The importance of complex tasks for the development of pupils' competences in science subjects

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Abstract Contextual tasks in science education are essential for students' development and their ability to apply knowledge to solving real-world problems while utilizing scientific principles. Based on the ongoing PISA results, new curricular documents, and teachers' perspectives, it is evident that these tasks support not only critical thinking but also an interdisciplinary approach, creativity, and problem-solving skills. Teachers face significant challenges in implementing these tasks, which requires adequate support, training, and sufficient time resources. The presented article showcases part of the results of an electronic questionnaire-based research study involving science teachers from primary and secondary schools in Slovakia. The aim of the article was to conduct a quantitative analysis of the actual implementation of complex contextual tasks in the teaching process from the perspective of science teachers. The research findings indicate that teachers strive to integrate complex tasks into their lessons, as evidenced by their methodological approaches in designing and applying these tasks in teaching. However, the study also identified weaknesses that need to be addressed in the teaching process to improve science education.

Keywords complex tasks, science education, competencies, interdisciplinarity

1. THEORETICAL BACKGROUND

In Slovakia, in recent years, there have been several reforms and changes in the field of education, which also concern science education. New curriculum documents that have been implemented or are in the process of implementation aim to modernise and streamline the teaching of science subjects.

One of the most important documents is the New the State Educational Programme (SVP), which has been updated at various stages to respond to current challenges in education. This programme focuses on creating a quality and flexible education system that should be oriented towards the development of critical thinking, problem-solving, and preparing pupils for life in the 21st century (SVP 2024).

Curriculum changes in science education are focused on different key areas. One of these is the integration of science subjects, whereby education in areas such as physics, chemistry, biology, geography and other natural sciences is increasingly interconnected in an attempt to create a comprehensive picture of natural processes and phenomena. An important area is the development of critical thinking and the scientific approach. Here the emphasis is on experimentation, observation and analysis, which seeks to develop pupils' ability to apply scientific ways of thinking. One way of developing the scientific approach is to implement complex contextual tasks in the teaching process.

A contextual task refers to an assignment in which a context of interest to students, preferably real-life, is followed by several tasks, usually of increasing difficulty.

A characteristic feature of complex tasks is a longer introductory text, which may be of a different nature, be it a newspaper article, an etiquette, an information leaflet. It should essentially be a text that pupils encounter in everyday life. It should take the form of a coherent or less coherent text, which may include various tables, graphs, maps, pictures, etc. When solving the questions or sub-problems that follow the introductory text, which are of different types, the pupils' task is to read and understand the text and use it to find the answers to the sub-problems. Real-life contextual tasks usually motivate pupils more than 'classic' word problems. In addition, they can often be solved in different ways, which teaches pupils to think independently and creatively, and they require explanations as well as results, thus teaching pupils to argue.

Complex contextual tasks in science education are tasks that integrate multiple science disciplines (e.g. chemistry, physics, biology, geology, etc.) and require students to apply their knowledge and skills in real-world or practical contexts. These tasks often involve a problem that is related to everyday life or current issues and is not solvable by the application of one simple formula or fact. Characteristics of complex contextual tasks:

1. Multidisciplinary in nature: these tasks typically require students to apply knowledge from different science domains in a way that reflects the interconnectedness of these disciplines.

2. Problem-based approach: the task is based on solving a specific problem that is relevant or realistic, whether it is an environmental, technological or social topic. For example, the question of how to reduce CO_2 emissions or how to clean up polluted water.
3. 3.Creative and critical thinking: Students must analyse a problem, find solutions, design experiments or procedures, interpret results, and critically evaluate their answers.
4. Applying theory to practice: tasks often require pupils to apply specific theoretical knowledge to solve practical problems. This means that these are real-life situations that are not just pure theory but are linked to practical applications in everyday life.
5. Collaboration and Communication: In many cases, these tasks are designed to have students work in groups and discuss different approaches and solutions, which supports their skills in teamwork and effective communication.

Tasks of this type have recently come to the forefront of interest among teachers and experts in the field of didactics, they are called variously, e.g. complex tasks, multicomponent tasks or contextual tasks.

The aim of the presented contribution is to analyse their real implementation in the teaching process from the perspective of science teachers, based on the need and use of complex contextual tasks.

2. THE NEED TO CREATE COMPLEX CONTEXTUAL TASKS FROM A PISA PERSPECTIVE

Interim results of PISA (Programme for International Student Assessment) show a steady decline in the science literacy of Slovak pupils. PISA emphasises not only memorisation of facts, but also the ability to apply knowledge and skills in real, complex situations (OECD 2020).

Analyses of the PISA tests have shown that pupils have problems linking theoretical knowledge with practical problems. This finding suggests that there is a need to focus on creating complex contextual tasks that motivate pupils to apply the principles they have learned in real-life situations (OECD 2018). Such tasks should:

1. Connect multiple science fields - students should be able to integrate knowledge from physics, chemistry, biology and other sciences to solve real-world problems (e.g. problems related to environmental issues or challenges related to new technologies).
2. Promote critical thinking and analysis - pupils should be able to assess different possible solutions and identify the most effective approaches, using knowledge from the natural sciences.
3. Innovative approaches in assessment - traditional forms of testing are increasingly being replaced by tasks that test pupils' ability to work with complex problems, explore hypotheses, design experiments and interpret results.
4. Consideration of real-world problems - tasks should reflect the challenges facing contemporary society, such as climate change, energy efficiency, pollution, health and nutrition, biotechnology and others.

The creation and implementation of complex contextual tasks could make a significant contribution to improving this literacy and prepare students for the challenges they face in a rapidly changing and technologically advanced world (Dillon, Worsnop 2011).

3. THE NEED TO CREATE COMPLEX CONTEXTUAL TASKS IN THE LIGHT OF NEW CURRICULUM DOCUMENTS

The focus of Slovak education in the 21st century is shifting from memorising lessons and memorising isolated facts to systematic and deliberate development of versatile and functional literacy in accordance with the requirements of society, which can be applied in everyday personal and social life and in meeting personal, educational, cultural and social needs. This is because the breadth of knowledge acquired is no longer sufficient. Teachers and pupils face more demanding challenges: the depth of learning, the ability to put things into context. This is what will enable 21st century people to engage in complex challenges, adapt to new situations, take responsibility and solve complex problems, critically engage with information, create and collaborate in diverse teams.

In the first and second cycles, the learning area takes the form of a science-focused integrated subject. In the third cycle, the school has the option of continuing with full or partial integration of science or teaching separate subjects (SVP 2024).

The main aim of the learning area is to develop science literacy so that pupils can identify the science aspects of many complex situations and apply not only science knowledge, skills and attitudes but also the principles of cognition in science to these situations. Pupils should be able to investigate and then make appropriate links between knowledge and critical thinking by the end of Cycle 3. With science literacy thus developed, they will be able to compare, select, evaluate, justify and formulate explanations based on critical analysis of results and reasoning.

It is crucial for teachers and curriculum designers to create tasks that develop not only factual knowledge but also the ability to apply this knowledge in different contexts. To this end, it is necessary to:

- Improve school materials and textbooks - these should contain not only theoretical knowledge but also tasks that support application in practice.
- Provide support to teachers in the development of complex tasks - professional development of teachers is important for the implementation of new methodologies in teaching.
- Incorporate project-based and research methods - the use of project-based methods, experiments and science papers can help students better understand and apply science principles.

4. CREATING COMPLEX TASKS FROM TEACHERS' PERSPECTIVES

When solving the questions or sub-problems that follow the introductory text, which are of different types, the pupils' task is to read and understand the text and use it to find the answers to the sub-problems. Important prerequisites for the inclusion of complex tasks in the classroom that must be fulfilled are, first of all, the mastery of the reading technique, then the ability to understand the text, evaluate what has been read, and solve a complex learning task based on the text, which focuses on science literacy (Bellová 2018).

In solving these tasks, pupils apply reading literacy skills, which is a prerequisite for the development of science literacy (Vasilová, Prokša 2013). Currently, reading literacy is considered a key competence that affects not only the level of reading, but also the level and possibilities of pupils' education in all subjects (Koršňaková, Kováčová, Heldová 2010). Also, according to the new curriculum, reading literacy is emphasised as a cross-cutting supporting literacy for comprehension of different types of text, at several levels - from explicit meanings through inferring implicit meanings to critical evaluation of the text.

Complex tasks can be used not only as classical test tasks in the diagnostic phase of teaching, but also as learning tasks during the access and fixation of new material. The difference is that test tasks of a complex nature serve for classical verification of pupils' knowledge and learning tasks help to deepen and broaden pupils' knowledge, thus also serving as supplementary learning.

Tasks can be of the following types:

- multiple-choice tasks - pupils choose one correct answer from a choice of four or five options.
- complex multiple-choice tasks - pupils select one of the YES/NO answers in a set of at least two questions.
- closed-ended multiple-choice questions - pupils construct their own answer, but it is a one- or multiple-word answer.
- open-ended questions with answer formation - pupils answer in their own words, it is a broad answer (Mandíková, Houfková 2012).

5. COMPETENCES DEVELOPED THROUGH COMPLEX CONTEXTUAL TASKS

Complex tasks often require a multidimensional approach, critical thinking, creative analysis and synthesis, and are aimed at developing multiple student competencies. These competences are crucial for students' success in today's society, which requires not only factual knowledge but also the ability to apply this knowledge in different contexts. Complex tasks therefore often focus on the development of the following competences:

- Critical thinking and problem-solving pupils must analyse a problem, identify relevant information and apply theoretical knowledge to a concrete situation. Complex tasks promote the ability to reason about different solutions and evaluate their effectiveness (Zohar 2013).
- Interdisciplinary thinking: complex tasks often involve different areas of knowledge (e.g., combining physics, biology, mathematics, and chemistry), which allows students to see the connections between the different subjects and gain a broader perspective on the problem (Leschinsky 2017).
- Soft skills: In many cases, complex problems are solved in groups, which promotes teamwork, effective communication, and the sharing of ideas among students (Rosen 2017).
- Application and interpretation of knowledge: Complex tasks allow pupils to apply theoretical knowledge to concrete real-life situations. This transfer of knowledge from theory to practice is essential for developing real-life problem-solving skills (OECD 2018).
- Increase motivation and interest in the subject: complex and contextually interesting tasks can increase pupils' motivation by showing them how science is used in the real world. When pupils see that what they are learning has practical value and a direct impact on their lives, they can be more engaged and motivated to learn. In this way, they develop a stronger relationship with the subject, which becomes more interesting and relevant.
- Independence and self-reflection: Solving complex problems requires pupils to work independently, set goals, plan their actions and evaluate their results. This promotes their capacity for self-reflection and autonomy in learning (Hattie 2009).

6. RESEARCH METHODOLOGY

In order to meet the above objective, we needed to investigate several aspects, which we set out in our research questions (RQs):

RQ1: What methodological approaches do science educators use to implement complex contextual tasks in their teaching to support students' cognitive and applied development?

RQ2: Which pupils' competences are developed during the teaching process when solving complex tasks?

We have chosen a quantitative method in the form of an electronic questionnaire. The created questionnaire was electronically distributed to different types of schools, which we obtained in the database of the Centre of Scientific and Technical Information of the Slovak Republic (2023). We preferred random sampling as schools were not selected, the questionnaire was sent to schools without any preference. The first questions of the questionnaire contained identification questions that helped us to further characterize the sample of respondents (type of school, grades in which they teach, subjects of interest). The research sample consisted of 95 science teachers, of whom 70 teachers (74%) were from second cycle primary schools, 17 (18%) from secondary schools and only 8 (9%) from eight-year grammar schools.

The content questions in the questionnaire took different forms. We included closed-ended multiple-choice questions for the sake of precision, and their results were evaluated in terms of percentages, using a five-point Likert scale. In some questions, there was the possibility of ticking boxes, giving respondents the opportunity to tick multiple answers as well as to express their own opinion or add their own answer.

7. RESEARCH RESULTS AND DISCUSSION

To answer the two research questions (RQ1, RQ2), we created 8 items in the content section of the questionnaire.

RQ1: What methodological approaches do science educators use to implement complex contextual tasks in their teaching in order to support students' cognitive and applied development?

The first research question concerned the following items:

1. Are contextual complex tasks part of your teaching? (choose from 5 options)
2. At which stages of the lesson do you most often implement them in your teaching? (comma boxes, choice of 4 options)
3. Your contextual tasks are in the nature of the following activities: (comma boxes, choice from 6 options + other...).
4. Do your complex tasks contain: (comma boxes, choice of 5 options + other).

From the first question, where we investigated the frequency of including complex tasks in the classroom, we noted a positive finding. The majority of educators reported that complex contextual tasks are part of their teaching (93% overall - 73% definitely yes, 20% sometimes yes), indicating a positive attitude towards the use of these tasks in the school process. This high percentage indicates that teachers recognise the benefits of these tasks for pupils' development.

From the second question, we found that they most often implement these tasks in the fixation phase of the teaching process (67%), i.e. when practicing the material, this approach supports students' cognitive development through repetition and application of the learned material in real, practical contexts. In addition to the fixation phase, teachers also use tasks in the diagnostic phase (39%), where they are used to determine the level of learning, and in the exposure phase (28%) when introducing new material. These approaches indicate that complex tasks can be an effective tool for assessing and developing prior knowledge, while also serving as a bridge between new information and prior knowledge. The finding that complex tasks are used less frequently in the motivation phase (22%) suggests that educators are not likely to use these tasks as a primary tool to motivate students, but rather to support them in other phases of instruction where learning is being developed, practiced, or diagnosed. Most teachers took the opportunity to indicate multiple responses.

In the next two questions, we were interested in the form of the tasks, what is the nature of most of their assignments in terms of embedded activities and what elements they contain. Figure 1 shows that the most common tasks are those where a variety of combined information is given (80%). This approach is effective because it stimulates students to analyse and synthesize different types of data and information, which promotes their critical thinking and ability to apply knowledge in the context of real-world problems. A high proportion (over 83%) of the tasks contain experiments of different types, which is very beneficial for the development of pupils' practical skills and experimental thinking. Experiments allow pupils to gain direct experience and a deeper understanding of science principles. Tasks that include demonstration experiments are used by the teacher to visually interpret natural phenomena. These experiments are important for developing pupils' imagination and understanding of phenomena that are difficult to perceive without practical demonstration. On the other hand, teachers also encourage tasks that involve pupil experiments, where pupils undertake the majority of the activity, promoting independence, experimental skills and developing pupils' ability to work with real life science problems.

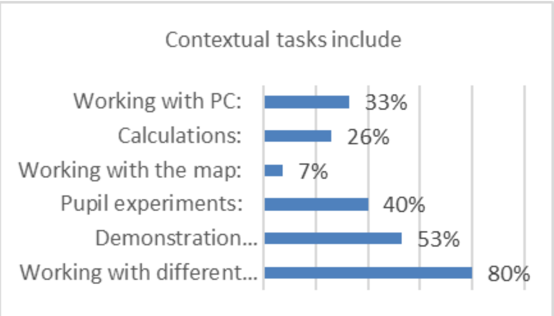

Figure 1 Visualisation of how complex tasks are divided according to different types of learning activities

The low percentage of teachers who reported activities such as PC work (33% of teachers), calculations (26%) and map work (7%) may have several reasons:

- Insufficient technical equipment - not all schools have enough computers or software to work effectively with PCs in the context of teaching.
- Limited digital skills of teachers - some teachers do not have sufficient experience in using digital tools for teaching and therefore do not use them frequently.
- Traditional teaching methods - many teachers still prefer traditional teaching methods (lecturing, writing on the board), which reduces the space for interactive activities.
- •Time-consuming - preparing tasks involving PC work, calculations or map work can be more time-consuming than conventional teaching methods.
- Low support from the state or school management - if teachers do not have sufficient support (training, methodological materials), this can lead to lower implementation rates of these activities.
- Lack of teaching materials - if there are no quality and accessible resources, teachers may struggle to incorporate these activities into the classroom.

As mentioned above, complex tasks should include a variety of motivational elements in addition to the continuous text, so we asked our respondents which elements are included in their tasks, and the following was found from the responses:

The majority of educators (93%) include images in their complex assignments, indicating that visual materials are seen as an important tool to promote student understanding and interest. Images are an effective way to make information accessible and support cognitive processes such as memorization and analysis. 73% of teachers reported using tables and 45% graphs. These elements are key to organizing information systematically and simplifying complex data. The use of tables and graphs supports students' analytical thinking and ability to interpret and present data. Video-cues are part of the assignments for 40% of educators. This format is useful for visualizing dynamic processes or phenomena that would be difficult to explain with text or pictures alone. Video-cues can help students better understand theoretical concepts through illustrative and interactive examples. Maps are used in only 7% of the tasks, indicating that their integration into the classroom is not common. Nevertheless, they can be useful, especially in subjects such as geography or biology, where it is important to understand spatial and geographical relationships. The 'other' option was not used by any teachers, suggesting that educators most often rely on traditional and well-established forms of visual and data materials such as images, tables, charts and video clues.

Evaluation of RQ1:
The majority of educators reported that complex contextual tasks are part of their teaching, indicating a positive approach to the use of these tasks in the school process, applying different activities such as working with information and different experiments in the tasks (see Figure 1).

Other findings show that educators prefer visual and data elements in the design of complex tasks, which promote understanding and increase students' motivation. The use of images and tables is very common, while video cues and maps are used less frequently, which may suggest scope for their wider inclusion in the classroom.

RQ2: Which competences are developed during the teaching process when pupils solve complex problems?

The second research question covered the following items:

1. Your contextual tasks focus on: (comma boxes, choice of 6 options + other).
2. In complex tasks, students develop the following competencies: (comma boxes, choice of 8 options + other).
3. Are your pupils able to understand the task/example - are they able to read comprehension in contextual tasks? (five-point bipolar Likert scale).
4. Are your contextual tasks interdisciplinary in nature? (five-point bipolar Likert scale).

The above items refer to the competences students develop during these tasks. Based on the percentage data, we created Table 1 to better visualize the responses and to evaluate the differences between the different aspects of the students' cognitive abilities and competencies. We asked which processes; competencies are targeted by the pupils' tasks.

Table 1 Responses to item 5

Evaluation aspect	**Percentage (%)**
Students' cognitive knowledge (content)	87
Practical skills and abilities	66
Competencies of scientific work, procedures of cognition (procedural)	27
Reasoning about knowledge produced by science (epistemic)	20
Formation and development of attitudes towards the environment	40
Metacognitive processes	20

Cognitive knowledge of students (87%) has the highest proportion, indicating that students show strong content knowledge. This aspect is clearly the strongest, indicating that pupils are strong in theoretical knowledge, information and memorization.

Practical skills and abilities (66%) are also at a reasonably good level, but there is room for improvement in the ability to apply knowledge to practical situations. This suggests that pupils have a good foundation but are not always able to use their knowledge effectively in practice.

Competences in scientific work, cognitive practices (27%) are at a low level, which means that pupils are hardly familiar with scientific research procedures, critical thinking, analysis and creation of new knowledge. This aspect is the weakness where there is the most room for improvement.

Reasoning about knowledge generated by science (20%) also indicates that students have weak skills in understanding and applying the scientific method and justifying theories, which is important for the development of scientific thinking and reasoning. Metacognitive processes (20%) is the lowest ranked aspect. This shows that pupils have large reserves in self-reflection and the ability to regulate their own learning process, which is crucial for the development of independent and effective learning.

The formation and development of attitudes towards the environment (40%) indicates that pupils have an average ability to develop critical and positive attitudes towards the world and society. There is potential for improvement in the area of values education and engagement with social issues.

In the next question, we were interested in the specific competencies pupils develop from the perspective of their teachers. We have neatly ordered the results in Table 2 and then analysed the individual responses.

Table 2 Responses to item 6

Competencies	**Percentage (%)**
Ability to develop and use scientific thinking and understanding to solve a variety of problems in everyday situations	80
Ability and willingness to explain natural phenomena using basic knowledge	60
Developing skills to ask questions and draw evidence-based conclusions	53
Ability to reflect on one's own personality	13
Manage time and information effectively	20
Work constructively with others	60
Interest in ethical issues	0
Promoting safety and environmental sustainability	33

The results highlight strengths and weaknesses in different competency areas. Ability to develop and use scientific thinking (80%) - this high percentage indicates that there is a good ability to apply scientific knowledge to solve problems in everyday life. This competence is key to analytical thinking and the ability to solve problems based on facts (OECD 2018).

Ability to explain natural phenomena (60%) - the result obtained shows a solid level of understanding of basic science principles and their application to interpret phenomena (Harlen 2018). Constructive collaboration (60%) - this outcome reflects the ability to work effectively in a team and collaborate with others, which is important for both professional and personal development (Johnson, Johnson 2017). Self-reflection (13%) - the low ability to reflect on one's own personality indicates the need to develop introspective skills, which are important for personal growth (Brown 2020).

Effective time and information management (20%) - this outcome indicates problems with work organization and information processing, which can negatively impact performance in a variety of areas (Covey 2019). Interest in ethical issues (0%) - a complete lack of interest in ethical issues indicates that this area is not perceived as important, despite its importance in society and in decision-making processes (Singer 2011).

Promoting safety and environmental sustainability (33%) - the result suggests low engagement with environmental and safety issues, which may be a risk factor in the current era of environmental challenges (Rockström et al. 2009).

The results suggest that pupils excel in applying scientific thinking to solve practical problems, but perform poorly in metacognitive processes, ethical issues and environmental sustainability. Based on these findings, there is a need to focus on improving these areas in order for pupils to become complex and responsible problem solvers.

As pupils need to analyse a problem, identify relevant information and apply theoretical knowledge to a specific situation when solving complex problems, they need to understand the text, be able to read with comprehension, so we have included a multiple choice question in the competency interview, "Are your pupils able to understand the task/example - can they read with comprehension in context tasks?" 72% of the teachers gave an affirmative answer, only 6% disagreed and 22% gave a negative answer.

The majority of teachers (72%) reported that pupils are able to understand the task, with 6% answering 'definitely yes' and 66% 'sometimes yes'. This result suggests that in the vast majority of cases pupils are able to read and understand the tasks, but that this is not always a full understanding in every case. The answer 'sometimes yes' may indicate that pupils can read with understanding in some cases, but in other situations they may struggle, such as in the case of more complex tasks, ambiguous instructions or multi-step tasks.

Only a small percentage of teachers (6%) were undecided, which may indicate that in some cases they did not have enough information or observations to give a clear answer. This may also indicate a diversity in teachers' experiences in different classrooms where pupils' reading comprehension skills may vary.

Almost a fifth of teachers reported that pupils were unable to fully understand the task, with 16% indicating a response of 'probably not' and 6% 'definitely not'. This negative view may be an indicator of various factors such as the inadequacy of the task, the complexity of the task, the ambiguity of the task, the language difficulty, the teaching methods, and so on.

The final questions that can illuminate our answers to VO2 focus on students' interdisciplinary thinking that can promote understanding of science concepts (Bellova; Culkova, 2024). We asked, "Are your contextual tasks interdisciplinary in nature?"

The finding that 27.8% of teachers say they definitely use interdisciplinary relationships suggests that some educators are actively integrating a variety of subjects into their teaching. This approach promotes a broader understanding of the curriculum and its application in different contexts. As many as 72.2% of teachers reported that they sometimes use interdisciplinary relationships. This means that the majority of educators perceive interdisciplinary connections as a useful tool but seem to apply them in specific situations or when needed. This approach shows that teachers have some flexibility in implementing interdisciplinary connections, but they are not necessary for them in every task.

No one reported ever using interdisciplinary relationships, suggesting that most teachers perceive the value of combining subjects at least occasionally. This fact suggests a growing interest in subject interconnections, which is important for comprehensive understanding and real-world application of knowledge.

Evaluation of RQ2:
Based on the evaluation of the four items (focused on RQ2), it is evident that students excel in cognitive knowledge (87%) and practical skills (66%) while solving complex problems. However, significantly weaker scores are given in the areas of metacognition, scientific practices and epistemic processes, where intensive improvement is needed. The overall picture suggests that more attention needs to be paid to developing students' ability to think critically, regulate their learning and apply their knowledge in scientific and practical contexts.

Based on the assessment of pupils' competence in complex tasks, it is evident that pupils have strong skills in applying scientific thinking to solve everyday problems (80%). However, in other areas such as critical thinking, self-reflection, time management and effective collaboration, more attention and development of these competencies is needed. Significantly low scores in the areas of ethical issues (0%) and the ability to reflect on one's own personality (13%) indicate a need to focus on improving these aspects, which are key to complex problem solving and responsible decision making.

We can also state that most pupils are able to read with comprehension in contextual tasks, but this is not always a seamless understanding. Around 22% of teachers reported problems with pupils' reading comprehension skills, which may be due to the complexity of the tasks, the difficulty of the language or the lack of clarity of the task. These findings support research on reading comprehension, which suggests that it is a skill that requires systematic practice and support from teachers.

From the last item, we found that although the full and regular use of interdisciplinary relationships is not entirely common among all teachers, most educators integrate them into their teaching at least occasionally. This suggests that interdisciplinarity is perceived as a valuable tool to support students' holistic development.

Research limitations:
The research results presented here are only part of a quantitative research study focusing on contextual tasks, their design, implementation, advantages, disadvantages and barriers from the teachers' perspectives. Further evaluation will include comparison with published research by Slovak and foreign authors. Also, a combination of quantitative and qualitative methods would be very beneficial, which can give us a more comprehensive view of the effectiveness of using contextual tasks in science teaching. Such as conducting interviews or focus groups with science teachers to identify effective methodological approaches.

8. CONCLUSION

Incorporating complex contextual tasks into science teaching is key to developing the competencies needed for the 21st century, such as critical thinking, problem solving, collaboration and interdisciplinary thinking. These tasks not only foster a better understanding of science concepts but also prepare students for the real-world challenges they will encounter in their personal and professional lives. As several studies and scholarly articles have shown, the implementation of complex tasks has a positive impact on student learning and engagement.

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