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Implementation of Inquiry-Based Education in Geography Teaching – Findings about Teachers´ Attitudes

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Abstract

Young people's interest in scientific and technical subjects, including geography, has been declining for a long time. According to the European Commission, the most important reason for the decline in interest is the way these subjects are taught in primary and secondary schools. As a result, numerous projects to support inquiry-based methods have been launched in recent years and significant changes have been made to the national curriculum in many of the European countries. Geography as a school subject, due to its multidisciplinary nature, provides options to make lessons more attractive and increases students´ motivation to learn by using practical research during lessons. This case study presents the results of a questionnaire survey that was conducted among geography teachers in Slovakia. The aim of the study was to measure the attitude of Slovak teachers, students and society towards Inquiry-based Education (IBE). Based on the results, the current position and degree of implementation of IBE in Slovak schools were estimated. It was determined that the implementation of IBE in teaching is not an easy task for teachers. To implement IBE successfully requires compliance with many elements, such as improvements in teacher training, curriculum changes and pupil´s assessment.

Keywords

Geography, Inquiry-Based Education, Primary School, Secondary School, Teachers, Slovakia

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In 2008 the new Slovak curriculum for primary and secondary schools was introduced, and then further innovated in 2015. Apart from modernized teaching content and new general objectives of education, students' key competencies were also presented. The need to meet these new objectives influences the methods used by teachers. Geography as a school subject, due to its multidisciplinary nature, offers many possibilities to make lessons more attractive. Teachers realize the teaching of geography should not be conducted in a transmissive (deductive) way; from which it is typical for the teacher to pass on finished information to the students and require them to memorize definitions. The use of ever-improving technologies already makes possible the ability for students to retrieve definitions and standard information. Teaching and learning of geography at school should equip students with skills that enable them to apply what they have learned in practice and to participate fully in cultural, social and professional life (Bernard, Maciejowska, Odrowaž, Dudek, & Geoghegan, 2012). Rather than targeting a body of knowledge, it is necessary to focus on deep but perfectly mastered basic knowledge about the Earth and the countries in it, and also about the fundamental laws upon which our world stands and functions (Karvánková & Popjaková, 2018). These need to be developed and elaborated into students' activities. Thus, constructivist (inductively) guided teaching comes to the fore, in which students are allowed to discover, create and construct information. It is a research-tuned concept of education (Inquiry-Based Education), which allows students to develop the skills of scientific work.

Geography, as a field of education, offers the potential to enrich education in natural science subjects through Inquiry-based Education (IBE). The breadth of its subjects, covering not only the natural but also the human landscape as the place of living and implementation of anthropological activities, also brings geography closer to the social sciences (Karvánková & Popjaková, 2018). For that reason, geography is also able to develop IBE in the area of social studies and link to social themes such as civil (social) education or history. Generally, geography as a school subject with a multidisciplinary and interdisciplinary reach can support IBE in natural science as well as social studies.

Background

According to Linn, Davis, & Eylon (2004) inquiry is the intentional process of diagnosing problems, critiquing experiments and distinguishing alternatives, planning investigations, researching conjectures, searching for information, constructing models, debating with peers and forming coherent arguments. Inquiry-based learning is an educational strategy in which pupils follow methods and practices similar to those of professional scientists in order to construct knowledge (Keselman, 2003). Inquiry-based learning is gaining popularity in curricula, international research and development projects as well as teaching (Pedaste, Mäeots, Siiman, de Jong, van Riesen, Kamp, Manoli, Zacharia, & Tsourlidaki, 2015).

Inquiry in the learning process, like scientific inquiry, is aimed at asking questions, finding answers, and using appropriate arguments to explain and justify

the findings (Ash, Bartels, Dow, Dyasi, Harlen, Hein, Bell, Lee, Rankin, John, & Worth, 2003). The students find the answers by actively exploring the world around them, proceeding in the same way as a scientist by experimenting with an object of exploration or creating theories, models of behaviour of an object or system (Bilgin, 2006). Inquiry can be defined as a process of discovering new causal relations, with the learner formulating hypotheses and testing them by conducting experiments and/or making observations (Pedaste, Mäeots, Leijen, & Sarapuu, 2012). It was in the Sciences that inquiry has experienced its main impetus. Many researchers (for example, Chiappetta 2008; Minner, Levy, & Century, 2009) have provided thorough overviews of the historical development of scientific inquiry in the field of education, however, inquiry is not exclusive to the Sciences.

The implementation of such research activities includes several phases. It begins with the formulation of the problem. Next, it continues with the design and implementation of the solution procedure, data collection in an experiment or modelling, and data analysis and evaluation. Finally, the implementation ends with the interpretation of results, formulation of conclusions and substantiation of findings. Llewellyn (2002) describes a six-step inquiry model as seen below in Figure 1.

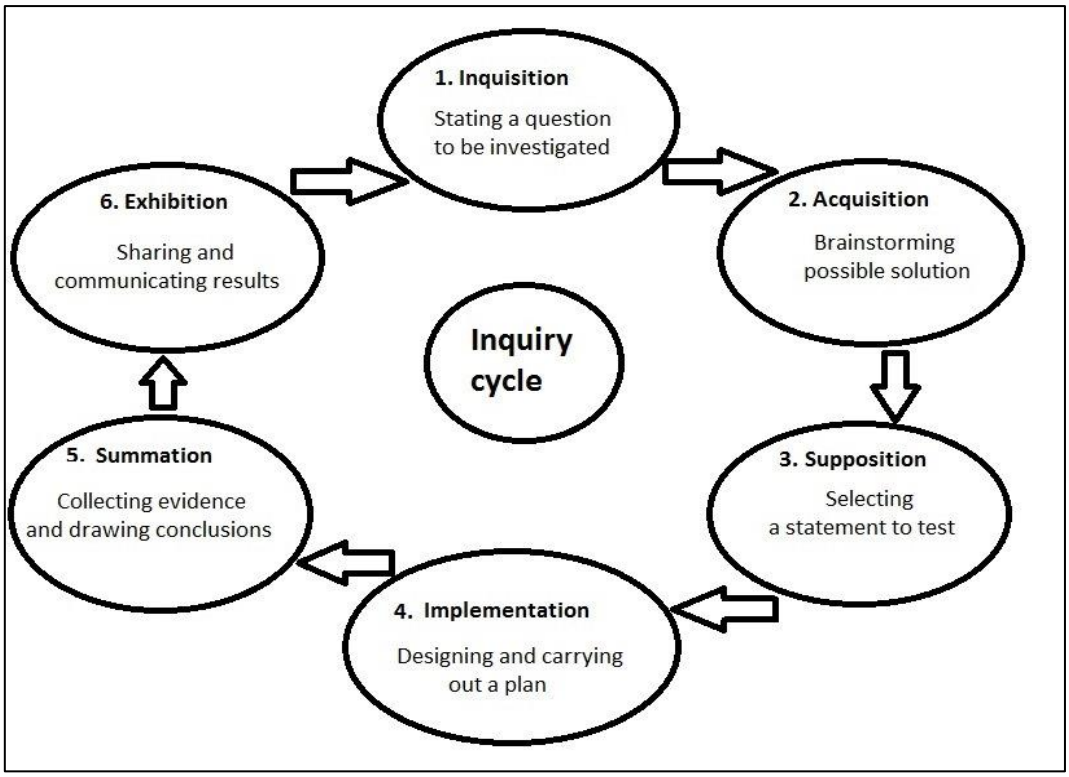

Figure 1. Model of IBE cycle

The teacher provides and manages the conditions for such learning; in so doing the teacher helps students to organize activities and represents themselves as a counsellor in the formation of questions and problems. Inquiry-based teaching is an organized and intentional effort on behalf of the teacher to engage students in

inquiry-based learning. The goal of inquiry teaching is not to transfer scientific knowledge, facts, definitions, and concepts. Rather, it is to enhance students´ ability to reason and to become independent learners who are capable of identifying main questions and finding relevant answers by a gradual acquisition and expansion of a body of scientific knowledge and abilities. The term 'Inquiry literacy' defined by Shore, Birlean, Walker, Ritchie, Labanca, & Aulls (2009) as the individual's capacity to critically understand and use the language, symbols, and skills of inquiry, and to reflect on their meaning and usage during and after the activity becomes important to understand.

From Figure 1, we see that IBE begins with exploratory activities, where the teacher provides some information, suggests a practical activity, plans a stimulating situation or random situation in which the phenomena representing the subject of the research are included. It is appropriate to prepare a stimulating situation from real-life examples likely to be experienced by the students. Conversely, some stimulating situations can be drawn from unexpected or surprising situations already observed by the students and based on their previous experience and intuition. Students explore information or observe a mysterious event, creating implicit questions that result in the **formulation of a research question**. Students look for answers through observation and research; they look for new questions and problems that are similar to those previously addressed and solved, which they use and adapt, if necessary, in a known process. The research process leads to **the determination of hypothetical answers**: assumptions that need to be verified. At the same time, students use their knowledge and ideas to search for laws, that explain the obtained data by searching for regularity or anomaly; they will then discuss possible solutions. Students establish a hypothesis or assumption to test and verify. Depending on the type of problem or hypothesis identified, **one or more ways to verify the established hypothesis will be developed**, so students analyze additional data to verify whether the hypothesis is valid even after looking at other information and findings (using experiment, model, search in secondary sources, observation, or immediate manipulation - trial and error). Based on **the obtained data** (research results), students formulate conclusions, the teacher organizes a discussion and assigns a word. **Students analyze** the thought process they used to find the laws/regularities and formulate conclusions. The teacher asks the students **how they came up with their solutions**.

If we look at the individual steps of the inquiry cycle (Figure 1), it is clear students cannot be expected to be able to immediately ask research questions and implement the entire sequence of steps of the inquiry cycle independently. Pupils' inquiry skills need to be developed gradually, therefore it is up to the teacher to design the activity taking into account the intellectual level of the pupils and thus providing the pupils with an adequate level of independence (Ježková, Lukáč, Hančová, Šnajder, Guniš, Balogová, & Kireš, 2016). For example, Artvinli (2010a) suggests using the 5W 1H technique to develop student's ability to start asking questions because it is a

student-centered approach that can be used to reveal detailed and structured answers in geography lessons.

Therefore, many authors distinguish between several levels of inquiry, depending on how much information needs to be provided to students (i.e., auxiliary questions, instructions for the research procedure, instructions for data processing, etc.), or the extent to which the activity is managed and interfered (helped) by the teacher (i.e., with questions, comments, guidelines, etc.). Students require support to undertake inquiry (Alfieri, Brooks, Aldrich, & Tenenbaum, 2011). Without support, they generally experience difficulties regulating their own learning processes, undertaking investigations and drawing conclusions (Zimmerman, 2007). To facilitate the learning of this regulation, it is important for the student to experience the varying levels of openness of the inquiry learning task. This can be done by structuring the inquiry process in such a way that learners are guided through inquiry opportunities, whilst engaging in hypothesizing, experimenting and concluding (Jiang & McComas, 2015).

The four-level classification of inquiry - confirmation, structured, guided and open inquiry (Banchi & Bell, 2008) - was extended by other authors (Kireš, Ješková, Ganajová, & Kimáková, 2016) to five basic levels of inquiry activities depending on the level of the teacher's guidance and direction, intellectual difficulty and support of teaching materials.

Interactive demonstration. The experiment is performed by the teacher who asks questions in an interactive way and leads a student discussion around them. The student makes predictions, thinks, compares and draws conclusions.

Guided discovery. Students receive a problem from the teacher to investigate, however, they also receive detailed instructions about how to proceed in solving the problem. The result the students have to reach is already known in advance; they only have to verify it with their own practice.

Guided inquiry. Students solve a problem formulated by a teacher based on a preparation process. The teacher significantly influences the research and helps the students (asks them guidance questions or suggests possible solutions), the students look for the solution independently on the basis of the evidence they have obtained during the research.

Bounded inquiry. Students solve a problem formulated by a teacher based on a procedure that they prepare (design). The teacher guides the students in the research - together with the students they determine the research question and provide advice in planning the solution procedure, which the students themselves design and implement.

Open inquiry. Students solve a problem, which they formulate independently based on a procedure that they prepare (design). Students ask themselves questions, think about the process, carry out research and formulate results. This is the highest level of Inquiry-based education, which freely builds on previous levels

and is closest to real scientific research. In previous levels, the teacher intervened in the research to varying degrees. This level is suitable for the highest age categories of students or for gifted students.

According to Kidman, & Casinander (2017) teachers themselves would have to first become inquiry-literate before they can effectively provide opportunities for students to engage in inquiry-oriented activities. Such inquiry-oriented activities include asking questions, conducting investigations, gaining understanding based on evidence, reporting their findings and reflecting. For inquiry to be effective, three frameworks must become intertwined - classroom goal, instructional approach and degree of teacher-given direction. This framework will enable students to develop the ability to recognize assumptions, use critical and logical thinking, and acknowledge alternative explanations. It is essential that the student is at the center of the process as a participant and be a central participant who becomes increasingly independent. Teachers should understand what inquiry means, what activities they can carry out with their students, what levels are appropriate for their students, etc., in order to move from teacher-centered education to student-centered inquiry lessons and labs.

Methodology

This case study is based on the quantitative and qualitative methods of data collection and procedures analysis of their results. The research had three stages. In the first stage (the period of preparation), the current national curricular documents (The National Institute for Education, 2014a, 2014b) were examined with respect to the potential application of IBE methodology in geography teaching. At the same time, scholarly literature on IBE geography teaching was reviewed, both in the global and local scale.

In the second stage, an electronic questionnaire was conducted during the Spring of 2020. The questionnaire was completed by 114 geography teachers in Slovakia (89 female and 25 male), who teach at primary school (73.3%) or grammar school (26.3%) from all regions of Slovakia. The questionnaire was completed electronically and conducted anonymously. The questionnaire was divided into an introductory part (items to identify the respondent - gender, type of school, career level, length of practice and frequency of use of IBE) and the questions themselves.

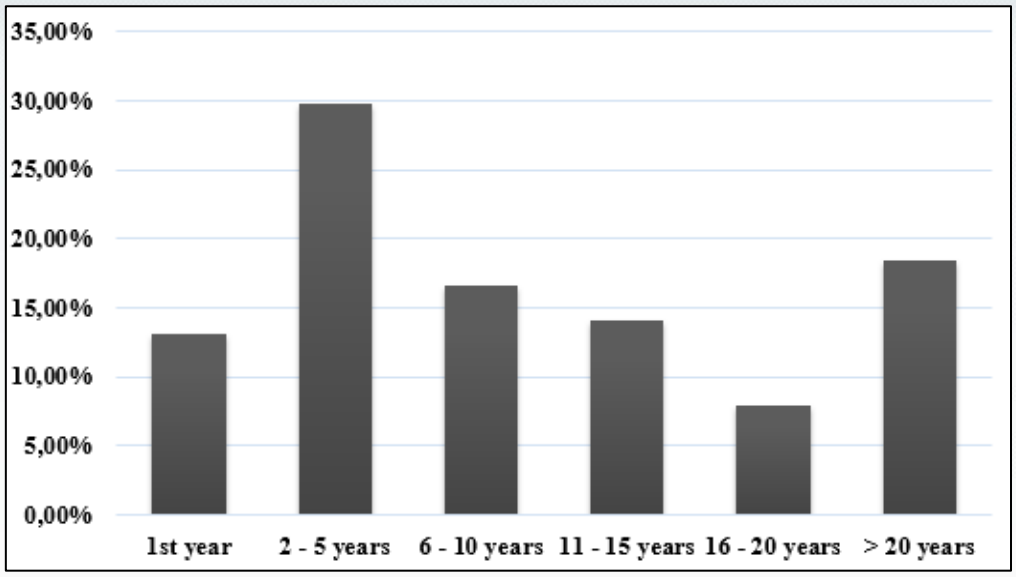

Figure 2. Length of Teaching Experience

The purpose of the questionnaire was to find out what Slovak teachers think of teaching methods based on inquiry. The following four areas that may affect the application of IBE in Slovak schools were analyzed:

- Teachers and IBE
- Pupils and IBE from the view of their teachers
- School curricula and IBE
- Evaluation of pupil´s working with IBE

The respondents could answer the questions using a five-point, bi-polar scale of the following type: strongly disagree, disagree, not sure, agree, strongly agree.

In the third stage, the answers were used to estimate the current position and degree of implementation of IBE in geography teaching across schools in Slovakia.

Findings

Analysis of Teacher's Answers

From the results of the questionnaire, it was found that teachers are increasingly aware that the path to knowledge is as important in learning as the content. Therefore, it is equally important to focus not only on what students are learning but also on how they learn it. Although only 13 teachers (11.4%) used research activities almost every lesson, 44 teachers (38.6%) used them at least once a month. Together, they make up half (50%) of all teachers who participated in the study (Figure 3).

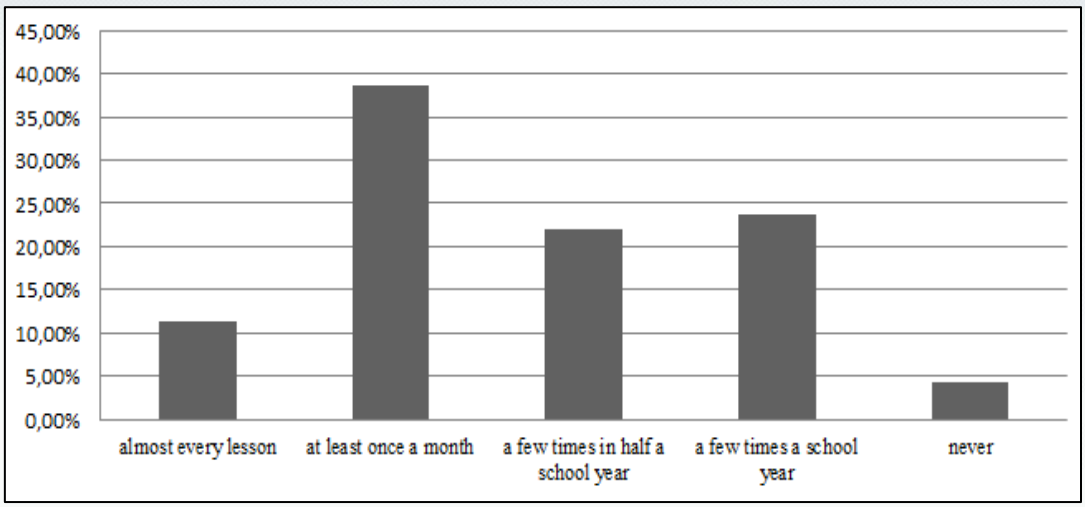

Figure 3. Frequency of IBE Use in Geography Lessons

Up to 62.3% of teachers disagreed and 3.4% strongly disagreed with the statement that teachers prefer research activities to traditional methods (Table 1). On the contrary, they thought that students preferred these activities to traditional methods (49.1% of teachers surveyed agreed with the statement and 2.6% even strongly agreed). The majority also agreed with the statement that the school management supports the implementation of these activities in teaching (52.6% agreed and 10.5% strongly agreed).

Table 1
Preference for IBEs and Traditional Methods

Assertion	strongly agree		agree		no sure		disagree		strongly disagree	
Teachers prefer IBE methods to traditional methods	3	2.6%	10	8.8%	26	22.8%	71	62.3%	4	3.4%
Pupils prefer IBE methods to traditional methods	3	2.6%	56	49.1%	30	26.4%	21	18.4%	4	3.5%
School management supports the implementation of IBE	12	10.5%	60	52.6%	32	28.1%	9	7.9%	1	0.9%

One of the reasons why teachers do not use IBE more often may be the time aspect (Table 2). Teachers thought that IBE required more time than traditional methods, for which they needed longer time blocks than 45 minutes (1 lesson). Respondents mostly agreed or completely agreed with both statements (about 83% of teachers surveyed).

Table 2
Results of the Questionnaire Describing the Time Aspect of IBE

Assertion	Strongly Agree		Agree		Not Sure		Disagree		Strongly Disagree	
IBE requires more time than traditional methods, but there is insufficient time for this in school	24	21.1%	71	62.3%	9	7.9%	10	8.8%	0	0%
IBE requires longer blocks of time than are not normally available in the school timetable	32	28.1%	62	54.4%	10	8.8%	10	8.8%	0	0%

Other statements were focused on teachers' views about students' attitudes to the use of IBE in teaching (Table 3). Teachers thought (57% agreed and 10.5% strongly agreed) that with IBE, students are lacking confidence and surety if they are not working according to the exact instructions of the teacher. Also, up to 73.7% of the teachers thought (60.5% agreed and 13.2% strongly agreed) that students needed enough knowledge about the issue to be able to use IBE. As many as 93% of teachers are convinced (58.8% agreed and 34.2% strongly agreed) that IBE requires more thinking from students than traditional methods, because IBE requires active student participation in creative activities and self-regulation.

Table 3
Results of the Questionnaire Describing the Pupil´s Attitude to IBE from the View of Their Teachers

Assertion	Strongly Agree		Agree		No Sure		Disagree		Strongly Disagree	
Pupils lack the confidence to work without explicit instructions from teacher	12	10.5%	65	57%	14	12.3%	23	20.2%	0	0%
Pupils require a good foundation to benefit from IBE	15	13.2%	69	60.5%	13	11.4%	15	13.2%	2	1.8%
IBE requires more thinking than traditional methods	39	34.2%	67	58.8%	7	6.1%	1	0.9%	0	0%

Surveyed teachers confirmed (Table 4) that it is still not common practice in Slovak schools to use IBE in geography lessons because the effective application of IBE places high demands on teachers. Almost 85% of the interviewed teachers thought (71.1% agreed and 13.2% strongly agreed) that the use of IBE requires more competencies from teachers. One of the reasons why teachers do not implement IBE more often is that they feel insufficiently prepared, because the use of IBE requires more skills and knowledge of the subject from teachers (almost 90% of respondents agreed or strongly agreed). The interdisciplinary nature of IBE requires more competence from the average teacher, who felt a lack of knowledge and skills in other natural sciences (almost 72% agreed or strongly agreed).

Table 4
Results of the Questionnaire Describing the Teacher´s Attitude to IBE

Assertion	Strongly Agree		Agree		No Sure		Disagree		Strongly Disagree	
IBE requires more competence on the part of the teachers	15	13.2%	81	71.1%	14	12.3%	3	2.6%	1	0.9%
Teachers need deeper understanding if they are to facilitate pupils' engagement with challenging tasks	26	22.8%	76	66.7%	9	7.9%	3	2.6%	0	0.0%
IBE tasks are often interdisciplinary and can involve topics that are outside the teachers' comfort zone	12	10.5%	70	61.4%	22	19.3%	1	0.9%	0	0.0%

In Table 5, it can be seen that most teachers believe that textbooks are too normative for the use of IBE (73.7% agreed and 10.5% strongly agreed). However, almost half of the teachers who participated in the study confirmed it is not difficult to find suitable topics in the current curriculum where they could use IBE. Topics should be attractive to students and should encourage students' natural curiosity. The teacher should choose activities that are motivating for students and have the potential to engage students, but at the same time are related to the content of the curriculum and allow students to acquire knowledge through research. Interdisciplinary activities can be suitable for examples of activities.

Table 5
Results of the Questionnaire Describing the Inclusion of IBE in Existing School Curricula

Assertion	Strongly Agree		Agree		No Sure		Disagree		Strongly Disagree	
Textbooks are too prescriptive for use in IBE	12	10.5%	84	73.7%	15	13.2%	3	2.6%	0	0.0%
It is difficult to find suitable IBE topics	2	1.8%	41	36.0%	20	17.5%	48	42.1%	3	2.6%

The majority of teachers thought (76.3% fully agreed and agreed with the statement) that it is easier to assess by giving students information in the form of marks or a percentage of success. These numbers tell students how they rank compared to other classmates but they do not give them information about what they have learned and what they have failed to learn. This is the so-called summative evaluation, which is aimed at evaluating the quality of the output. Its purpose is to get a final overview of the achieved performance, diagnose the students and inform them about their success.

There were 72.8% of teachers (fully agreed and agreed with the statement) who thought that when the way of teaching changes, the assessment must also change. IBE needs to assess not only the level of conceptual understanding (summative assessment) but also the development of competences and skills (formative

assessment). Its goal is to detect the student ´s progress in learning, or stagnation, or to alert them to a mistake they are making.

Table 6
Results of the Questionnaire Describing the Evaluation of Pupil´s Working with IBE

Assertion	Strongly Agree		Agree		No Sure		Disagree		Strongly Disagree	
It is easier to assess pupils' progress using traditional methods	17	14.9%	70	61.4%	18	15.8%	8	7.0%	1	0.9%
It is difficult to compare pupils' achievement in IBE because they are engaged in different tasks and generally work in groups	13	11.4%	65	57.0%	17	14.9%	17	14.9%	2	1.8%
New forms of assessment are needed which favor IBE	19	16.7%	64	56.1%	26	22.8%	5	4.4%	0	0.0%

Discussion

Based on the obtained results, it can be stated that teachers have a positive attitude towards IBE. They feel that scientific research in geography lessons is interesting and attractive for students. Problem presentation is very motivating for students (motivation toward non-traditional problems solutions or creating problem situations) because they see the sense and usefulness of the things that they are going to study. Therefore, it forces them to identify what they should know about problem-solving. On the other hand, teachers think that Slovak teachers currently use mostly traditional forms of teaching in geography classes because they are not yet sufficiently prepared for the implementation of IBE and they do not feel confident in using IBE methods. Teachers confirmed in their answers that the effective application of IBE places high demands on the teacher, in addition to professional erudition. IBE also requires professional competencies such as flexibility, alertness, ingenuity and creativity. Therefore, one of the reasons why teachers do not implement IBE more often is that they feel insufficiently prepared and/or they have not yet acquired the necessary competencies. When dealing with issues in individual IBE activities, topics that are the content of different subjects often overlap. Even when solving problems in everyday life, it usually does not concern only one school subject.

In Slovakia, geography is a stand-alone curricular subject where instruction occurs across lower and higher secondary education. The teaching standards for geography are included in a State Educational Program (National Curriculum) together with other school subjects, organized into educational areas. The teaching standards are defined by performance and content as a minimal level of knowledge and skills students have to achieve (Csachová, 2020). Slovak teaching standards (The National Institute for Education, 2014a, 2014b) are highly demanding content-wise. Therefore, the education should be realized with IBE elements to create better logical, critical and creative abilities of students. In their responses, teachers agreed

that IBE is time-consuming, requiring longer teaching blocks for each subject - to give students enough space to focus on the facts being researched, on data collection and for appropriate group and class discussion. In Slovakia, the school reform in 2008 reduced the hours of individual subjects. In 2014, the Ministry of Education, Science, Research and Sport of the Slovak Republic released the innovated National Educational Programs (NEP) for primary school and primary education and lower secondary education (ISCED). Primary schools started education under the innovated NEP from 1st September 2015, gradually from 1st and 5th year of primary school. The subject of geography is taught in the 5th year in the range of 2 teaching hours per week (66 teaching hours per year) and in the 6th, 7th, 8th and 9th years it is 1 teaching hour per week (33 hours per year). The curriculum of geography is divided into individual years into thematic units (The National Institute for Education, 2014 a, 2014b). Due to the school curriculum, the number of geography lessons in individual years can be increased. Objectively, however, it should be added that in schools there is often no desire to increase the number of hours for geography in the school curriculum. The hours are strengthened mainly in favor of foreign languages or other subjects defined by the state curriculum as cross-cutting themes. Therefore, it is not surprising there is no room for creativity, and the lack of time causes the absence of constructivist (inductively) led teaching (Tomčíková & Rakytová, 2018).

More than half of the teachers surveyed think that students prefer active learning methods so the application of IBE can increase their interest in science. On the other hand, up to two-thirds of teachers are convinced that students do not have the appropriate skills to work independently and do not feel confident when working without specific instructions from the teacher. However, it is a mistake when a teacher starts to push their process through guiding questions or by offering solutions. If the student is to reach a solution through their own research and verification, then the teacher's ability to understand how students think about the phenomenon being studied is much more important. If the teacher wants students to work creatively, they should let students work without unnecessary instructions (e.g., work creatively, read with understanding, etc.). Almost three-quarters of teachers believe that students need enough knowledge about the issue to be able to use IBE. On the contrary, the development of creativity requires only a minimum of information–the information that is necessary to start independent work. Meaningful learning is an active cognitive process that proceeds with the use of thinking in which the student uses past experience, and the students own previous knowledge in receiving, understanding and further processing of input information. The result is mental constructions, which the student interprets as meaningful structures of their own knowledge. It is characteristic of IBE that students think about different issues, analyze problems or tasks, and seek to try different solutions. The dominant motive here is curiosity, which is manifested in the desire to solve problems, find answers or explanations. The task assignment itself should support and enable creative thinking, i.e., flexible, fluent thinking, and the ability to solve

problems, tasks and situations in a unique way. Learning by discovery should give students opportunities to express and realize their own interests, as well as satisfy their curiosity.

According to the surveyed teachers, the textbooks currently available in Slovak schools are not suitable for the introduction of IBE because they are too prescriptive. On the other hand, teachers are convinced that it is not difficult to find topics that can be taught in this way in the current curriculum. In Slovakia, the requirement to use IBE in the subject of geography is placed in innovated State Educational Programs for primary schools and grammar schools. It is designed to create opportunities for students' cognitive activities, which operate with concepts such as searching, researching, exploring, and discovering because they are the basic premise of cognition and understanding. In this sense, students should not only be passive actors in teaching and consumers of ready-made knowledge, which they should only remember and then reproduce (The National Institute for Education, 2014a, 2014b). On the other hand, in some studies, it is argued that teaching styles of geography teachers are still teacher-centered and students are passive (Artvinli, 2010b).

More than three-quarters of teachers surveyed think that it is easier to assess pupils' results by summative assessment. However, two-thirds of teachers agree with the statement that new forms of assessment are needed for IBE. They realize that the use of summative assessment tools in IBE is not sufficient; it is necessary to use formative assessment tools, which assess not only the level of conceptual understanding but also the development of students' abilities and skills.

Teachers should understand what IBE activities they can do with their students what levels are appropriate for their students to move from teacher-centered education to student-centered learning. If a student is exposed to open research activities too soon, he or she may fail to meet the learning objectives. It turns out that teachers identify with simpler levels of IBE (interactive demonstration, confirming research) rather than open research, where the student plans the whole research process himself.

Conclusion

In conclusion, it can be stated that the implementation of IBE in the conditions of the current school system is not easy. The ongoing education reform strongly emphasizes the need for scientific research in geographical education. On the other hand, very little has been done to achieve its successful implementation. Appropriate educational materials and well-educated teachers are still lacking.

From the results of our questionnaire, it was found that teachers realize in teaching it is important to focus not only on students' knowledge but also on how they acquire the knowledge. In the implementation of IBE in teaching, they especially appreciate the possibility of active learning, knowledge acquisition at the higher thought-operations level, the durability of knowledge, and development of

scientific work skills (such as the ability to observe, reason, judge, classify, experiment and draw conclusions and generalizations). Furthermore, the development of thinking and learning skills such as collaboration and communication, increasing the attractiveness of lessons and creating positive attitudes for pupils towards the subject is appreciated.

Problematic aspects of IBE, according to the teachers, are the large number of pupils in the classroom, time constraint (45 minutes is not enough), the necessity for intensive preparation and a low number of lessons. According to teachers, fulfilling the effectiveness of IBE requires systemic solutions, for example, increase the time allowance for lessons, change the organization to block teaching, add educational materials for students and instructional materials that will be available to teachers.

One of the reasons why teachers do not implement IBE is that they feel insufficiently prepared to do so and do not believe they have the necessary competencies. In addition to subject-specific pedagogical knowledge, which is linked to the content of education and didactic competencies, they must also acquire specific certain pedagogical skills to support teaching IBE (such as how to motivate students to learn through IBE, how to connect IBE with practical life, and how to develop students' thinking through IBE). This should be the focus of in-service teacher training, but also the training of future teachers.

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