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TEACHERS' OPINIONS ON THE FEASIBILITY OF IMPLEMENTING THE DESIGN PROCESS IN THE FIELD OF TECHNOLOGY IN PRIMARY SCHOOLS

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ABSTRACT

The goal of the subject 'Design and Technology' is to foster an understanding of the creation of products and services in students, taking into account human needs and applying the basic principles of design thinking. During the learning process, students are given the opportunity to practically create products, services, and environmental solutions that are useful to themselves and society, plan the design process, use safe techniques, tools, and digital devices, choose suitable materials, and create a healthy working environment. The design process involves the selection and implementation of methods for developing design thinking, which, in turn, is the responsibility of the teachers. The aim of the study is to analyze teachers' opinions on the feasibility of the design process in primary schools. A self-designed questionnaire for teachers was used as a research tool. Data processing was performed using the SPSS program, employing the following methods: Mann–Whitney test, Kruskal-Wallis test, correlation, Kolmogorov-Smirnov test, and frequency analysis. The research sample consisted of 30 teachers from the first stage of primary education who teach the subject 'Design and Technology'. The results of the questionnaire revealed that the teacher's knowledge and experience, the creative environment, safe work equipment, and the age stage, as well as the chosen methods, play an important role in the successful implementation of the design thinking process. If any of these aspects are not well-planned, teachers most often face difficulties and negative emotions. The development of design thinking in relation to the implementation of the design process in schools can be effectively guided by a teacher who understands the specifics and importance of this type of thinking in the student's development.

Keywords: *design and technology, design process, design thinking, primary school, survey, teacher*

Introduction

Design thinking can be viewed as a way of thinking, a method, or a process that changes the world's beliefs, contributes to the identification of various problems and

the realization of new ideas, creating services, strategies and products (Serrat, 2010; Lee & Wong, 2015; Dell'Era et al., 2024). At the moment, design thinking is considered an approach that helps to cope with the challenges of the 21st century in various fields (Efeoglu et al., 2013), although the concept of design thinking began to be talked about in the world since the late 60s of the 20th century (Simon, 1969). In today's world, problems and situations are increasingly emerging in which people do not have previous experience and solution steps, so it is important to generate ideas that will contribute to insights into creative and new solutions (Owen, 2007). The basis of design thinking allows for a deeper and broader study of economic, social, political and technological problems. Design thinking has become an important aspect of human growth in various fields, including education. The school is the place where we nurture the society of the future, so it is important to use design thinking as a tool to improve the learning process (Razali et al., 2022).

The Ministry of Education and Science (2018), proposed changes in the approach to education in Latvia in order to develop, approbate and implement in succession the content and approach to learning of general education, which would promote more effective preparation of pupils for the life of the 21st century. Not only in Latvia, but also in other parts of the world, the understanding of what knowledge and skills will be needed in the future society is currently changing (Izglītības un zinātnes ministrija/ Ministry of Education and Science, 2018).

The design thinking process for educating students and developing various skills in Latvian schools is included in the acquisition of the technology field subject 'Design and Technologies'. In education, design thinking is oriented towards learning, which involves actively solving problems and promoting influential change (Lor, 2017; Krumina, 2018). The object 'Design and Technology' aims to create an understanding of the creation of products and services, taking into account human needs and observing the basic principles of design thinking. During the learning process, the student is given the opportunity to practically create products, services and environmental solutions useful for himself or herself and society, plan the design process, use safe techniques, tools and digital devices, choose suitable materials and create a healthy working environment (Skola2030, 2019b).

By implementing design thinking in primary school classes, students develop practical skills, mutual cooperation and the implementation of creative ideas. Pupils, by developing a variety of skills, need a creative tool to be able to engage and participate in a society where change is continuous. Design thinking provides a powerful alternative and challenges students to find answers to questions that are relevant to them (Carroll et al., 2010). The subject 'Design and technology' covers the study of many topics related to both theoretical knowledge and practical work. Technologies in education are associated with the formation of the creative stimulus of the child, the implementation and verification of their ideas. The study of the subject 'Design and Technology' allows experiencing joy and a sense of accomplishment for the work done (Hart-Anderson & Holme, 2022).

The aim of the study: to study the characteristics of design thinking and analyze the opinions of teachers about the possibilities of implementing the design process in primary school.

Research methods: theoretical: literature analysis; empirical: survey; processing of the obtained data in the program IBM SPSS Statistics 29.

Characteristics of design thinking

Design thinking is inherently the promotion of experience and the creation of a product that is associated with creative activity. Creativity is considered to be conscious thinking and acting towards invention, creation and influenced by surrounding circumstances (Gaveika, 2016; Gralewski & Karwowski, 2012). Creativity is a unique and individual skill of a person that can be applied in any field (Brakovska, 2018). Design thinking has its own specifics, which differ from the above concepts. Design thinking is multidimensional, so it cannot be explained within the framework of a single concept (Malekzai, 2023). Design thinking is characterized by features that form a set and reveal its essence.

Summing up the characteristics of design thinking (see Tab. 1), it can be concluded that the essence of design thinking is diverse, since the concept includes the ability to dare to implement ideas, correct previously made mistakes, cooperate in groups, look for sustainable solutions. Design thinking changes a person's understanding of the realization of opportunities and creates greater confidence in the ability to influence the direction of the world. Crucially, by learning the design thinking process, people can hone their skills, make responsible decisions and become more open to unknown situations. In addition, the result of the design thinking process is always innovative.

Table 1 The Essence of Design Thinking (created by the authors based on Owen, 2007; Baeck & Gremett, 2012)

Feature	Description
Problem-solving	Awareness of the problem and the ability to find multiple solutions through critical thinking and research.
Originality	The ability to come up with and create unconventional solutions using modern technologies.
Flexibility	The ability to accept different viewpoints and adapt to non-standard situations.
Responsibility	An attitude that defines the quality of decisions made and actions taken.
Empathy	When implementing ideas, considering the desires and needs of people.
Sustainability	Human creative activity impacts the surrounding environment, so it's important to think about sustainable material use and product development.
Multifunctionality	The developed product is designed to be used in multiple ways, allowing users to find the most suitable application.
Awareness of mistakes	Not being afraid of failures, as the work process provides opportunities to identify, analyze, and correct mistakes.
Experimentation	The courage to take risks and explore questions that uncover new directions.
Collaboration	Working in a team and communicating with like-minded individuals promotes more effective outcomes.

It is important to update design thinking in the field of education as a tool for planning and organizing work, in order to provide students with the opportunity to improve communication skills, creativity, and the ability to express their opinions. By learning the approach of design thinking and tackling complex challenges, students begin to understand the importance of sustainable development, generating benefits in various areas (Odewole et al., 2023). Design thinking in the learning process helps students become empathetic, flexible, and innovative problem-solvers who understand the possibilities of technology, societal needs, and the necessity of sustainable solutions for the future (Charles, 2022).

Thus, it can be concluded that by changing their way of thinking, people can promote sustainable development, as thoughtful decisions and meaningful actions create a positive impact on the environment. In the design thinking process, anyone can create functional products beneficial to society that can be used in the long term. It is important to think about sustainable development in various fields, which is why design thinking is a comprehensive tool to be used in businesses and schools.

Design thinking is a non-linear and interactive process in which problems are defined, the needs of the involved people are understood, ideas are generated, prototypes are developed, and testing is conducted. Anyone can create revolutionary solutions, which is why it is essential to understand and implement the steps of the design process (Dam & Siang, 2017).

Design thinking is an approach that encourages taking specific steps to solve a real problem by creating a prototype and basing it on feedback (Charles, 2022).

E. and Ch. Bushman (Bušmane & Bušmanis, 2020) suggest integrating design thinking in schools by implementing a three-step model: understand, create, and offer. Introducing children to the design thinking process by offering age-appropriate tasks can build an understanding of the need to explore, generate ideas, and test outcomes.

The first step is the student's understanding, which means exploring and delving into the context of the problem or challenge. In the exploration phase, empathy plays a crucial role, as this ability allows one to understand not only their own needs but also to satisfy the desires of peers and others. The student must be able to evaluate and recognize the essence, relevance, and necessity of a topic of interest in order to find answers and solutions. A deep understanding builds the student's knowledge and experience base, which fosters creativity.

Following this is the second step in promoting the development of design thinking, which involves generating various ideas. By expressing their opinion and participating in discussions, students encourage diverse approaches to achieve the set goals. In the idea phase, the key condition is to generate as many ideas as possible so that the right solution can be selected in the final step.

In the third step, the main idea is implemented and presented to the target audience to test and correct errors (Bušmane & Bušmanis, 2020). Feedback and opinions from others can improve the quality of the implemented idea, allowing the student to return to one of the steps and refine their decision.

Figure 1 7-step design thinking process

In the field of technology education, to build an understanding of design and technology, students should aim to answer the questions "How?", "With what?", and "Why?" in each topic, emphasizing the design process as a necessity for achieving results by using appropriate technologies and understanding the significance of the developed solution for society. In the sample curriculum for the subject "Design and Technology for Grades 1–9," the design thinking process is highlighted as a problem-solving method that helps students understand how useful design solutions for people are created, following a sequential workflow (Skola2030, 2019a). In the sample curriculum for the subject, teachers are provided with a methodological comment, where the key steps of the design process are emphasized in the study of each topic (see Fig. 1).

The design thinking process in the subject 'Design and Technology' is linked to the students' ability to work creatively while applying transversal skills in the learning process. Teacher collaboration and the organization of integrated lessons provide the opportunity to identify diverse connections between the creative tasks of different subjects, flexibly involving students' problem-solving skills, critical thinking, creativity, collaboration, entrepreneurship, and self-directed learning (Briška & Kalēja-Gasparoviča, 2020). In order for students to acquire problem-solving skills through practical activities, teachers need to organize the learning of the design process within each topic.

The authors conclude that mastering the design thinking process in the subject 'Design and Technology' is significant for the student's development, as it allows them to understand the algorithm for creating innovative products. The knowledge and skills gained can be applied in various subjects and fields. The design thinking process model offered by Skola2030 is a methodological tool for teachers' work.

Methodology

To assess the current situation regarding the implementation of the design thinking process in primary schools while studying the subject "Design and Technology", a pilot study was conducted. The data collection method was a teacher survey using a questionnaire. The questionnaire consisted of 10 questions. Eight questions allowed the option to choose an answer or provide a custom response, while two questions required descriptive responses from the participants. The study on the implementation of design thinking in primary education was conducted from February 2024 to April 2024. Data processing was performed using IBM SPSS Statistics 29 software, employing the following methods: Mann-Whitney test, Kruskal-Wallis test, Correlation, Kolmogorov-Smirnov test, and Frequency test. The study sample included 30 primary education teachers who teach

the subject 'Design and Technology'. The questionnaire was published in a Facebook teachers' group. Teachers who work in primary schools and teach the subject "Design and Technology" were invited to fill out the questionnaire. Teachers from different cities and educational institutions voluntarily filled out the questionnaire.

To process the data in SPSS, a coding table was created. To ensure internal consistency of the questionnaire, a Cronbach's alpha test was performed. The obtained result ($\alpha = 0.794$) indicates good internal consistency.

In addition to quantitative data analysis using IBM SPSS Statistics 29, open-ended responses were analyzed using qualitative content analysis. All responses were initially carefully reviewed to identify relevance to the design process implementation. An open coding approach was used, and codes were developed according to the steps of the design process. Two independent researchers coded the data separately, and reliability was ensured through discussion and consensus.

This study met ethical research standards. Participation in the survey was voluntary, and informed consent was obtained from all participants before data collection. Respondents were informed of the purpose of the study, the anonymity of their responses, and their right to withdraw from participation at any time without consequence. All data were analyzed in an aggregated manner to ensure confidentiality.

Results and Discussion

The statistical analysis shows that the respondents are women with varying levels of professional experience as teachers. Four respondents work with 1st grade students, 10 with 2nd grade students, and 16 with 3rd grade students. The teachers' different professional experiences, the grade they work with, as well as their place of residence, provide insight into the trends of implementing the design thinking process in primary schools.

The Kolmogorov-Smirnov test indicates that the data does not follow a normal distribution ($p < 0.05$), so non-parametric tests were used in the data processing.

A Frequency test was conducted to determine the distribution of responses and the mean values (see Tab. 2).

Table 2 Implementation of the Steps of the Design Thinking Process in Grades 1–3

Design thinking process step	Mean	Response distribution		
		Causes difficulty	Depends on the topic	No difficulties
Identifying needs and opportunities	2.00	7	16	7
Search for ideas and choice of solution	1.90	7	13	10
Planning	2.03	11	9	10
Development	1.57	4	9	17
Evaluation	2.00	11	8	11
Testing and improvement	2.07	10	12	8
Implementation	2.23	11	15	4

The response distribution indicates that primary school teachers in the first stage of education face difficulties in implementing specific design steps in the subject 'Design and Technology' depending on the topic that needs to be addressed in the learning process. This means that teachers most often select which design thinking steps to include in the learning process based on the topic. Teachers experience the most difficulty in the steps of 'Implementation' and 'Testing and Improvement', with average values of 2.23 and 2.07, as also indicated by the response distribution. For example, a teacher with 10 years of experience in a school links implementation difficulties to the lack of time in the learning process, which prevents a deeper exploration of the topic: "Often the idea is so extensive that only the prototype model gets tested, and it's not possible to implement the idea fully so that it can be used in reality." A 3rd-grade teacher with three years of experience at school believes: "Primary school students like to work creatively, create practical projects, rather than plan and analyze. Design is the subject where students expect the opportunity to express themselves, work, and demonstrate their skills. Often, the curriculum offered does not seem interesting to them. With students of this age, it is impossible to complete everything required within the class period, planning, development, analysis, evaluation, etc." A 2nd-grade teacher from Riga with 40 years of experience in primary education states: "The path to a finished product is too long. It is not appropriate for this age group, it is time-consuming, very little can be done within the lesson, and interest is lost. A small child needs to work with their hands, to develop practical skills."

It can be concluded that teachers offering the design thinking process in topic acquisition must have highly developed planning and organizational skills. It is important for the teacher to implement a time distribution for the steps to ensure that the process is purposeful and not rushed. Teachers' experiences can be linked to the guidelines provided in the sample curriculum (Skola2030, 2020b). In the subject 'Design and Technology' at the primary school level, it is crucial to get acquainted with materials and learn techniques such as knitting, sewing, crocheting, and others, as this skill set is the primary condition for creating things. The student needs to build their experience by working with their hands. Teachers must remember that the process of exploring materials and techniques should be separated from the design process, which is related to creativity and innovation. The meaningful creation of new things should be connected with a design thinking-based process, so students can apply their previous experience by selecting appropriate materials and processing methods in their individual work development.

A teacher from a city school with three years of teaching experience emphasizes the impact of an inadequate environment on the implementation of the design thinking process: "There is insufficient equipment to search for ideas, and the number of lessons is too small. Sometimes the environment is not suitable for testing and implementing the developed ideas." This teacher's opinion can be linked to findings in theoretical literature, where the importance of a positive environment for a successful design thinking process is highlighted. It is important to ensure the interaction of multiple environmental dimensions, considering the arrangement of space, technical equipment, individual

attitudes, mutual cooperation, and creative methods (Geske & Zizlāne, 2018; Briška & Kalēja-Gasparoviča, 2020). The learning environment is an important aspect of the creative discovery process so that teachers and students can achieve the set goals.

The average score for the 'Planning' step is 2.03, indicating that teachers face difficulties. A 2nd-grade teacher with 40 years of experience from Riga draws attention to the age group and the skills of students: "A student can plan when they have learned the skills and know what they can work with in their work. In 2nd grade, there is still much to teach basic skills and techniques with various materials before asking them to plan something themselves". Another respondent's opinion on implementing the planning step in class: "A young child needs to work with their hands, exercise their fingers, rather than spend half the class time reasoning and talking. Writing skills are also not developed enough to write a plan." A primary school teacher in the first stage must encourage students to become aware of their skills and think about planning, gradually introducing them to the design process (Skola2030, 2019b). It can be concluded that teachers in the primary school stage understand the planning step in design thinking as students writing their own plan independently. It is important to understand that at this age, the teacher should build understanding about planning through different tasks and questions, not necessarily expecting students to independently plan the creative process. Emphasizing the importance of planning and building a deeper understanding in 1st-3rd grade will promote the development of independent planning habits in later grades.

The average score for the 'Evaluation' step is 2.00, indicating that some teachers do not face difficulties in implementing this step, while others encounter challenges when evaluating the design thinking process or the product developed in primary school. Respondents raise the question: "How do you assess a student's work if the child enjoys it a lot, but the work is not of high quality?" It is important for both teachers and students to understand the purpose of evaluation and the criteria beforehand so they know how to achieve the best results. The survey results reveal teachers' views on evaluating work when students have different levels of knowledge and skills: "Evaluation is challenging because each child has their own abilities, within which the work is done." It can be concluded that teachers need to think about task differentiation and individualization. One respondent's opinion was: "Rarely, but it is still challenging to formulate the expected results and determine criteria that are appropriate for the age group."

Evaluating a creative process or product requires clearly defined and understandable criteria to reduce misunderstanding among both teachers and students. Evaluating a creative process is more difficult because its course is unpredictable, and the outcome is not always what was initially planned (Briška & Kalēja-Gasparoviča, 2020; Lucas et al., 2013).

The results of the Manna-Witney test revealed statistically significant differences in the implementation of the 'Testing and Improvement' step depending on teachers' experience in primary school ($p = 0.043$). This indicates that teachers with 30 or more years of experience in primary school find it more challenging to test and improve the product they have developed compared to younger teachers with 5 to 10 years of experience. It can be concluded that more experienced teachers have a harder time adapting to changes,

as they have worked with traditional methods for many years, focusing on evaluating the final product.

In the data analysis regarding the development of students' skills through the use of design thinking, the Kruskal-Wallis test showed no statistically significant differences based on the class level taught by the teacher ($p > 0.05$). This suggests that teachers, regardless of the class they teach, can develop students' collaboration skills, ability to persist in the face of challenges, and the ability to find alternative solutions to achieve goals while implementing the design thinking process.

The theoretical literature also discusses that design thinking encourages students to take on new challenges, enhances group collaboration, and fosters perseverance and goal-setting (Carroll et al., 2010). The use of design thinking in schools influences the range of experiences and knowledge that fosters confidence in students' opinions and abilities (Dam & Siang, 2017). By developing design thinking in primary education, students are given opportunities for personal growth, helping them to become individuals with a broader perspective in the future.

According to the mean values, respondents' answers about the difficulties in implementing the steps of the design thinking process were analyzed, depending on the location of the school (see Tab.3).

Analyzing the implementation of the steps of the design thinking process in capital city Riga schools, the mean values for the steps 'Identifying needs and opportunities' and 'Testing and improving' are 2.67, while the mean values for the steps 'Idea search and solution selection', 'Planning', and 'Implementation' are 2.33, indicating that their implementation presents difficulties. In city schools, the highest mean value of 2.25 is found for the steps 'Planning' and 'Implementation', while in rural schools, the greatest difficulties arise with the implementation of the 'Implementation' step.

By analyzing the distribution of the mean values, it can be concluded that the most difficult design thinking steps to implement are in Riga schools. One reason for this is that in Riga and city schools, the large number of pupils in the class creates challenges for teachers in organizing a quality design thinking process for the subject matter. Each pupil

Table 3 Implementation of the steps of the design thinking process depending on the location of the school

The Steps of the Design Thinking Process	Mean		
	Capital city	City of national importance	Rural areas
Understanding Needs and Opportunities	2.67	1.92	1.93
Search for Ideas and Choice of Solution	2.33	2.00	1.73
Planning	2.33	2.25	1.80
Development	2.00	1.50	1.53
Evaluation	2.00	1.92	2.07
Testing and Inprovement	2.67	2.00	2.00
Implementation	2.33	2.25	2.20

requires an individual approach, which the teacher cannot provide effectively within the time constraints of a lesson. In rural schools, the design process is easier to implement because individual attention can be provided to pupils in the class, whereas difficulties arise if the appropriate environment, design process methodology, and technologies are not provided.

The results of the Kendall correlation show the interrelationship between the steps of the design thinking process (see Tab. 4).

As shown in Table 4, the steps of 'Search for Ideas and Choice of Solution' and 'Planning' are closely correlated ($r = 0.647$), which suggests that when a teacher faces difficulties in implementing the idea generation and solution awareness stage, the subsequent 'Planning' step also presents challenges. It is important for teachers to ensure a dynamic and understandable design process to foster student growth in achieving the set goals. I. Kupča, founder of the art education center *TRĪS KRĀSAS* and co-author of the content development of the new subject "Design and Technologies", expressed her opinion in an interview with A.Auziņš on the Skola2030 blog that "The initiative and starting point for thinking of a primary school student may not be a problem or need, as in the classical design thinking model. It may be a material or an example seen in the surrounding environment that stimulates and provokes imagination. The most important thing in this process is that within the scope of one task, solutions can be different for each student in the class. In high school, this process is structured and more closely resembles a full design cycle, including research, need formulation, and development" (Auziņš, 2020).

Briška and Kalēja-Gasparoviča (2020) in 'Design and Technology' encourage offering students various tools and materials, defining the problem, and allowing them to experiment, make mistakes, and choose the best option. The principle of creating a product with a specific purpose or for a particular character will foster the student's creativity. Instead of following instructions to complete a task, for example, students could make a necklace for Shrek, the Sun Daughter, or a grandmother, as this introduces a problem situation where the student's solution must consider the recipient's personality traits and taste. Students can be encouraged to observe irregularly shaped natural materials (pieces of bark, plant roots, or leaves), allowing their imagination to see silhouettes, textures,

Table 4 Kendall correlation results

Step	1	2	3	4	5	6	7
1	–	–	–	–	–	–	–
2	–	–	.647**	.606**	–	.475**	–
3	–	.647**	–	.470**	–	.513**	–
4	–	.606**	.470**	–	–	–	–
5	–	–	–	–	–	.504**	–
6	–	.475**	.513**	–	.504**	–	–
7	–	–	–	–	–	–	–

1 – Identifying Needs and Opportunities; 2 – Search for Ideas and Choice of Solution; 3 – Planning; 4 – Development; 5 – Evaluation; 6 – Testing and Improvement; 7 – Implementation

human or animal figures, or other images. As a result, they can enhance these observed images with details so that a clear story emerges (Briška & Kalēja-Gasparoviča, 2020).

The steps of 'Planning' and 'Development' are correlated ($r = 0.470$), which means that if students do not have the opportunity to plan the creative process themselves, the teacher must become involved in the development stage and provide guidance on the tasks to be completed. 'Development' and 'Idea Generation and Solution Selection' ($r = 0.606$) are correlated, indicating that product development is not possible without an idea or problem solution, so it is important to set a goal and strive to achieve it. 'Testing and Improvement' correlate with the steps of 'Idea Generation and Solution Selection' ($r = 0.475$), 'Planning' ($r = 0.513$), and 'Evaluation' ($r = 0.504$), which means that testing the developed work and listening to other opinions is an important stage in order to return to previous steps and make necessary improvements. It can be concluded that the steps of the design thinking process are interrelated, so if the teacher has difficulty implementing even one step, the entire design thinking process is disrupted. The interaction between the steps of the design thinking process is an aspect that enables achieving a positive result in developing a needed problem solution or product. The successful integration of design thinking steps into the learning process provides the student with a multifaceted view of topic mastery in primary school, which is also emphasized in the survey responses.

In the teacher survey, the participants were asked for their opinion on the importance of the design thinking process and why it is essential to implement the design steps in primary school. Some of the responses were as follows:

- All the steps are very necessary because if any one is missing, the design process will not be complete and may not yield the desired results.
- It helps to better understand the topic being studied.
- It encourages looking at the task from a broader perspective, thinking more, getting involved, and ensures that students' work is their own creation and ideas, not modeled after a template.
- It fosters a deeper understanding of the task at hand.
- It develops various skills that can be used in other situations.
- It helps in developing students' thinking.
- In some topics, these steps can be used to create a high-quality, useful, and tested product.

It can be concluded that primary school teachers' insights on implementing the design thinking process in the subject 'Design and Technology' differs. This is determined by the teachers' work experience, understanding of the design thinking process, ability to choose appropriate teaching organizational forms and methods that stimulate students' interest and achievement of the set learning outcomes. A significant aspect that hinders the implementation of the design process in the learning process is an unsuitable environment, poor technical equipment, and the lack of materials, which restricts teachers' creativity.

In the survey, respondents noted the acquisition of various skills as a positive result of the design thinking process, which promotes the student's personal growth. To clarify teachers' opinions on which skills are developed and improved, seven skills were offered: being flexible, showing courage, accepting challenges, the ability to take risks, collaboration, the ability to find alternative ways to achieve a goal, and the ability to not give up in the face of difficulties. By analyzing the results, the number of cases was determined. After compiling the survey data, it can be concluded that teachers of the subject 'Design and Technology' for grades 1–3 have identified three main skills developed in the design thinking process while developing an idea or product. In six cases, teachers believe that students learn to find alternative ways to achieve the set goal, in seven cases, that collaboration is an important skill that is enhanced during the creative process, and in the most cases, 10 cases, teachers responded that students develop the ability to not give up in the face of difficulties. It can be concluded that students, by mastering the design thinking process, learn to see multiple possible solutions to a problem, develop a habit of collaborating with their peers, and communicating with professionals from different fields. When developing a new product, students follow the design steps, which purposefully guide them to the result, not allowing them to give up if difficulties arise. Similar conclusions were made by researcher Veita (2019), who found that in the design process, students acquire intellectual, technological, and collaborative skills while exploring problems and seeking creative approaches to idea generation and implementation.

In three cases, teachers noted that students' thinking becomes more flexible, which means that students have the ability to adapt to different unknown situations and find solutions in difficult moments. Teachers least often highlighted the skills of accepting challenges, showing courage, and the ability to take risks, which suggests that students in grades 1–3 are still reluctant to take on a leadership role in decision-making. The conclusion is that teachers need to offer tasks within the design thinking process that allow students to take risks and make mistakes. It is important for the teacher to emphasize that making mistakes in the learning process is normal because there is an opportunity to correct them.

Conclusions

Implementing the design process allows for the structured flow of the creative process, giving students an understanding of the essence of design product development. The results of each stage are crucial for the successful progress of the process, making it important for the teacher to take responsibility for the chosen forms of teaching organization, teaching methods, evaluation techniques, and the selection of an appropriate learning environment.

The survey results showed that the implementation of the design thinking process heavily relies on the teacher's knowledge and experience, a creative environment, safe working equipment, and age-appropriate teaching methods. If any of these aspects are

not carefully considered and planned, teachers most often encounter difficulties and negative emotions.

The development of design thinking in primary school is crucial for the subject 'Design and Technology', thus creating an appropriate learning environment, opportunities to learn outside of school, and fostering teacher development in design thinking are essential. These are relevant issues in the education field, and therefore, research and solution-seeking should be carried out by both teachers and educational institution leaders. Design thinking in schools can be promoted by a teacher who understands the specific nature of this way of thinking and its importance in student development.

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