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DEVELOPING SELECTED COMPONENTS OF CRITICAL THINKING THROUGH THE USE OF NON-STANDARD TEXT TASKS IN MATHEMATICS EDUCATION FOR THIRD-GRADE PRIMARY SCHOOL PUPILS*

Introduction: In a rapidly changing world, where children are faced with an overload of information from an early age, developing critical thinking is becoming a key task for education. This applies not only to young people but also to early school education, where critical thinking can be developed in various teaching areas, including mathematics education.
Research Aim: The study aimed to examine how the use of non-standard text tasks develops selected components of critical thinking in third-grade primary school pupils. The study focused on such elements of critical thinking as analysis, synthesis, reasoning, evaluation and problem solving.
Method: The study consisted of a pedagogical experiment in a pre-test – intervention – post-test format, involving 73 pupils from three third-grade primary school classes. An original diagnostic test containing six text tasks (two standard and four non-standard) was used, completed twice: before and after a series of ten mathematics lessons focused on solving unusual text tasks.
Results: After the experiment, a clear improvement in the pupils' skills was observed. They were much better at solving non-standard tasks – they more often noticed missing, redundant, or contradictory data and responded appropriately to such problems. The quality of solutions to standard tasks also improved, and key components of critical thinking were developed.
Conclusions: The results confirm effectiveness of non-standard text tasks as a tool for developing critical thinking in early school education. Introducing such tasks into mathematics classes

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not only allows pupils to better understand the problem contained in the task, but also enables them to improve their logical thinking skills.

Keywords: critical thinking, non-standard text tasks, early school education, mathematics education, third-grade pupils

INTRODUCTION

Developing mathematical skills and shaping cognitive competencies in children at an early stage of education is one of the key objectives of teaching. Already in the first years of school, pupils encounter difficulties in solving word problems, especially those of an unusual nature, which require them to think independently, critically analyse data, and search for solution strategies. Therefore, foundations for critical thinking should be laid as early as on the early school education stage (cf. Ceglińska, 2015; Czaja-Chudyba, 2013, 2020; Dąbrowski, 2013; Grabowski, 2021; Kalinowska, 2010; Klus-Stańska, 2018; Klus-Stańska & Nowicka, 2014; Nawolska, 2021; Nawolska & Rutka-Gliksman, 2019; Nawolska & Żądło-Treder, 2017, 2020).

Mathematical problems, formulated as verbal descriptions containing certain unusual structural elements are non-standard text tasks. This category includes, among others, tasks with excess data, tasks with insufficient data, tasks with contradictory data, and tasks with the so-called bad content (i.e., seemingly normal tasks in which the question is inadequate; see Gleichgewicht, 1988). In addition, the literature also distinguishes between problems with ambiguous solutions and problems with content that has no practical meaning (otherwise known as meaningless in real life), which additionally force pupils to critically analyse data and go beyond standard solution patterns (Nawolska, 2021). As a result, working with non-standard tasks can contribute to developing a range of critical thinking skills in children: from the ability to analyse and synthesise data, through assessment of logical correctness of information, to creative search for solutions (cf. Ceglińska, 2015).

In Polish literature, this issue has been addressed, among others, by Dąbrowski (2013), who highlights the importance of gradually introducing problem-based tasks into early school education. Kalinowska (2010), in turn, emphasises the role of open-ended and ambiguous tasks as tools for developing children's cognitive independence. Klus-Stańska and Nowicka (2014), on the other hand, point to the didactic value of non-standard tasks in the context of teaching critical and creative attitudes.

The need for such measures is also highlighted in reports from nationwide studies conducted by the Central Examination Board (CKE, 2014) and the National Education Information Centre (IBE), including the National Study of Third-Grade Students' Skills (Karpiński et al., 2014) and the Diagnosis of Third-Grade Students' Competences (IBE, 2015). Their results showed that pupils cope relative-

ly well with schematic tasks, but have significant difficulties with tasks requiring inference, noticing missing data, or rejecting irrelevant data. This points to the need to systematically develop children's analytical and reflective competences through appropriately selected non-standard tasks.

Similar conclusions can be drawn from international studies (e.g., Mullis et al., 2016). It is emphasised that mathematics education in lower grades should not only cover arithmetic, but above all stimulate critical thinking and problem solving in new contexts. This approach promotes the development of key competences, such as the ability to analyse, reason, and solve problems creatively; accordingly, the present article addresses the use of non-standard text tasks as a tool for developing selected components of critical thinking in third-grade primary school pupils.

RESEARCH PROBLEM AND AIM

The research focused on developing selected aspects of critical thinking in third-grade primary school pupils by solving non-standard text-based tasks, and the main research problem addressed in the study was formulated as follows: to what extent do non-standard text-based tasks support development of selected components of critical thinking in third-grade primary school pupils? Based on this main problem, more detailed research questions were identified, to which the study was to provide answers:

1. What level of ability to solve standard text-based tasks (both complex and straightforward) do the pupils present?
2. What level of ability to solve non-standard text-based tasks do the pupils present?
3. What critical thinking skills are developed through working with non-standard text-based tasks?
4. How does a different approach of pupils to standard and non-standard tasks (understood as the mechanical application of patterns vs. critical analysis of data and searching for the essence of the problem) affect their engagement and motivation to learn?
5. What difficulties do pupils encounter when solving non-standard text-based tasks, and what strategies do they use to overcome them?

The above questions formed the basis for defining the purpose of the study. The main objective was to examine whether and to what extent solving non-standard text-based tasks contributes to the development of selected components of critical thinking. These components are a set of skills including analysis, synthesis, inference, information evaluation and problem solving.

MATERIALS AND METHODS

The study employed a pedagogical experiment method with a pre-test – intervention – post-test design. It aligned with methodological assumptions described by Łobocki (2003) and Babbie (2004). In this approach, the experiment involved a planned introduction of an independent variable – a series of classes using non-standard text tasks – and an observation of its impact on the dependent variable, which included selected aspects of pupils' critical thinking.

The research was conducted between October and December 2024 in three primary schools located in the municipality of Wieprz. The experiment involved 73 third-grade pupils, deliberately selected from schools implementing the basic curriculum. Headteachers of the schools gave their consent to participate in the study. Teachers were informed about its objectives and schedule. Parents signed relevant consent forms, and pupils were informed about the purpose of the research via an accessible form. The experiment was conducted in accordance with the principles of educational research ethics, ensuring anonymity and voluntary participation. Due to the nature of the project (a teaching experiment in a classroom setting), consent of an ethics committee was not required.

A diagnostic test prepared by Wróbel was the primary research tool. It contained both standard and non-standard tasks. It was developed specifically for the experiment, and its design was inspired by the tool used in the research by Nawolska and Rutka-Gliksman (2019).

Each test (Test A – before class and Test B – after class) consisted of six text tasks: two standard tasks (one simple and one complex chain task) and four non-standard tasks – one from each of the distinguished categories (data overload, data deficiency, contradictory data, destructive content). The non-standard tasks were not marked or highlighted in any way in the test – they were mixed with the standard ones so that the pupils would approach them naturally, without any prior knowledge of their unusual nature. The tasks were solved independently by the pupils under conditions similar to a school test. However, the pupils were allowed to freely write notes in the margins, formulate questions, or even – if they deemed it necessary – propose modifications to the content of the tasks. As a result, in addition to quantitative data on the results, qualitative insight into the pupils' reasoning, and their task-solving strategies was also obtained.

The research was conducted according to the following scheme:

1. Initial test (pre-test)*:* Pupils solved a set of tasks (Test A) containing standard and non-standard tasks. At this stage, the aim was to identify the initial level of pupils' skills – to verify how they cope with typical text tasks and tasks with an unusual structure.

2. Teaching intervention: Next, as part of regular school classes lasting approximately 8 weeks, a series of 10 experimental lessons in mathematics education was

conducted, focusing on developing selected components of critical thinking. The classes were conducted according to the following plan:

Introduction – the teacher presented sample word problems to the pupils and discussed their content with them.

Problem solving – the pupils solved sets of problems individually or in pairs.

Discussion of results – the solutions were analysed together: the pupils discussed them, justified their strategies, and pointed out difficulties. The teacher acted as a facilitator – asking questions, encouraging the pupils to express their opinions and search for solutions together, but without giving ready-made answers or making any suggestions.

Reflection and summary – the pupils and the teacher concluded their solutions together, highlighting the importance of a critical approach to mathematical content and the need to verify data validity.

3. Final test (post-test): After completing the course, the same pupils took another test (Test B) with a similar structure to the initial test (also two standard tasks and four non-standard tasks). The tasks in the final test were of the same type but with different content from those in the initial test in order to eliminate the effect of learning specific solutions. To compare the results, the conditions for conducting test B were the same as the first time.

DATA ANALYSIS

After collecting the research material, a multifaceted quantitative and qualitative analysis was performed. The pupils' solutions were checked in detail for factual correctness and reasoning. In the case of standard tasks, it was assessed whether the pupil correctly arranged the arithmetic operations, performed the correct calculations and formulated an answer relating to the question in the task. The absence of any of these elements was treated as an incomplete solution. For non-standard tasks, assessment criteria were developed that took into account both mathematical correctness and the ability to recognise the unusual nature of the task. For example, in tasks with excess data, a complete arithmetic solution (correct operations and answer) was considered proper, even if the pupil did not indicate which data was unnecessary. The pupil's additional identification of unnecessary information was treated as a sign of critical thinking skills. In tasks with missing data, it was checked whether the pupil noticed the missing information and how they reacted – whether they tried to guess (which indicated an incomplete understanding of the problem) or left the task unsolved with a note about the missing data (which was considered a correct response, signalling critical thinking). In tasks with contradictory data and incorrect content, it was crucial to determine whether the pupil attempted to solve the problem despite logical contradictions (errors) or whether they signalled their

presence and corrected or interrupted the solution accordingly. All pupil work was checked several times, and in case of interpretative doubts, the solution was discussed with the pupil in question to understand their train of thought properly.

It is worth noting that the presented research project was a pedagogical experiment in a pre-test, intervention, post-test format, but without a control group. This means that the conclusions drawn on this basis should be treated with caution. They indicate observed trends in pupils' behaviour and problem-solving methods, but do not allow for an unambiguous confirmation of cause-and-effect relationships. The study was therefore exploratory in nature and may serve as a starting point for further analysis, where including a control group will allow for a more complete verification of the hypotheses.

RESULTS

A comparative analysis of the initial and final test results revealed positive changes in the skill levels of tested pupils. Below are the most important observations. They regard solving the standard and non-standard tasks and development of critical thinking skills. Solving standard tasks – initial and final tests: Already in the initial test, most third-year pupils correctly solved word problems with a typical structure. A simple task requiring a single arithmetic operation did not cause the pupils any significant difficulties – almost all of them were able to choose the correct operation and obtain the correct numerical result (64 correct solutions and 9 incorrect ones in test A, and 66 and 7 respectively in test B). However, some difficulties arose with the complex (multi-step) problem: some pupils had difficulty planning the solution step by step or omitted one of the calculation steps. Furthermore, in both types of standard tasks, it was noted that not all pupils formulated complete written answers – about 20% initially limited themselves to giving only a number as a result, without specifying what the number referred to (e.g., '15' instead of 'the tourist travelled 15 kilometres'). In the case of complex standard tasks, the results were as follows: test A had 48 correct solutions and 22 incorrect ones, while test B showed better results with 60 correct solutions and 12 incorrect ones. It can therefore be seen that after a series of classes using non-standard tasks, there was an improvement in the quality of solutions to standard tasks. Not only did the pupils make fewer calculation errors, but they also gave answers in complete sentences more often, correctly interpreting the context of the result. Such reactions indicate an increase in mathematical awareness of the respondents – pupils began to understand that in word problems, the numerical result alone is not everything; it is also important to explain what it means in the context of the problem.

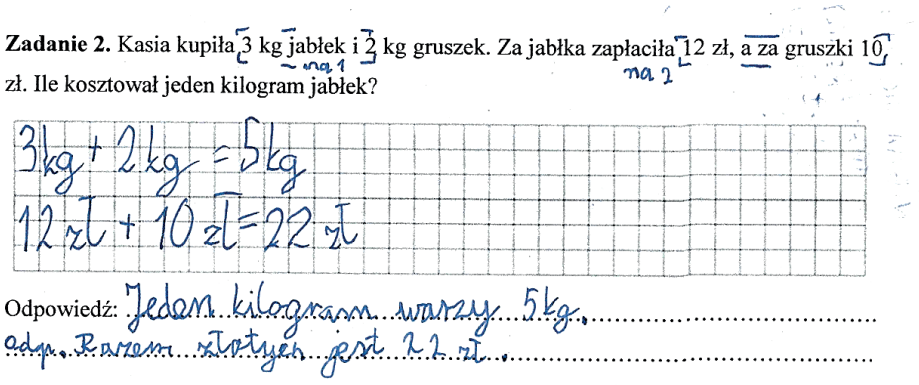
Solving non-standard tasks – initial test: Tasks with an unusual structure proved to be a significant challenge for the pupils before the experimental classes. Many of

them approached these tasks in the same way as they would normal ones – trying to apply familiar solution patterns uncritically. In the task with excess data, which read: Kasia bought 3 kg of apples and 2 kg of pears. She paid £12 for the apples and £10 for the pears. How much did one kilogram of apples cost? A large group of pupils felt lost: presence of unnecessary numerical information in the content caused some of them to try to force it into their calculations. The phenomenon of 'number hunting' (i.e., mechanically selecting all the numbers given in the text and performing operations on them without understanding whether they were relevant to the question asked) was observed (cf. Nawolska & Żądło-Treder, 2020). This resulted in incorrect solutions or no answers – some pupils, confused by the excess of information, were unable to indicate how to approach the solution. Thus, 13 of the examinees' papers were classified as 'no solution.' Among the remaining participants, 29 provided correct answers and 31 did not meet the selected criteria for a correct assessment, including: as many as 26 test-takers wrote down incorrect arithmetic expressions, 1 made a mistake in their calculations, 3 formulated their written answers incorrectly, 1 participants made a mistake in their calculations and provided a written answer that was inadequate to the question.

No one indicated that the task was unusual. No attempts to correct the task were noted either.

Photo 1

Attempt to use all numerical data contained in task (pupil's work no. 13)

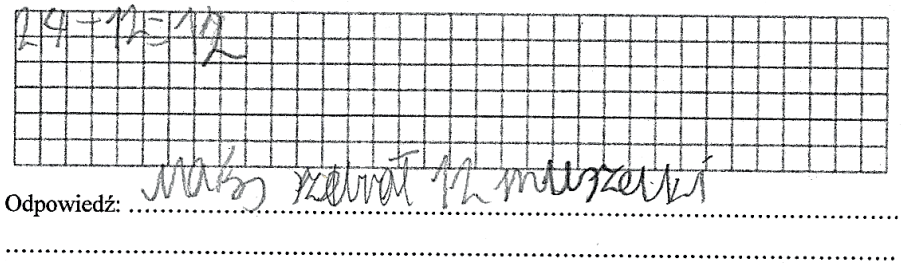


Note. Author's own study.

Tasks with missing data (such as *Zuzia and Maks collected shells on the beach. Zuzia collected 24 shells. How many shells did Maks collect?*) cannot be solved without first correcting its content. Such tasks provoked strong reactions in pupils – surprise and even frustration. After several unsuccessful attempts at calculation, most of them realised that the necessary information was missing. However, their

reactions varied: some pupils tried to 'save' the task by guessing the missing value or making an assumption, while others gave up on the answer altogether, sometimes noting in the margin that it could not be solved. Analysis of the collected research material allowed 33 papers to be classified as unsolvable. At the same time, 21 pupils demonstrated the ability to evaluate the content of the text task critically and pointed out its non-standard nature. Only one pupil corrected the task and solved it correctly. On the other hand, 19 pupils attempted to solve the task without correcting it, which is why their solutions were considered incorrect.

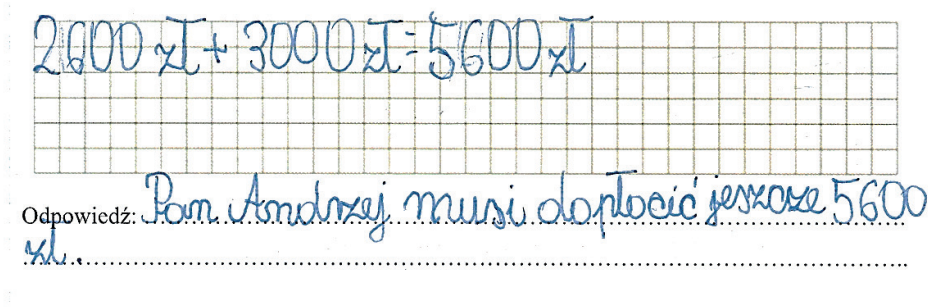
Photo 2
Attempt to solve task by adding (pupil's work no. 21)



Note. Author's own study.

A task with contradictory data (such as: *Mr Andrzej wants to buy a new mountain bike that costs PLN 2,600. He transferred PLN 3,000 to the bike shop's account. How much more should he pay?*) often resulted in incorrect answers – many pupils did not notice the contradiction and tried to perform the operations, treating the data uncritically. Sometimes, pupils obtained two different results from two parts of the task and did not see a problem in their simultaneous occurrence. This task was solved correctly by 24 pupils. However, only 5 pupils indicated its non-standard nature, and 6 corrected the content. There were 23 incorrect solutions: 9 pupils wrote down incorrect arithmetic expressions, 2 made mistakes in their calculations, 3 did not provide a written answer, 2 formulated a written answer that was inadequate for the situation in the task ('He should pay an additional PLN 400'), and 7 decided that the task could not be solved, which is untrue, as despite its specificity, it is indeed solvable. Despite the contradictions, the structure of the task does not prevent it from being answered, as evidenced by examples of correctly solved tasks. In addition, 19 papers were classified as 'no solution.'

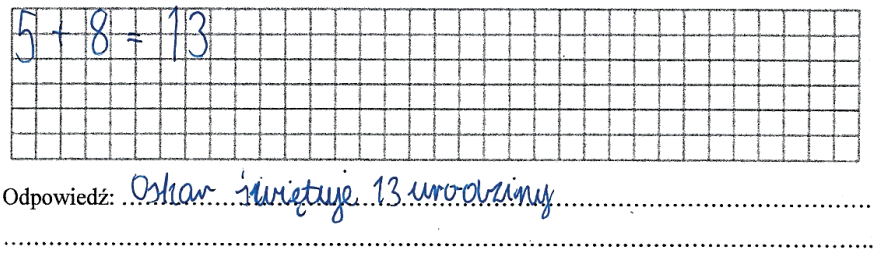
Photo 3
Attempt to solve task by addition (example of pupil's work no. 32)



Note. Author's own study.

A task with poor content, in which the question did not match the given data was: *Oskar invited 5 female friends and 8 male friends to his birthday party. Which birthday is Oskar celebrating?* This also proved difficult, as evidenced by the results: 32 incorrect answers, 14 cases with no answer, 8 correct answers, 1 pupil corrected the task. While analysing the collected research material, it became evident that many pupils attempted to answer the question, even though it required information outside the content. As a result, the answers were often irrelevant or completely random, and some pupils left the task unanswered again, feeling that 'something was wrong with it' but unable to specify what exactly.

Photo 4
Attempt to 'fish' for numbers from task and its incorrect solution (example of pupil's work no. 36)



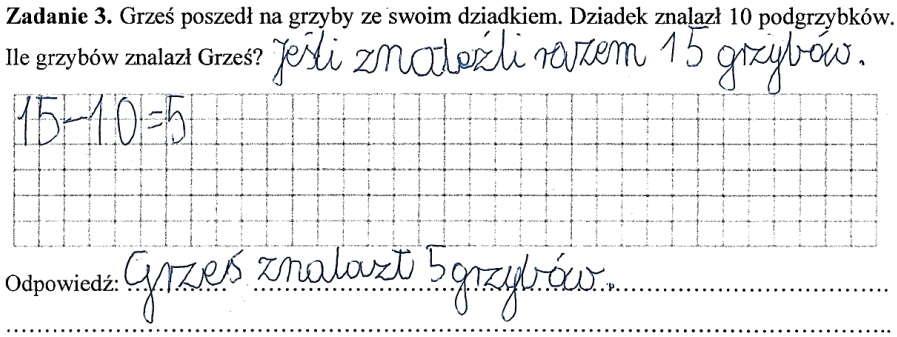
Note. Author's own study.

Solving non-standard tasks – final test: After completing classes focused on critical thinking, pupils performed significantly better on non-standard tasks. In tasks with excess data in the second test, most pupils were able to solve them correctly, ignoring irrelevant information. Notably, some of them explicitly indicated

on their work that a given value was unnecessary (e.g., by crossing it out in the task text) or wrote a comment next to the calculations, such as 'additional information, unnecessary.' This indicates an increase in vigilance and ability to critically analyse the content of the task – pupils were no longer so easily thrown off track by excess information. There was also noticeable improvement in tasks with missing data: the vast majority of respondents interrupted their calculations and noted that the necessary data was missing (e.g., 'no information about...', 'cannot be calculated'). This response was considered entirely correct because it indicated an understanding of the essence of the problem. In the task with contradictory data, the pupils showed much greater caution after the lessons. Many of them noticed the illogicality already at the reading stage and either did not attempt the calculations or, after performing the operations, noticed the conflict in the results and indicated this in their answers. For example, pupils added comments such as: 'contradictory data – cannot be solved' or suggested improvements to the content to make the task solvable. Similarly, in the task with poor content, a significant proportion of pupils identified the lack of connection between the question and the data. Instead of giving random answers, they wrote, for example: 'question to be changed – does not fit the task.' Such reactions show that pupils have learned to critically evaluate the meaning of each problem, rather than just automatically performing operations on the numbers given in the task. Overall, in the final test, the number of completely correct solutions to non-standard tasks increased significantly compared to the initial test, and the number of answers indicating the lack of understanding of the problem (or no answer at all) decreased significantly. Below is an example of a correction to a task with missing data proposed by a pupil (see Photo 5) and a summary of the changes observed in task solving before and after the teaching intervention (see Table 1).

Photo 5

Correction of task content by adding information about total number of mushrooms collected (example of pupil's work no. 24



Note. Author's own study.

The examples of pupils' answers presented in Table 1 below illustrate the change in the way non-standard tasks are solved before and after the teaching intervention. There is a visible shift from a mechanical approach to the content of the task towards a more reflective analysis and recognition of errors in task construction, as evidenced by examples of pupils' statements.

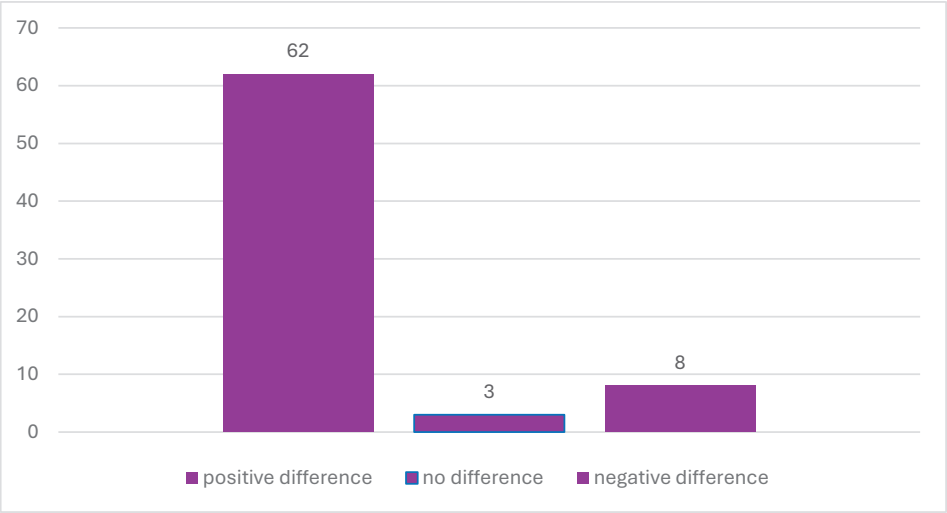
Table 1
Changes in pupils' task solutions before and after teaching intervention

Type of task	Prior to intervention	After intervention
With excess of data	The pupil takes into account all numbers given in the text, which leads to an incorrect result. They do not indicate unnecessary information.	The pupil adds a comment: *This number is not needed here,* and correctly solves the problem, discarding excess data.
With no data available	The pupil attempts to "guess" the missing value or accepts the default data.	The pupil more often writes: *Cannot be solved because there is insufficient information about...* – consciously recognises the lack of data.
With contradictory data	The pupil performs the tasks despite the logical inconsistency of task content.	The pupil points out: *This task is wrong; these numbers cannot be correct because...*
With inappropriate content	The pupil treats the question as correct and provides random answers.	The pupil writes: *How am I supposed to know? The task doesn't make sense! The question is not about that.*

Note. Author's own study.

Comparison of the results of both tests (see Chart 1 below) and observations from the course indicate development of important components of critical thinking in pupils. Thus, 65 respondents demonstrated the same or higher level of tested skills after completing the course. Analysis of the work of three pupils showed no difference in points between the post-test and pre-test. These pupils made similar mistakes in Test A and Test B. In contrast, 62 participants showed a positive difference, indicating an increase in skills.

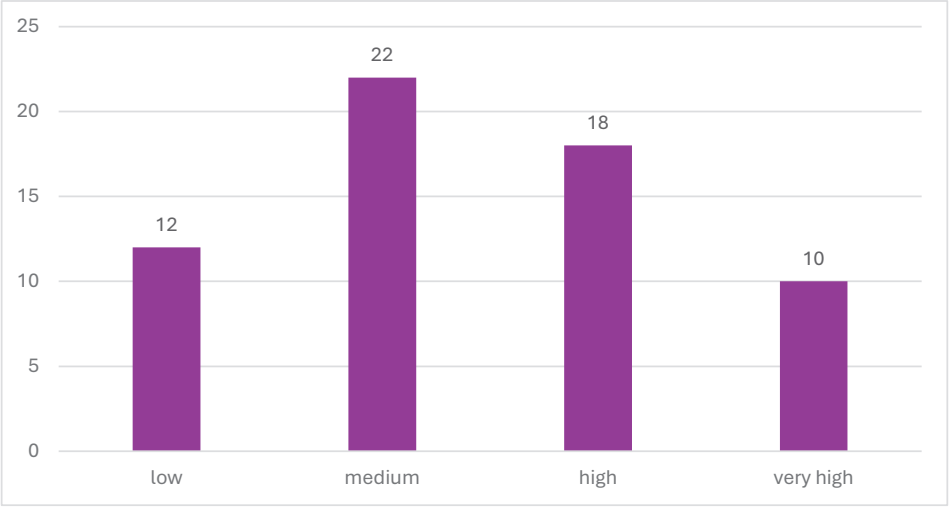
Chart 1
Individual point differences from comparison of Test A and Test B results of pupils participating in study



Note. Author's own study.

The negative difference result may suggest a decline in skills. However, it is necessary to closely examine the pupils whose results in the second test were worse, as such a change may be due to various external and internal factors. The negative difference applies to 8 participants in the study and may be worrying, but it is no more than 1 point. This means that on the final test, these students achieved an overall score 1 point lower than their initial test score. This change in results is due to abandoning additional activities within the task (e.g., in the first test, the pupil identified the non-standard nature of the task, corrected it, and solved it correctly, while in the second test, they corrected the task and solved it correctly, but refrained from indicating the non-standard aspect of the task and lost the opportunity to earn 1 point for additional actions or calculation errors. In the group of 62 people who showed a positive increase in critical thinking skills, the extent of this increase varied, as shown graphically in Chart 2 below.

Chart 2
Degree of increase in pupils' critical thinking skills (individuals with positive difference in results)



Note. Author's own study.

In the final stage, based on the results obtained by all participants in the study, the average point difference was calculated, which amounted to approximately 3.18 points. The positive results allow us to conclude that the classes using non-standard text tasks, conducted as part of the experiment, contributed to an increase in critical thinking skills among third-grade pupils. Firstly, the ability to analyse the content of the task improved – when reading the task, the pupils began to consciously separate relevant data from irrelevant data and assess whether they had all necessary information. Secondly, their reasoning and logical thinking skills improved – the pupils became more inquisitive, looked for connections between data, and checked the logical consistency of the result with the assumptions of the task. Thirdly, their ability to formulate judgements and assessments developed – this was evident, for example, in their noting of critical comments on tasks (e.g., pointing out errors in the task or assessing missing data). Finally, the pupils demonstrated greater independence and confidence in decision-making: instead of passively waiting for the teacher's prompt, they attempted to explain the problem on their own, and when the task proved to be flawed, they had the courage to point it out. Their fear of making mistakes decreased, while their willingness to question the task's content and seek alternative solutions increased; overall, the study's results showed a positive relationship between working on non-standard text tasks and the development of selected components of critical thinking in third-grade pupils

DISCUSSION

The fact that younger schoolchildren can develop critical thinking skills with appropriate teaching support is confirmed by the observations of other authors. For example, results obtained by Nawolska (2021) show that giving 9-10-year-old pupils unusual text-based tasks provokes them to critically analyse a problem and look for ways to solve it, thereby developing their critical thinking skills. This study provides additional evidence for this thesis, while also showing a specific qualitative dimension of these changes – from the improvement of specific skills (information analysis, drawing conclusions) to a change in the pupil's attitude towards tasks (a more inquisitive and independent attitude).

It is worth emphasising that the appropriate methodology of working with pupils was the key element of the intervention. Although the non-standard tasks themselves provided an important intellectual stimulus, they might not have been as effective without an atmosphere of open discussion and encouragement to ask questions. The experimental classes created a space for pupils to safely make mistakes and analyse them together, which is fundamental to the development of critical thinking (cf. Nawolska & Żądło, 2010).

According to classical constructivist concepts (e.g., Filipiak, 2015; Kalinowska-Iżykowska, 2020; Piaget, 1966; Wygotski, 1989), pupils learn most effectively when they discover irregularities and draw conclusions themselves, rather than receiving ready-made answers. In the experimental classes discussed, the teacher acted as a moderator, directing the children's attention to the essential elements of the tasks and encouraging them to think independently, without offering suggestions. This approach enables pupils to build knowledge through experience and reflection actively.

Another interesting observation is the increase in the pupils' motivation and engagement that accompanied introduction of unusual tasks. The initial shock or frustration eventually turned into curiosity: the pupils began to treat these tasks as puzzles that could be 'solved' together. At the end of the experiment, many of them declared that such non-standard problems were 'more interesting' than ordinary ones because they required thinking, which is an important tip for teaching practice. Moderate introduction of intellectual challenges and unusual problems can not only develop specific competences, but also increase pupils' internal motivation to learn, making teaching less formulaic and dull.

Referring the results to the literature, there is complete agreement that development of critical thinking in early school years is possible and desirable. Czaja-Chudyba (2013, 2020) has repeatedly emphasised that children of this age are capable of asking questions and thinking logically if the curriculum is not limited to providing ready-made information but actively engages them in the process of acquiring knowledge. The study confirms this postulate, showing that non-standard text tasks can act as a catalyst for such activities.

CONCLUSIONS

The study provided evidence that, through appropriately planned teaching activities, certain components of critical thinking can be effectively developed in children as early as on the early school education stage. Based on the results, the following main conclusions were formulated:

- Non-standard text tasks promote development of critical thinking components such as analysis, inference, as well as detection of errors and omissions in information.
- Early mathematical education can integrate elements of critical thinking training**.** Inclusion of non-standard tasks in early school mathematics curriculum is an effective way of achieving not only mathematical but also general developmental goals.
- Activating methods enhance the effec**t.** Non–standard tasks are valuable in themselves, but only when combined with the proper working methodology do they yield full results in the form of increased critical thinking skills and pupil engagement.
- Pupils gain confidence as 'thinkers' – the experience of being able to independently detect an error in a task or identify missing data strengthens their belief in their own intellectual abilities. They begin to understand that learning is not just about following established patterns, but also about questioning and inquiring.

In summary, results of this experiment indicate that it is worthwhile to enrich education of the youngest pupils with elements that teach critical thinking. In an era of rapid civilisational and informational change, this is an investment in the future of pupils who, as adults, will have to cope with a flood of information, complex problems, and the ability to make informed decisions.

LIMITATIONS

It should be noted that certain limitations in the research affect interpretation and generalisation of its results. Firstly, the experiment covered a relatively small and specific group – 73 pupils from three schools in one municipality. Although the schools were deliberately selected for their differences in size and location, they all had a similar profile, and the classes were taught by teachers willing to implement this type of innovation. This may mean that obtained results are somewhat context-dependent – under different conditions, the effects could be slightly different.

Secondly, the study did not use a classic control group. All participants underwent the teaching intervention, and the comparison was based on their results before and after the classes. This research procedure makes it difficult to rule out alternative explanations for improvement in results completely (e.g., the effect of

retesting itself or general cognitive maturation during the experiment). Although the study period was short and the content of tasks in tests A and B differed, it cannot be ruled out that a small part of the improvement was due to the pupils becoming familiar with the test situation, rather than solely to the intervention itself.

Thirdly, the nature of the analysis methods used – mainly based on qualitative interpretation of pupils' notes and their behaviour during lessons – carries with it a particular subjective element. Despite efforts to assess as objectively and repeatably as possible (multiple verification, consultations with pupils), certain aspects may have been subject to interpretative error. Interpretation of a pupil's intention in the case of a non-standard answer is but one example of a potential interpretive error.

Fourthly, based on the research conducted, it cannot be unequivocally stated that the pupils have fully developed critical thinking, as no tools enabling precise operationalisation of its components were used. However, it is possible to point to the emergence of selected manifestations of this competence, such as noticing contradictions in the content of the task, rejecting unnecessary data, pointing out missing information, and questioning meaningfulness of task content. The observed behaviours are symptoms of developing a critical attitude towards mathematical tasks. Therefore, the results of the study suggest that it is possible to develop some aspects of critical thinking in early school education. However, further in-depth research is needed using diagnostic tools that allow for a more precise measurement of this competence.

Finally, the short duration of the experiment constitutes a limitation, as the effects were measured shortly after the end of the classes; therefore, the long-term permanence of the observed changes in pupils' skills remains unknown, and further large-scale studies involving different schools, random sampling, and a control group are needed to confirm and generalise the findings.

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ROZWIJANIE WYBRANYCH KOMPONENTÓW KRYTYCZNEGO MYŚLENIA POPRZEZ ZASTOSOWANIE NIESTANDARDOWYCH ZADAŃ TEKSTOWYCH W EDUKACJI MATEMATYCZNEJ UCZNIÓW KLAS TRZECICH SZKOŁY PODSTAWOWEJ

Wprowadzenie: W dynamicznie zmieniającym się świecie, w którym dzieci już od najmłodszych lat zmierzają się z nadmiarem informacji, rozwijanie myślenia krytycznego staje się kluczowym zadaniem edukacji. Dotyczy to nie tylko młodzieży, ale także uczniów edukacji wczesnoszkolnej, gdzie myślenie krytyczne można kształtować w różnych obszarach nauczania, w tym w toku edukacji matematycznej.
Cel badań: Celem badania było sprawdzenie, w jaki sposób zastosowanie niestandardowych zadań tekstowych rozwija wybrane komponenty myślenia krytycznego u uczniów trzeciej klasy szkoły podstawowej. Badanie koncentrowało się na takich składowych myślenia krytycznego, jak analiza, synteza, wnioskowanie, ocenianie i rozwiązywanie problemów.
Metoda badań: Stanowił ją eksperyment pedagogiczny w układzie pre-test – interwencja – post-test, obejmujący 73 uczniów z trzech klas trzecich szkół podstawowych. Wykorzystano autorski test diagnostyczny zawierający 6 zadań tekstowych (dwa standardowe i cztery niestandardowe) rozwiązywany dwukrotnie – przed i po cyklu 10 lekcji matematyki ukierunkowanych na rozwiązywanie nietypowych zadań tekstowych.
Wyniki: Po zakończeniu eksperymentu zaobserwowano wyraźny postęp w umiejętnościach uczniów. Znacznie lepiej radzili sobie oni z rozwiązywaniem zadań niestandardowych – częściej dostrzegali brakujące, zbędne lub sprzeczne dane i właściwie reagowali na takie problemy, potrafili je identyfikować. Poprawiła się także jakość rozwiązań zadań standardowych oraz rozwinęły się kluczowe komponenty myślenia krytycznego.
Wnioski: Wyniki potwierdzają skuteczność niestandardowych zadań tekstowych jako narzędzia rozwijania myślenia krytycznego w edukacji wczesnoszkolnej. Wprowadzenie takich zadań do zajęć matematycznych pozwala uczniom nie tylko lepiej rozumieć zawarty w zadaniu problem, ale także umożliwia doskonalenie umiejętności logicznego myślenia.

Słowa kluczowe: myślenie krytyczne, niestandardowe zadania tekstowe, edukacja wczesnoszkolna, edukacja matematyczna, uczniowie klasy trzeciej