		Students of teachers with seniority of ≥ 21 years	
		No	Yes	No	Yes	No	Yes
Blackboard	**0.00003**	43.46	56.53	25.86	74.13	29.66	70.33
Textbook	0.3714	20.76	79.23	16.71	83.28	17.79	82.20
Atlases, albums	**0.0292**	29.23	70.76	19.87	80.12	22.45	77.54

Journals of nature	0.3694	83.46	16.53	86.11	13.88	81.77	18.22
Boards	**0.00001**	77.69	22.30	73.18	26.81	58.47	41.52
Films	**0.0037**	41.53	58.46	28.39	71.60	32.62	67.32
Software	0.2159	90.38	9.61	86.11	13.88	86.86	13.13
Inanimate natural objects	**0.0000**	59.23	40.76	39.74	60.25	38.55	61.44
Live plant or animal cultures	**0.0008**	75.38	24.61	76.34	23.65	62.71	37.28
Models	**0.0002**	73.07	26.92	63.72	36.27	57.62	42.37
Laboratory equipment	**0.0048**	66.53	33.46	58.68	41.32	54.23	45.76
Microscopes	**0.0000**	63.84	36.15	41.64	58.35	44.06	55.93

Characteristics of classroom communication

The possibility of asking questions by students can be an indicator of the direction of the flow of information in the classroom. Regardless of the type of teacher education, most of the surveyed students claim that they can ask questions during science classes (Fig. 7).

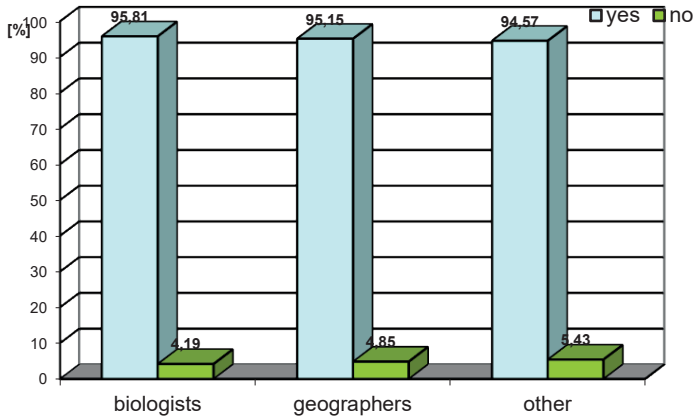

Figure 7. The possibility of asking questions by students during science classes by the type of teacher education

The vast majority (98.30%) of sixth-graders taught by teachers with seniority of ≥21 years think that they can ask questions during science classes, and 93.55% of students of teachers with seniority between 11 and 20 years also declare such

a possibility. A chi-squared test shows a statistically significant correlation at the level of $p = 0.0280$ between the seniority of teachers and students' answers about the possibility of asking questions during science classes (Fig. 8).

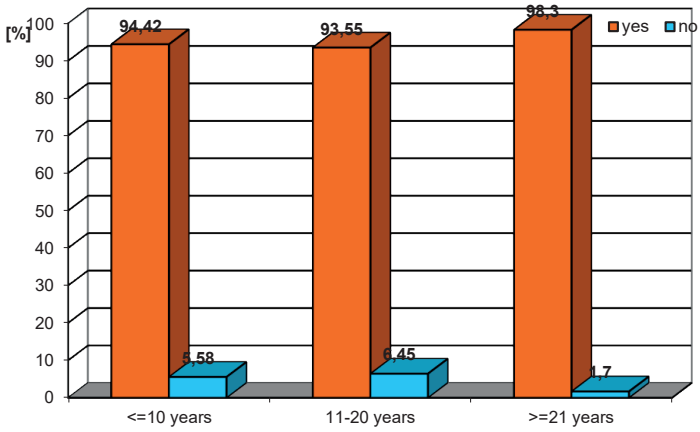

Figure 8. The possibility of asking questions by students during science classes by the seniority of teachers ($p = 0.0280$)

The nature of students' questions is related to topics. Most often students ask for information and less often for a way to solve a task. Their questions least frequently relate to other matters. The type of teacher education and the length of their work experience are not related to the nature of students' questions.

Based on the analysis of students' opinions about ways of seeking answers to questions, it has been found that they have no correlation with the type of teacher education, yet are related to their seniority (Fig. 9).

Students of teachers with seniority of ≥21 years usually seek answers to their questions independently – 79.24%, while only 7.2% of respondents accept answers given by their teacher. For comparison, 18,58% of students of teachers with seniority between 11 and 20 years and 15.23% of students of teachers with seniority of ≤ 10 years declare that they accept answers given by their teacher. The highest percentage of pupils (17.57%) who are satisfied with answers given by their fellow classmates is students taught by teachers with seniority between 11 and 20 years.

The directions of verbal interaction can also be assessed on the basis of the forms of the students' involvement, for example, depending on whether a task is solved collectively by all students or by small groups of students (3–5). Most of the surveyed students say that they sometimes work in groups during science classes. It has been found that the frequency of group work in the opinions of students does not depend on the type of teacher education.

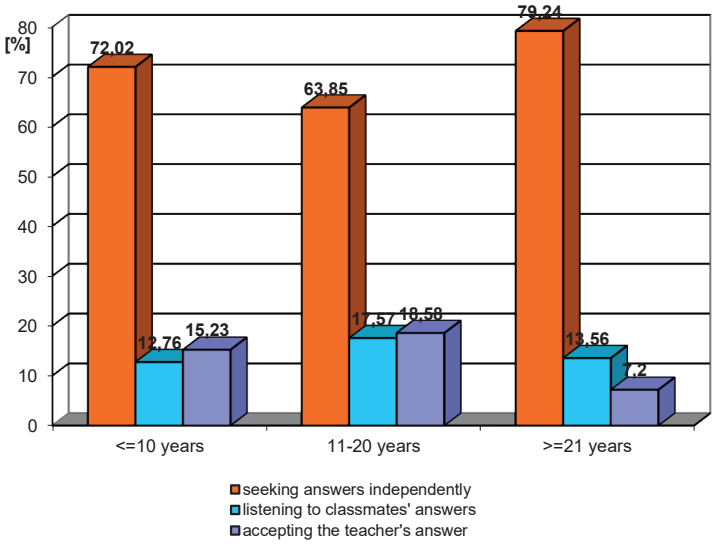

Figure 9. Ways of seeking answers to questions by students by the seniority of teachers ($p = 0.0007$)

It is easier to develop a divergent way of thinking in students working in a team rather than individually. Group work makes it possible to exchange and confront ideas, develops creative dispositions, makes it easier to understand the content and know one's own shortcomings and imperfections. According to students' statements, the frequency of group work significantly depends on the seniority of teachers. The p value for the chi-squared test is 0.0397 (Fig. 10).

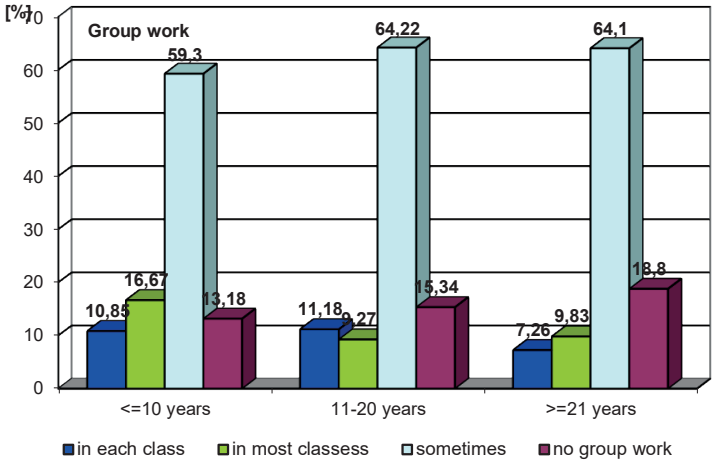

Figure 10. Frequency of group work by the seniority of teachers in the students' opinions ($p = 0.0397$)

Ned Flanders's categories were used to determine students' preferences for the verbal behaviour of the teacher. Students were asked to choose their preferred communication behaviours of the teacher from the following seven categories: the teacher accepts the emotions and attitudes of students, rewards and encourages students, uses the ideas of students, asks questions, gives speeches, gives advice, criticizes, students react to the teacher's statements, students speak to the teacher, there is silence or confusion in the classroom.

It has been observed that transmitting large amounts of a variety of information in science classes is students' favourite type of verbal behaviour adopted by the teacher, regardless of the type of teacher education. Apparently, students are used to this type of work in the classroom.

The nature of communication in the classroom depends more on seniority than on the type of teacher education. Students indicated that teacher behaviours, such as encouraging students to take action, rewarding and emboldening them, using and developing students' ideas and suggestions, asking students questions and transferring large amounts of information depend significantly on the seniority of teachers (Table 3).

Table 3. Students' preferences for teachers' verbal behaviours by their seniority

Teacher behaviour	*P* for χ^2	Seniority of ≤10 years	Seniority of 11-20 years	Seniority of ≥21years
Encouraging students to take action, rewarding and emboldening	0.0001	36.92	40.38	54.66
Using students' ideas	0.0004	37.69	29.34	45.76
Asking questions	0.0027	20.77	11.99	22.03
Transmitting large amounts of information	0.0000	56.54	47.63	68.64
Ordering and defining requirements	0.1458	7.31	5.05	3.39
Criticizing, showing dissatisfaction and disapproval	0.0670	6.92	4.42	2.54
Calling for silence in the classroom	0.6920	18.85	19.24	16.53

Most often, students of teachers with the longest work experience affirmed that they like it when the teacher encourages them to act, rewards and emboldens them, uses their ideas, but also asks questions. The above-mentioned variants of teacher behaviour in science classes were least often indicated by students of teachers with the shortest seniority.

Conclusions

The results of the study have led to the following conclusions. Based on the opinions of the surveyed sixth-grade students of primary schools, it can be stated that the most common way teaching approach in science classes is, still the transmission of knowledge by teachers, particularly among those with the shortest work experience. Students declare, among other things, that they usually perform tasks whose exclusive purpose is to acquire knowledge, and that they use other than a handbook or exercise book teaching aids, to a very limited extend. Answers given by students may result from the behaviour of teachers to whom students are accustomed.

Teachers are obliged to implement the curriculum of science education in accordance with official requirements and care for the best results of their own work. However, this should not be an obstacle to finding original detailed solutions. Such solutions can only be found if a teacher is characterised by high teaching reflectivity conducive to professional development. "It seems that teachers identify professionalism with a perfect, reconstructive craft rather than personal development and professional awareness, both of which condition the ability to take conceptual initiatives and make accurate decisions in unique, unpredictable situations in school" (Arciszewska, 2008: 296). Teachers are probably not fully committed to the use of activating strategies in teaching, which were introduced to science education by administrative channels. Thus, methodology guides are not always useful for preparing for work, which may be a result of certain bureaucratic requirements, imposed without taking into account local contexts.

> In the area of thinking and acting in education, we have to deal with false teaching awareness. It determines such a way of perceiving and understanding the world that is based on distortion and falsification. Distorted (…) reality, as well as the causes and effects of action that occur in it are considered selectively, inaccurately, inadequately and unrealistically. As a result, we begin to have pedagogical experts (e.g., methodologists), who do not understand education, its contexts, circumstances and mechanisms, who have their projects but do not know in fact what they talk about. (Klus-Stańska, 2008: 31–32)

Perhaps the school as such, should not be managed centrally. Teachers are formed by the teacher training system, which is why they act in a specific manner. They obediently carry out what is required of them. Therefore, teachers and in particular beginners, should not be blamed for the current state of affairs.

Interestingly, teachers with longer work experience more often organise tasks to activate students involving presentations and demonstrations and let students

ask questions, which may indicate that they prefer problem-based learning in science classes, conducting observations of phenomena and natural objects with their students and letting pupils carry out simple experiments during classes more frequently. It can therefore be presumed that teachers with the longest work experience are more inclined towards dialogue-based rather than monologue-based education, in contrast to teachers with shorter seniority. This is probably due to the fact that the youngest teachers provide their students with ready answers in order to have more control over the information acquired by students and then, by asking students, they expect to receive specific, precise responses that are consistent with the official school curriculum. There is no room for spontaneity and diversity responses. This leads to all kinds of inhibitions in students who learn bad habits. As a result, learning becomes a reproductive process. Not to mention the negative consequences in the area of emotional and social development. Hence, young teachers should receive professional and competent assistance from their older colleagues, the so-called internship coordinators, who have more experience and perhaps greater reflexivity, which is an inherent precondition for any changes.

On the basis on students' opinions concerning teaching styles of science teachers, the tendency towards syncretic combination of divergent and sometimes conflicting views on teaching has been observed. Through this syncretic teaching style, some teachers seek new teaching solutions and do not rigidly follow the schemes that have been recognized as effective. This may result in a new approach to teaching-learning process, which is slowly emerging and which inspires optimism and hope.

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