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Participation in the miniLogia Computing Competition – Trends Emerging from the Long-Run Experience

Uczestnictwo w konkursie informatycznym miniLogia – tendencje wynikające z wieloletnich doświadczeń

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Introduction

At the current stage of scientific development, it is difficult for us to avoid modern technologies in our daily lives. Research show that teenagers spend on average more than 4 hours a day on the Internet, mainly as an entertainment space (access to music, films, etc.) and a centre of social life (Bochenek and Lange, 2019). In this respect, the significant role of computer education is to show children and young people alternative ways of using new technologies. Secondly, new professions emerging on the labour market no longer require basic IT skills but often advanced data analysis or programming. Therefore, algorithmic thinking and programming skills should be improved already from primary school. The development of logical thinking, creativity, imagination benefits everyone, even if not every student will become a computer scientist or programmer in the future. One of the increasingly commonly used tools to achieve this goal is to conduct computer science competitions. Although it is possible to learn a lot about computer science education from the competitions or olympiads' results, the issue of competitive programming and informatics competitions is still underexplored in the research literature on computing education.

With these considerations in mind, the study discusses the teachers' role in supporting students at primary school entering information competition in Poland, specifically the miniLogia competition. A thirteen-year quantitative longitudinal study was employed in which the participants' data were analysed, including the score results.

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Computing education through competitions

A healthy computing rivalry allows to discover and develop programming skills among students (Dagiene, Skupiene 2004). The participation in students contests, especially as a team, stimulates to share the knowledge and new praxis in programming techniques (Grigorova, Hristova 2010; Yates, Das Majumder, Wentz 2020). It encourages to autonomous decision-making and evolves various approaches in problem solving (Nagyová 2018), also including mathematical reasoning. Supplementary after-school computing activities develop creativity in computational thinking and stimulate student's imagination.

The development of new technologies is a cause of changes in widely understood education. It affects teaching materials, methods, learning environment, educational content (Domingo, Garganté 2016). The use of information technology in schools is becoming ubiquitous. Computing education (in particular various competitions), trying to keep up with globalization process, influences the changes in the national core curricula, and not only informatics education curriculum (Dagiene, Stupurienė 2016).

The global transformation enforces a different approach to education. Teacher is no longer at the centre of the education process (Krahenbuhl 2016). He or she should inspire learners, indicate methods of knowledge constructing, help to recognize interesting and important educational problems. Nowadays, the role of a teacher is to motivate, give guidance, let children learn by doing rather give lectures (Reinsvold, Cochran 2012). Hence, the conclusion that computer education seems to give a wide range of possibilities to implement these postulates.

One of the methods to motivate students to active learning is the competition approach. Teacher encourages, but does not compel, to take part in subject contests. Urging students to set ambitious but achievable educational goals not only makes learning more enjoyable, attractive but also strengthens students' self-confidence and belief in the educational success (Bolhuis, Voeten 2001; Komm et al. 2020). The teacher's measure is often the reason why students decide to participate in competition (Šimek, Košir 2015). However, the role of teacher is really significant, as it is necessary to choose the right competition tailored to the student's potential and abilities. Every student has right to clarify one's field of interests, develop and deepen one's knowledge and skills and mastery in it – step by step and feel the potential to succeed. An inappropriate choice of competition may weaken students' intrinsic motivation to learning, creativeness and self-esteem. By creation of an atmosphere of support, emotional commitment, instruction and feedback teachers build effective educational environment which allow to co-coordinate development of students' knowledge and skills (Perry et al. 2002; Kramarski 2018; Perry et al. 2018). The influence of teachers concerns both what students learn and above all how they learn. The meaningful task setting, choosing strategies tailored to students' needs, assists students, accurately evaluating their emerging knowledge gaining are all positively correlated with learning outcomes (Moos, Ringdal 2012).

Polish primary school computing education is based on the national core curricula and is carried out in only one lesson per week throughout the entire educational cycle. Each lesson lasts 45 minutes. In consequence, as the compulsory informatics education is carried out on a very basic level, it is supported by encouraging student participation in various facultative contests. The competition approach is used in Poland on three levels. The first of them: in-school contests, organized by teachers, are the most popular. They cover the knowledge indicated in the core curriculum and strengthen the basic school education. They motivate students to on-going learning. In the end of the school year the best students are awarded by certificates and higher subject grades. The second type are competitions, very often commercial, organized by educational companies, with a regional, national or international range. They differ in level, scope and popularity. They are most often carried out in the form of a test during lessons or optional classes. Students who achieve high scores are rewarded with certificates and/or souvenirs, prizes. And finally, the third type are competitions organized by regional or national school authorities, free of charge, going far beyond the core curriculum. Reaching the winner's place enables admission to any, chosen secondary school.

The miniLogia belongs to third category, as the only one computing competition in Mazovian Voivodeship giving access to every secondary school, avoiding the general recruitment procedure. As it is not easy to be accepted to a school that is on a high position in the ranking of Polish secondary schools (http://licea.perspektywy.pl/2021/tabele) the relevance of the miniLogia competition has become even more significant.

Logo programming

The miniLogia competition is organized by the Computer Assisted Education and Information Technology in Warsaw. What seems to be the purpose of the competition is to reveal the development of talented children. Which is not insignificant, it also results in raising the level of informatics education. The competition is addressed to students from the 4th to 6th grade of primary schools in Mazovian Voivodeship. The participation is not compulsory, however it brings a few tangible benefits for successful participants. The tasks of the competition participants is to solve algorithmic problems using turtle graphics in the Logo environment.

The Logo programming language was designed by a team including Seymour Papert in the late 1960s as an educational experiment (Layman, Hall 1988) and is used in primary education until now. The literature review indicates Logo programming contributes to improving problem-solving skills, cognitive and metacognitive skills, improving social interaction (Walsh Jr 1994). Logo programming increases performance in students' geometric problem solving and should facilitate ICT education, especially in primary schools (Pardamean, Suparyanto, Evelyn 2015). Experimental research confirm the Logo programming is particularly effective for elementary students, improving not only geometric concepts (solving properties problem with use of figures properties, logical world) but also improve figural creativity, visual inference (Pardamean, Evelin, Honni 2011). The Logo environment facilitate the development of student confidence, strengthens the interest in computer programming (Lewis 2010).

From the school year 2013/2014 the miniLogia competition has been extended with the possibility of solving the same contest tasks in the Python environment. When entering the competition, the student chooses a programming environment.

Research Focus

Computing competition issues are not a research field explored deeply enough by national researchers. Data on student participation in competitions are most often held only by the organizers. Therefore, the presented data, gathered from the miniLogia organizers, are an important and new source of knowledge about the quality of education in Mazovian Voivodeship and should become the first step towards further research on the role that subject competitions play in education. The topic is very important, as digital skills, broadly defined, will be a requirement for entering the labour market in the coming years. Skills that should be developed from the earliest stages of education. Lack of attention to computer science education will be a detriment to the entire society.

While alternative computing competitions (such as Scratch for example) are currently organized, they will not be considered in the following article. Although, they play an important role in IT education, as they distinguish computational and algorithmic thinking, but they are not regarded as the high stakes competition in Mazovian district. The aim of the study was to investigate trends in the participation in Polish informatics competition miniLogia and to analyse the results obtained by students. In order to achieve these goals the following analyses were delivered:

1. The level of participation in the miniLogia competition over the last 13 years.
2. The level of qualification to second level of the miniLogia competition.
3. Results of third level of the miniLogia competition.

Methodology of Research

General Background

According to the Bandura's social-cognitive theory, the students' eagerness to involve in the learning process and the quality of their engagement depend on the self-efficacy perceptions, students' belief in their capability to succeed (Bandura 1997; Pajares, Schunk 2001; Brophy 2010). The theory postulates that among various classroom environmental factors, the role of the teacher is essential. The teacher supports process of intentional education by arrangement of tasks in goal-oriented learning, which becomes more important with the age of the students. The teacher also enhances students' learning motivation, encourages students to pursue ambitious but achievable educational goals, directs their learning process (Rheinberg, Vollmeyer, Rollett 2000). This approach is particularly significant in the miniLogia competition, which requires active commitment in a few important key phases of the process, from the engagement in the main competition's levels to engagement in the auxiliary e-learning course. The supporting role of the teacher is required on every step of the competition flow (figure 1). This approach was used as the basis in the study.

The research was triggered by discussions with a dozen or so students from various primary schools about the poor involvement of their teachers in promoting programming education. The study is not focused on the determination of factors causing the existing state. The aim of the paper is to investigate the existence of a phenomenon, its trends and scale in case if observed.

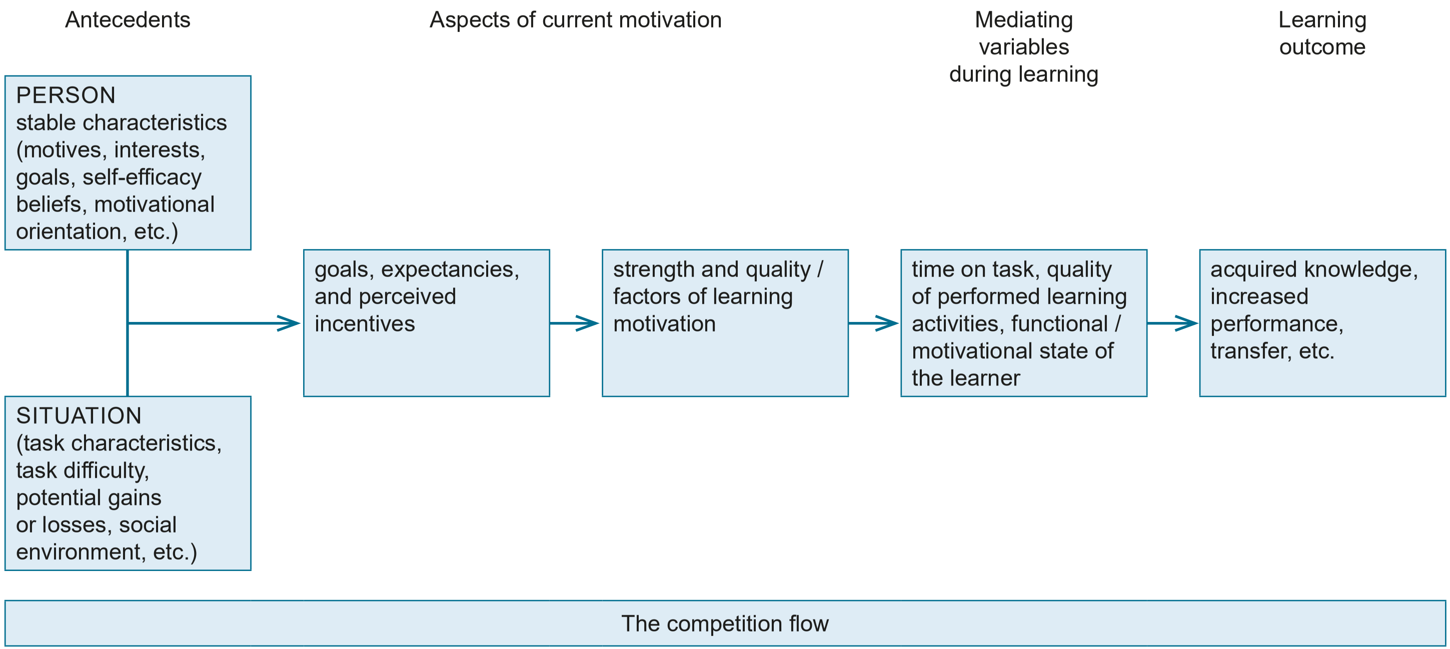

Figure 1. The framework of learning during a competition flow

Source: Rheinberg, Vollmeyer, Rollett (2000, p. 505).

Sample of Research

The study was based on the secondary data containing quantitative data of the competition, including score results of the highest level of miniLogia competition. The research involved a thirteen-year period, from school year 2006/2007 to 2018/2019. Due to the pandemic situation, the organisation of the competition in the 2019/2020 and 2020/2021 school years was disrupted, these sessions were therefore not included in the study. The analysed score results of participants include all finalists and laureates of each competition's year. Specifically the sample consisted of 709 boys (83.4%) and 141 girls (16.6%), a total N of 850 participants. Additionally data contained records with numbers of participants of the first and second level of the miniLogia contest (in total 8665 participants) and represented schools (in total 1728). The data were received from the competition's organizer, the Computer Assisted Education and Information Technology Centre (OEIiZK), with respect for the rights to personal data protection. The received data does not present the information about specific age of the participants. The educational system in Poland was changing a few times during analysed period. The 2009 reform introduced a law according to which in the years 2009–2011 parents could decide when their children start primary education (age 6 or 7), from 2012 all children started first grade as 6 years old (one year earlier than the pre-reform period). In the 2017 reform the six-year primary school has been extended to eight years in place of the liquidated lower secondary school. As a consequence the competition in school year 2017/2018 was addressed to students from the 4th to 7th grade of primary schools in Mazovian Voivodeship, in school year 2018/2019 to students from the 4th to 8th grade. As a consequence of these changes and missing information on the age of participant, the age factor was not analyzed. Unfortunately, a lot of valuable data concerning the participants in the previous years of the competition have been deleted by the OEIiZK, due to the introduced low of the General Data Protection Regulation 2016/679 and domestic law.

The data analyses were performed using IBM SPSS Statistics, version 26.

Results of Research

Participation

Firstly, the level of participation in the miniLogia competition over the last 13 years was analysed.

The unquestionable advantage of the miniLogia competition is its availability. It is three-levelled computing competition. First one, the school level, consists of three or four tasks (writing the procedure, which creates an indicated picture on the screen; writing procedures with parameters). Tasks are the same for all age groups. Schools receive task envelopes in advance and should make them known to all students. Participants of 1st level competition can solve the tasks independently, at the time and place of their choice. They can ask teacher questions, they can ask their parents, family or friends for help. The idea of this approach is to stimulate students to active learning, learning by doing. First level of miniLogia competition lasts three to four weeks, depending on the school year. The tasks solutions, in electronic form, are handed over to the Informatics teacher, who assess them according to the criteria set by the organizers. The qualification to second level of the computing competition is based on the obtaining by participant a minimum of 75% of the total number of points in 1st level (Borowiecka et al. 2006).

With such lenient assessment criteria, it seems that at least two scenarios are going to happen. Firstly, a large number of students will apply for a participation in the competition. Secondly, the vast majority will qualify to the next level. This assumption could be highly justified, as until the last reform, the miniLogia was one of four competitions (the others being Polish, Mathematics and Knowledge about an environment), which allowed admission to any secondary school avoiding a general recruitment procedure. Moreover, out of these four most significant Mazovian competitions, it is the only one promoting students to a higher level on the basis of homework tasks. Yet, the miniLogia data does not confirm expected theses. Table 1 shows the number of participants in first level of the competition during analysed period. The presented analysis are based on data received from OEIiZK and demographic data retrieved from the government executive agency Statistics Poland portal.

Table 1. Descriptive statistics for participants in 1st level of miniLogia competition from school year 2006/2007 to 2018/2019, N = 13

	Min	Max	M	SD	Me
Eligible students	147734	234568	163969	23424.36	158134
No of Participants	290	939	667	186.89	670

Where: Min – minimum value; Max – maximum value ; M – mean; SD – standard deviation; Me – median

An average 667 participants per year of the contest as the absolute value seems to be high but when is considered as a relative value, it changes the perspective. The very low participation rate (M = 0.41%, Me = 0.41%) with reference to all eligible students should be highlighted. It should also be noted the number of participants per school is clearly decreasing (figure 2; r = -0.80, $p < 0.05$, R2 = 0.64), on average one participant per almost three schools (participant per school rate: M = 39.43%, Me = 40.51%). Considering often one school is represented by several participants, it means the large number of schools is not represented at all. Assuming roughly that each participant in the first level represents a different school, last year at least 1'300 eligible schools did not apply for participation of their students (M = 1'019, Me = 984). However, in fact, the rate is much higher. Such high numbers must be of natural interest, why students do not take part in the well known and important competition.

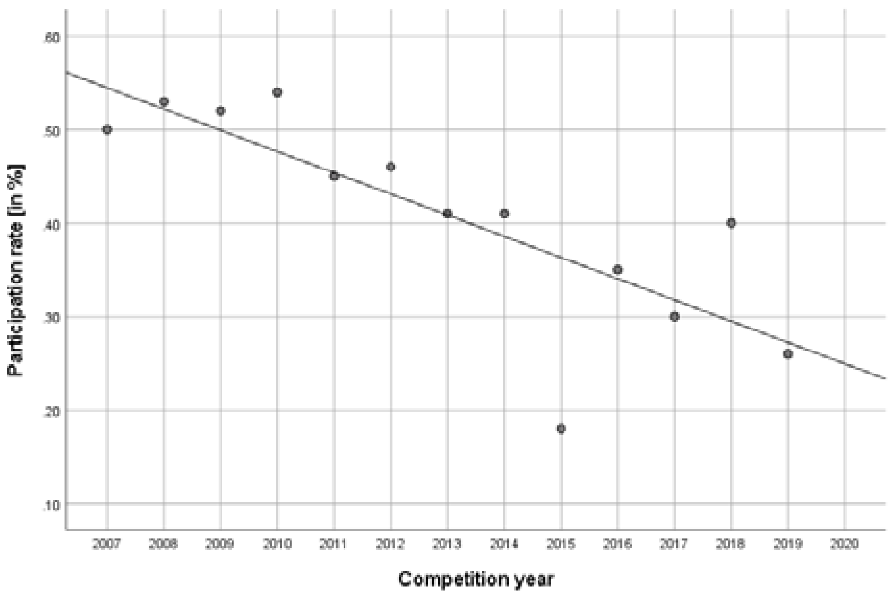

Figure 2. Linear trend of participants per school rate

Source: Author's own elaboration.

The disproportion is also visible, when we compile the data on participation in all subject competitions under the patronage of the Mazovian Superintendent of Education (table 2).

Table 2. Participation in 1st level of miniLogia, Polish, Mathematics, and Knowledge about an environment Mazovian competitions

	Participation in miniLogia	Participation in miniLogia [%]	Total participation in other competitions	Average participation in other competitions	Average participation in other competitions [%]
2012/2013	616	0.41	33 787	11 262	7.56
2013/2014	616	0.41	33 022	11 007	7.29
2014/2015	290	0.18	31 779	10 593	6.67
2015/2016	558	0.35	20 563	6 854	4.33
2016/2017	475	0.30	17 317	5 772	3.60
2017/2018	939	0.40	19 901	6 634	2.83
2018/2019	484	0.26	48 948	16 316	8.84

Source: Author's own elaboration based on Kossakowska (2020).

While an average 5.87% of eligible students participate in Polish, Mathematics or Knowledge about an environment competition, only 0.41% participate in the miniLogia. This issue must give rise to reflection and require further in-depth research and analyses.

Qualification to second level

Secondly, the level of qualification to second level of the miniLogia competition was analysed.

The intention of the competition's organizers is not only to reveal and develop informatics gifted children, but above all to support and raise the level of computing education in primary schools. The curriculum of the competition in general goes beyond the core curriculum of education in primary school, especially in higher levels. Furthermore, shortly after the first level, the OEIiZK organizes a free of charge online programming course for students, with one group meeting face to face. Participants who collect a certain number of points for the solved tasks receive certificate, which can be the basis for a higher grade at school. School teachers should be interested in the cooperation with OEIiZK in order to strengthen their didactic effort. Once again the miniLogia data do not confirm this thesis. As the tasks are clearly formulated, supplemented by a graphic example, students can easily verify correctness of own sent solution. Here is an example from the 2013/2014: "Write a one-parameter procedure/function of 'little men', when called, in the centre of the screen will produce a picture of little men holding hands. The parameter determines the number of drawn little men and can take values from 2 to 12. The drawing width is 500" (figure 3). The supporting detailed drawing of one little man is given. What matters in the tasks is the final result and not the advancement of the written procedure. Every, even the simplest solution is scored the same way. The role of the teacher is very important on this moment. Teacher should sensitize students to verify the correctness of send solutions.

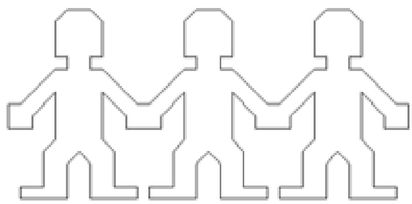

Figure 3. Illustration to competition task. Call effect: Logo – little men 3, Python – little men (3)

Source: https://minilogia.oeiizk.waw.pl/zadania/tresci/12_1.pdf

Despite being able to validate the correctness of the solution and carry out any consultations, the qualification to second level of the competition rate is relatively low (table 3; Min = 32.91%, Max = 67.15%, M = 46.39%, Me = 44.16%), the linear trend is increasing (figure 4; $r = 0.64$, $p < 0.05$, $R2 = 0.41$). On the other hand, the number of schools represented by the participants is decreasing, especially those from outside Warsaw (figure 5; $r = -0.79$, $p < 0.05$, $R2 = 0.62$).

Table 3. Descriptive statistics for participants qualified to 2nd level of miniLogia

	Min	Max	M	SD	Me
No of participants	169	348	293	44.72	300
No of representing schools	122	146	140	54.01	134

Source: Author's own elaboration.

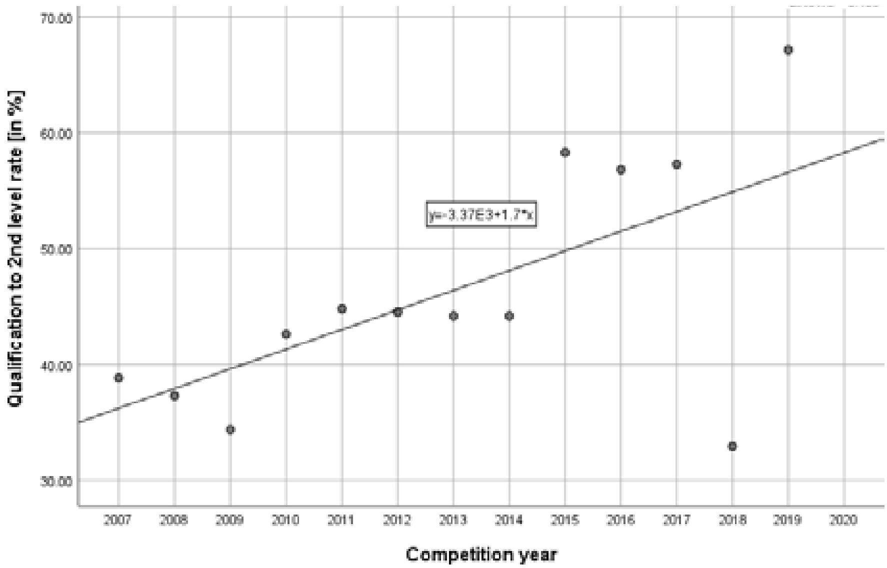

Figure 4. Linear trend of participants qualified to 2nd level

Source: Author's own elaboration.

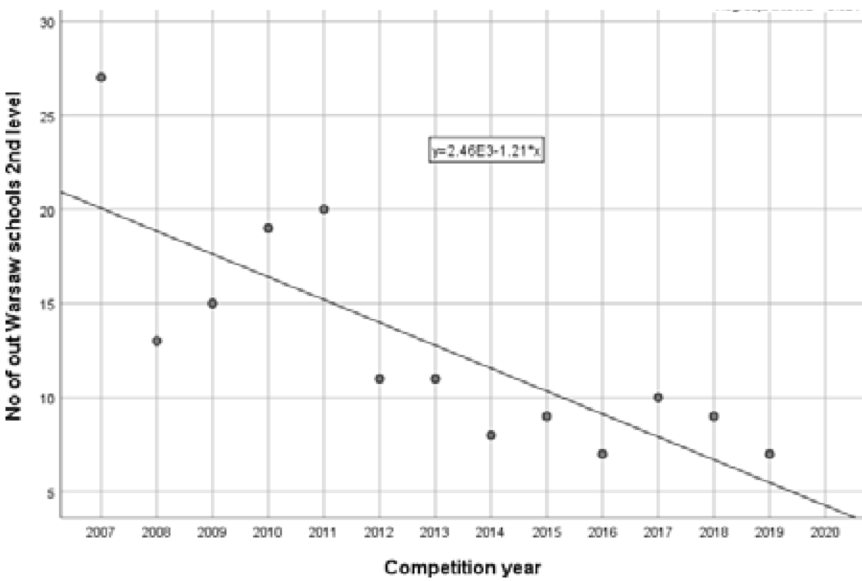

Figure 5. Linear trend of schools in 2nd level

Source: Author's own elaboration.

Winners

The next conducted analyses were related to results obtained by students qualified to the highest level of the competition. The factors such as gender, type of represented school were examined, to see if they are relevant in the planning further development of computing education in Polish primary schools.

The rules for selecting the winners of the miniLogia competition have changed over the years. In years 2006/07 – 2007/08 all participants qualified for the third level were automatically promoted to the finalists group. The laureates were students, who scored more than 85% of the points possible to obtain in the third level of the competition.

At present, all participants who have scored at least 25% of points available in the third level of the competition are promoted to the finalists group, participants who have scored at least 75% of points are qualified as the laureates. Percentage scores according to school years presents figure 6, in reference to laureates and finalists.

Changing the rules for the qualification of participants to a group of finalists and winners causes the resignation from analysing the results of the participants in relation to the place achieved in the competition. Next conducted analysis do not differentiate laureate and finalist place, every representative of each group is treated as a winner.

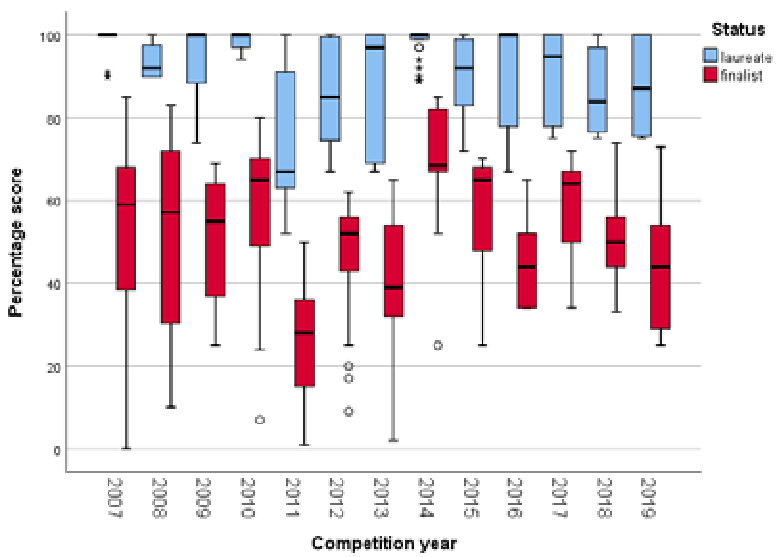

Figure 6. Percentage scores in 3rd level of the competition according to school years

Source: Author's own elaboration.

Among the author's interests was the participation of non-public schools in the quality of computing education. Non-public schools represent a small share of all primary schools in Poland, however their number is constantly increasing (from 4% in 2006/2007 to 10% in 2018/2019).

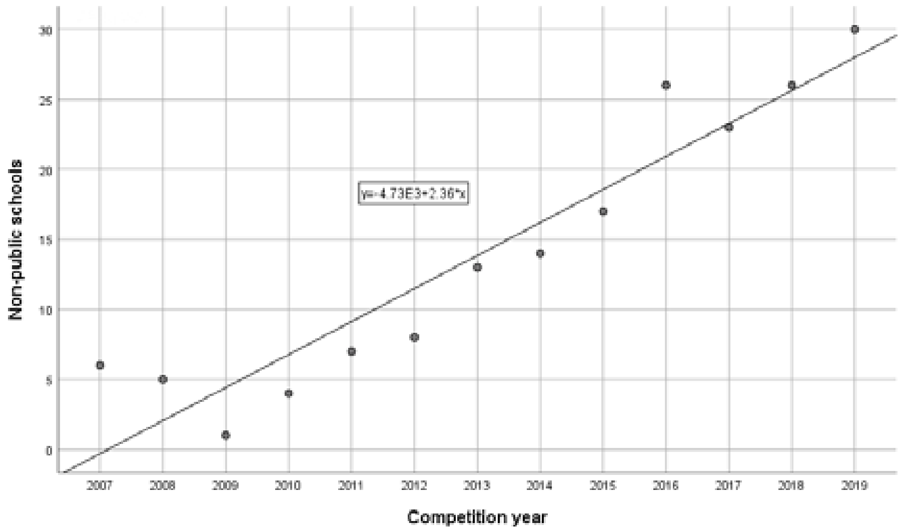

Figure 7. Linear trend of non-public schools among winners

Source: Author's own elaboration.

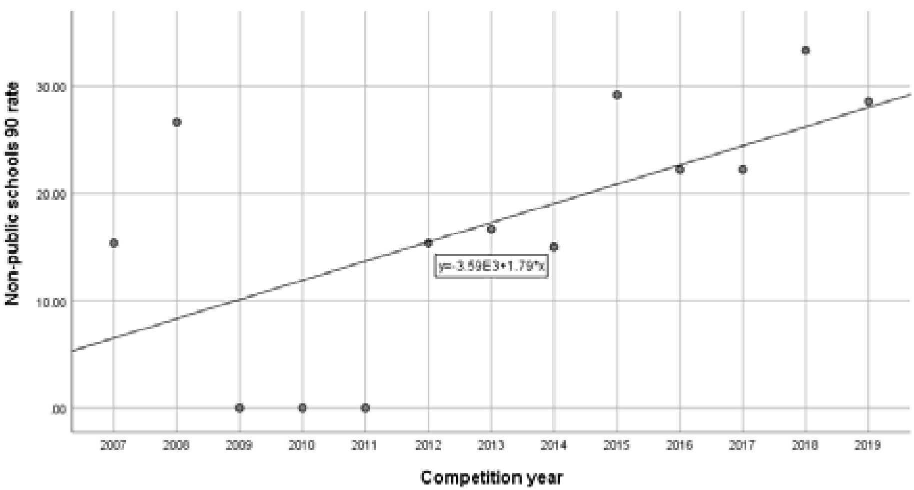

Figure 8. Linear trend of non-public schools among winners with at least 90% of points

Source: Author's own elaboration.

First of all, the significant increase of non-public school rate among winners is noticeable (figure 7). The analyses of individual levels of achievement also confirm a significant increase of high score (at least 90% of points) among winners from non-public school (figure 8).

An important issue is the gender imbalance between participants of the competition (figure 9), almost constant over time (the descriptive statistics for girls' rate in percentages: Min = 8.82, Max = 24.59, M = 16.31 SD = 5.03 Me = 15.00). For participants with high score (at least 90% of points, presented in Figure 10) the gap is even bigger (the descriptive statistics for girls' rate in percentages: Min = 0.00, Max = 27.50, M = 13.14, SD = 8.21, Me = 11.11).

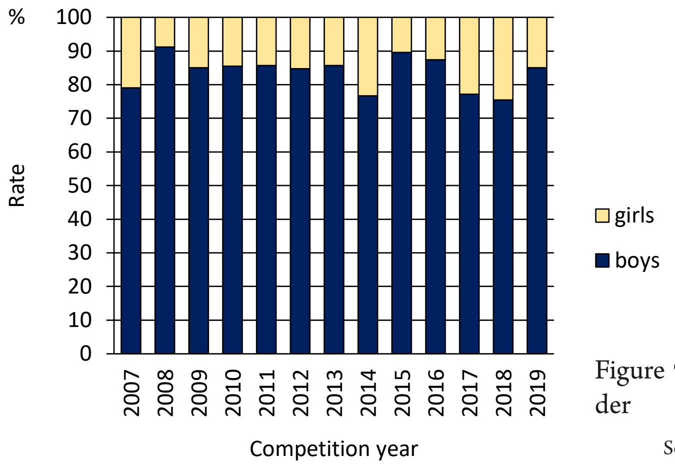

Figure 9. Winners rate by gender

Source: Author's own elaboration.

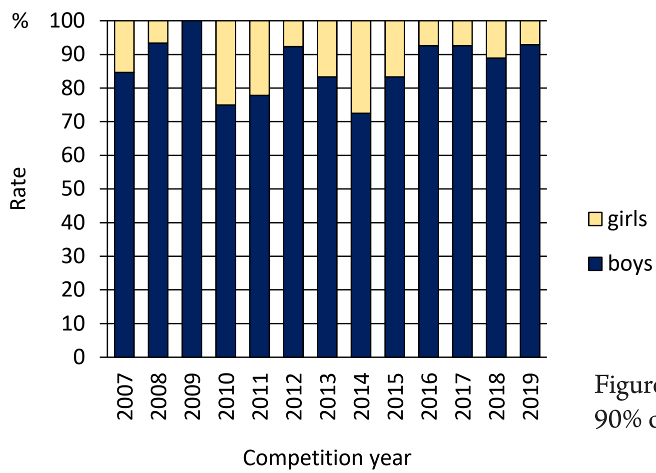

Figure 10. Winners with at least 90% of points rate by gender

Source: Author's own elaboration.

Discussion

The paper provides some trends in participation in the miniLogia competition, emerging from the thirteen years of experience. The findings enable to recognize problems faced by computing education in Polish primary schools and indicate the direction for future research.

First finding of this study is high rate of unrepresented Mazovian schools in miniLogia competition, systematically decreasing, especially those from outside Warsaw. Informatics contests are a great educational tool. Successive years of the competition discover new opportunities to strengthen students' intellectual potential. However, they will not achieve the planned goals if learners do not participate in this educational activity. The participation in miniLogia competition should be particularly valuable as, in addition to the students' computing development, they offer the opportunity to be admitted to a very good secondary school, bypassing the recruitment procedure. Many of the winners continue their computing education (indicated by participation in higher level Olympiads, Polish and foreign). Student successes also bring splendour to teachers. However, the potential of mini-Logia is not sufficiently exploited. The participation with the average rate 0.41% of eligible students, while other competitions of the same rank is 5,87% (Polish, Mathematics or Knowledge about an environment) indicates significant obstacles in computing education, which requires deeper consideration. The direction for future research is the analysis the reasons for low involvement of primary school teachers in promoting this form of educational activity. Even if the level of the competition is getting higher every year, limiting the possibility of substantive help for students, often the mere encouragement to participate in the contest will allow to discover another informatics giftedness and guide them appropriately. The increasing participation of representatives of non-public schools may indicate, among others, that teachers of that schools are more motivated and ready to pay attention to their students.

This first finding addresses the existing trends and require further in-depth research. The reasons could be on both sides: students and teachers. Even if the low participation relates to teachers not encouraging their students to participate, or students why they are not interested in taking part in the competition, it is important to determine the factors contributing to the phenomena. The decline of participation in the miniLogia competition could be also the result of the competition itself. However, this factor, in my opinion, is less significant but still relevant. The aspects requiring analyses include the attractiveness of the competition, its developmentally appropriateness or if the competition's tasks are inspiring, interesting and cognitively challenging. Qualitative research involving students, teachers and competition organizers would indicate what activities should be implemented in educational praxis to increase participation in the competition. The more thorough research is planning in the not too distant future.

The second finding indicates on average less than half of the participants of the miniLogia qualify to the second level of the competition. As students solve three tasks over four weeks, with opportunity to use the help of teachers, parents, friends, the Internet resources and can verify by themselves the correctness of the solution, the rate seems to be relatively low. The self-reliance of primary school students is not well developed, then teachers should not only encourage participation in the competition, but most of all inspire to finding proper solutions, guide the self-regulated learning process. The active presence of teacher is highly significant, however it requires at least three main factors: the noticing student potential, teacher's hard auxiliary work and time, and willingness of the student to participate in systematic self-regulated learning. It would be worthwhile to carry out research into which of these factors require the greatest support in order to improve educational system.

The first level of the competition should be the most valuable for school teachers, as part of their work is taken over by the organizers of miniLogia. The extra course they organize presents an unusual educational added value to the competition. Even if students do not advance to the third level, they will acquire additional valuable knowledge and skills.

At this point third finding is important, the increase of non-public school rate among winners and significant increase of participants with high scores (at least 90% of points) among winners from non-public school. The non-public schools in Poland are still not very popular, and are mainly chosen because of school work organization (Królikowska 2012). The non-public schools offer more hours of language classes, organize better after-school care and numerous extracurricular activities on the school premises. In public school, in 1st–3rd grade the school day very often takes 5 lessons, it equals 4,5 hours. Apart from a few, non-public schools are not ranked high in school rankings. It would be all the more worthwhile to conduct comparative research on the changing proportions among the winners of the miniLogia competition.

The fourth finding is continuing disparity between the number of boys and girls taking part in computing competitions, to the detriment of girls. The gender imbalance is also noticeable among participants with high score (at least 90% of points). It would be worth to find out if the disproportion appears only between winners or it is visible on every level on the competition. The computing education in Polish primary schools needs further, deeper analysis, looking for the true reasons contributing to the decrease of participation in meaningful learning activities. It also requires the recommendation for necessary changes.

The final remark concerns the broader view of the issues presented. The author's hope is this study will inspire researchers not only from Poland. It is worth comparing whether the trends are specific to a single European country or concern a much larger group of primary school students.

Conclusions

Logical, analytical thinking skills, digital skills are extremely important in this era of rapid digital development, so they should be developed from early childhood. Developing computing interests among both boys and girls should be an important part of educational activities. The presented low participation in the miniLogia competition is a phenomenon that should be recognized by a wide range of researchers. It requires an in-depth diagnosis and indication of practical recommendations for teaching practice, which needs the improvement of the current state. Both research among teachers, students and parents is advisable. These would enable recommendations to be identified at the following levels:

1. Students:
   - improve participation in significant activities that support computer science education;
   - support the process of self-directed learning;
   - balancing the disparity between boys' and girls' computer science achievement.
2. Teachers:
   - support in professional development, motivation, work organization.
3. Competition organizers:
   - adapt the organization of the competition to the needs of students, teachers and parents.

BIBLIOGRAPHY

Bandura A. (1997), *Self-Efficacy: The Exercise of Control*, New York: Freeman.

Bochenek M., Lange R. (2019), *Nastolatki 3.0. Raport z ogólnopolskiego badania uczniów*, Warszawa: NASK Państwowy Instytut Badawczy.

Bolhuis S., Voeten M.J.M. (2001), *Toward Self-Directed Learning in Secondary Schools: What do Teachers do?*, "Teaching and Teacher Education", 17 (7), s. 837–855, https://doi.org/10.1016/s0742-051x(01)00034-8.

Borowiecka A., Borowiecki M., Chechłacz K., Jochemczyk W., Olędzka K., Samulska A. (2006), *Mazowieckie Konkursy Informatyczne*, „Meritum. Mazowiecki Kwartalnik Edukacyjny", 1 (1), s. 58–60.

Brophy J.E. (2010), *Motivating Students to Learn*, UK: Routledge.

Dagiene V., Skupiene J. (2004), *Learning by Competitions: Olympiads in Informatics as a Tool for Training High-Grade Skills in Programming*, ITRE 2004, 2nd International Conference Information Technology: Research and Education, London, England, s. 79–83, https://doi.org/10.1109/ITRE.2004.1393650.

Dagiene V., Stupurienė G. (2016), *Bebras – a Sustainable Community Building Model for the Concept Based Learning of Informatics and Computational Thinking*, "Informatics in Education", 15 (1), s. 25–44, https://doi.org/10.15388/infedu.2016.02.

Gómez Domingo M., Badia Garganté A. (2016), *Exploring the Use Of Educational Technology in Primary Education: Teachers' Perception of Mobile Technology Learning Impacts And Applications' Use in the Classroom. Computers in Human Behavior*, 56, s. 22–28, https://doi.org/10.1016/j.chb.2015.11.023.

Grigorova K., Hristova P. (2010), *Extracurricular Training in Informatics in Ruse, Informatics in Education*, 9 (2), s. 209–216.

Komm D. et al. (2020), *Problem Solving and Creativity: Complementing Programming Education with Robotics*, in: ITiCSE '20: Proceedings of the 2020 ACM Conference on Innovation and Technology in Computer Science Education, June 2020, s. 259–265, https://doi.org/10.1145/3341525.3387420.

Kossakowska B. (2020), *Magia liczb, czyli konkursowa statystyka*, „Meritum. Mazowiecki Kwartalnik Edukacyjny", 56 (1), s. 33–43.

Krahenbuhl K.S. (2016), *A Student-Centered Education and Constructivism: Challenges, Concerns, and Clarity for Teachers*, "The Clearing House: A Journal of Educational Strategies, Issues and Ideas", 89 (3), s. 97–105, https://doi.org 10.1080/00098655.2016.1191311.

Kramarski B. (2018), *Teachers as Agents in Promoting Students' SRL and Performance: Applications for Teachers' Dual-Role Training Program*, in: D.H. Schunk, J.A. Greene (eds), *Handbook of Self-Regulation of Learning and Performance*, New York – London: Routledge, s. 223–240.

Królikowska I. (2012), *„Nasza idealna szkoła" – o oczekiwaniach i partycypacji rodziców w życiu podstawowej szkoły prywatnej*, „Colloquium Wydziału Nauk Humanistycznych i Społecznych AMW", 2012 (4), s. 51–74.

Layman J., Hall W. (1988), *Logo: a Cause for Concern*, "Computers & Education", 12 (1), s. 107–112, https://doi.org/10.1016/0360-1315(88)90063-2.

Lewis C.M. (2010), *How Programming Environment Shapes Perception, Learning and Goals: Logo vs. Scratch*, SIGCSE'10: Proceedings of the 41st ACM technical symposium on Computer science education, Milwaukee, Wisconsin, USA, s. 346–350.

Moos D.C., Ringdal A. (2012), *Self-Regulated Learning in the Classroom: A Literature Review on the Teacher's Role*, "Educational Research International", s. 1–15, https://doi.org/10.1155/2012/423284.

Nagyová I. (2018), *Analysing the Different Approaches in Mathematics and Informatics for Solving a Task and Educational Implications*, "Informatics in Education", 17 (1), s. 61–75.

Pajares F., Schunk D.H. (2001), *Self-Beliefs and School Success: Self-Efficacy, Self-Concept, and School Achievement*, "Perception", 11, s. 239–266.

Pardamean B., Evelin Honni (2011), *The Effect of Logo Programming Language for Creativity and Problem Solving*, E-Activities'11: Proceedings of the 10th WSEAS international conference on E-Activities, s. 151–156.

Pardamean B., Suparyanto T., Evelyn (2015), *Improving Problem-Solving Skills through Logo Programming Language*, "New Educational Review", 41 (3), s. 52–64, https://doi.org/10.15804/tner.2015.41.3.04.

Perry N.E., VandeKamp K.O., Mercer L.K., Nordby C.J. (2002), *Investigating Teacher-Student Interactions that Foster Self-Regulated Learning*, "Educational Psychologist", 37 (1), s. 5–15.

Perry N.E., Hutchinson L.R., Yee N., Määttä E. (2018), *Advances in Understanding Young Children's Self-Regulation of Learning*, in: D.H. Schunk, J.A. Greene (eds), *Handbook of Self-Regulation of Learning and Performance*, New York – London: Routledge, s. 457–472.

Rheinberg F., Vollmeyer R., Rollett W. (2000), *Motivation and Action in Self--Regulated Learning*, in: M. Boekaerts, P. Pintrich, M. Zeidner (eds), *Handbook of Self-Regulation*, London: Academic Press, s. 503–531.

Reinsvold L.A., Cochran K.F. (2012), *Power Dynamics and Questioning in Elementary Science Classrooms*, "Journal of Science Teacher Education", 23 (7), s. 745–768, https://doi.org/10.1007/s10972-011-9235-2.

Šimek D., Košir K. (2015), *Motivation for Participation in Competition and Avoidance of Competition: the Role of the Accuracy of Comparative Self-Evaluations of Academic Performance*, "The New Educational Review", 39, s. 142–152.

Yates H.N., Das Majumder S., Wentz B. (2020), *Effect of International Student Competition Experience on Smart Education*, in: V. Uskov, R. Howlett, L. Jain

(eds), *Smart Education and e-Learning 2020*, "Smart Innovation, Systems and Technologies", s. 188. Springer, https://doi.org/10.1007/978-981-15-5584-8_4.
Walsh T.E. Jr. (1994), *Facilitating Logo's Potential Using Teacher-Mediated Delivery of Instruction*, "Journal of Research on Computing in Education", 26 (3), s. 322–335, https://doi.org/10.1080/08886504.1994.10782094.

STRESZCZENIE

Konkursy przedmiotowe stanowią ważne wsparcie procesu nauczania / uczenia się. Na szczególną uwagę zasługują konkursy rekomendowane przez organy nadzoru pedagogicznego, które powinny cieszyć się dużym zainteresowaniem, zarówno wśród uczniów, jak i nauczycieli. Celem artykułu było zbadanie tendencji w zakresie uczestnictwa w mazowieckim konkursie miniLogia. W badaniu wykorzystano dane z lat szk. 2006/2007–2018/2019. W szczególności przeanalizowano wyniki uzyskane przez 850 uczniów w zawodach III stopnia. Wyniki wskazują na malejący udział uczniów, zwłaszcza z miejscowości podwarszawskich. Wzrasta również udział uczniów szkół niepublicznych wśród finalistów. Odsetek dziewcząt, które przechodzą do najwyższego etapu konkursu, jest nadal znacząco niższy, niż analogiczny odsetek chłopców. Co więcej, wyniki wskazują, że chłopcy nadal uzyskują wyższe wyniki niż dziewczęta.

SŁOWA KLUCZOWE: edukacja informatyczna, konkursy informatyczne, środowisko uczenia, nierównowaga płci

SUMMARY

Subject competitions provide valuable support to the teaching / learning process. Particular attention should be paid to competitions recommended by pedagogical supervision bodies, which should be very popular, both among students and teachers. The aim of the article was to investigate trends in the participation in Polish competition miniLogia. The contest is organized for children from the Mazovian primary schools and is aimed at revealing and developing computing talents, and raising the level of informatics education. The quantitative research exploited data from the thirteen years, from school year 2006/2007 to 2018/2019. In particular, the results obtained by 850 students in the third level of each year of the competition were analysed. The results show the decreasing participation of students, especially from the towns outside Warsaw. There is also an increasing share of non-public school students among finalists. The proportion of girls who advance to the highest level of the competition is still significantly lower than the corresponding percentage of boys. Moreover, the results show male participants still score higher than girls. The findings indicate the need for change in Polish computing education on the primary level and suggest a direction for future research.

KEYWORDS: computing education, informatics competitions, learning environment, gender imbalance

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