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The Examination of the Popularity and Development of the CodeCup Team Competition

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Abstract

International Informatics Olympiad in Teams (IIOT) is a competition for teams of high school students, organized since 2017. Hungary first participated in 2021. CodeCup, our national qualifier competition, gradually gained popularity over the past three years. In 2023–2024, teams have competed in four qualifying rounds.

The goal of our research was to find means of increasing the number of competitors in CodeCup, and potentially in other national qualifier competitions as well. Primarily, we wanted to measure the effects of recent changes in the competition rules.

We examined trends in the participation of the last three years: the list of involved schools, the age and gender distribution of students, with special regard to the impact of Program'Petition, a lightweight teer of CodeCup, launched in 2023.

The results show that the number of schools has not changed significantly, but the number of competitors and the ratio of girls has increased.

Keywords: CodeCup; Kódkupa; team competition; programming; evolution of competition; IIOT

CodeCup, and its little brother, Program'Petition, are the first team competitions in programming in Hungary, focused on primary (upper class) and secondary school children. The competition is still fresh in the competition calendar, as it has been running for a few years only. Fortunately, however, the examination of the competition is no longer just a possibility, but already an important foundation of its development that helps shape its profile. Our goal, beyond training and developing the communication of competitive programmers (Mhlongo, Oyetade, Zuva, 2020), is to get more students engaged in the world of programming and programming team competitions, because it is difficult to imagine the thinkers of the future without programming skills.

Introduction of IIOT and CodeCup

With goals much like those of the International Olympiad in Informatics (IOI), IIOT was founded in 2017 as an Italian initiative. Teams of up to four students can enter the competition, when all team members attend the same school. The international finals are always preceded by the national finals of every participating country, to which the best teams from the previous rounds qualify. The number of rounds in Hungary has increased steadily in recent years, and this year there were four qualifying rounds, similarly to other participating countries.

The qualifying rounds and the finals collectively have become known as CodeCup (CodeCup, 2021) in Hungary.[1] The winner of CodeCup is rewarded with a place in the international finals, a chance to compete and to represent the country at IIOT. To become a full member of the IIOT organization, a country must have a leader school that agrees to organize the national finals every year. The benefit of full membership is that not one, but two teams can represent the country: the national winner as well as the best team from the leader school. If these two happen to coincide, the second-placed team can also travel to the finals. Sending more than two teams to the international competition is possible but requires a fee to be paid by the delegating country.

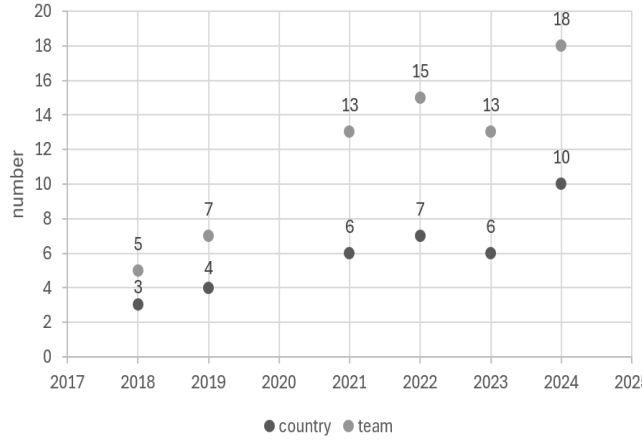

Figure 1. Number of countries and teams participating in the IIOT finals
(https://iio.team/editions)

During the last six years of IIOT, its growth has been uneven. In 2020, the international finals were cancelled due to COVID. In the following year, the competition was organized online. In return, however, more teams from non-

[1] On the website of CodeCup one can find the tasks of the previous years (CodeCup, 2022) and this year (CodeCup, 2024). In Hungary, the qualifying rounds were in Hungarian, and the national finals in English.

member countries were given the opportunity to compete. There are now five full member countries (IIOT, 2024). Figure 1 illustrates the growth of IIOT since the tournament was founded.

Countries that are full members also commit to organizing international finals themselves a few years after accession. This is no small investment of time, money and energy. There are also countries as guests at the IIOT finals that have not yet joined as full members and do not participate regularly.

This year's finals were held in Syria on 11 May 2024. Most of the students participated online due to military instability in the region. We hope that the IIOT finals will be organized in Hungary in the near future, at Fazekas Mihály Gimnázium in Budapest.

The financing of IIOT is also in line with the economic philosophy of IOI. The cost of the finals of a given year is mainly borne by the organizer. The provision of the competitors (meals, accommodation, local transport), the venue (infrastructure, supervision), the entertainment of the competitors (programs, socialization, quizzes), providing events related to the organization (opening and closing ceremonies, annual meeting) are all the responsibility of the organizer. The other countries are responsible for organizing the national qualifying rounds and finals, and for arranging and covering the costs of the travel for their own competitors to the venue of the international finals.

The long-term perspective of a competition, especially if it is held in a different location every year, can be guaranteed by the stability of the type and flavor of its tasks. The motivation and attention of the competitors can only be maintained by interesting tasks.[2] This can be achieved reliably through a large international and colorful professional committee. This committee currently consists of some 20 people delegated by countries with regular membership: Hungarians, Italians, Romanians. They are usually students who previously have been competitors themselves (source: L. Nikházy). The fact that the tasks for all national and international rounds alike are set by such a committee has the added benefit of significantly lowering the costs of joining the competition for any aspiring country.

Hungarian specialties and our Program'Petition

IIOT's competition rules are very flexible regarding the organization of the national competition and the selection of the winning team. The current recommendation, dating 5 October 2023, is that the national finals should be preceded by four online rounds of three hours each (IIOT, 2023).

Finding a date for four online rounds in our national competition calendar is a challenge. There are probably no four consecutive weekdays on the November–

[2] The tasks so far can be found on the competition website (IIOT, 2018).

February timeline that do not have some kind of competition. With this in mind, we have chosen to hold the rounds on the same dates as the Italians, but rather than limiting the rounds to three-hours each, we have chosen to schedule them over 27-hour periods. With this wider time window, we have been able to offer the students a choice of two consecutive afternoons in every round. Another advantage is that the participants are much less tied to a specific location. For example, they don't have to stay in school, miss classes, or wait in the school for the scheduled start time. Rather, they can compete from the comfort of their homes when it suits them best. Except for some extreme cases (there have been some submissions after midnight, at 00:21), students have always chosen to compete in the afternoons. The average time between two rounds was four weeks and one day. I.e., the first round started at 3pm on Monday and lasted until 6pm on Tuesday, the second started at 3pm on Tuesday, etc. This was chosen so as to spread the workload more evenly throughout the work week and to avoid the same afternoon extracurricular activity being missed every time. The double afternoons in every window also help to reduce conflicts with extracurricular activities.

The top 10 teams from the online rounds go through to the finals, which is held in the Fazekas Secondary School. In the finals, teams solve the problems without Internet or any other external help, using two computers provided by the school.

Students in Italy have been taking part in programming team competitions since 2017. This was their eighth year of the competition. For Hungary, it was the third. Considering the number of competitors in Italy (3911) and Romania (918) (source: L. Nikházy), it is reasonable to predict an increase in the number of participants in our national arena as well. The number of teams participating in the last three years is shown in Figure 2.

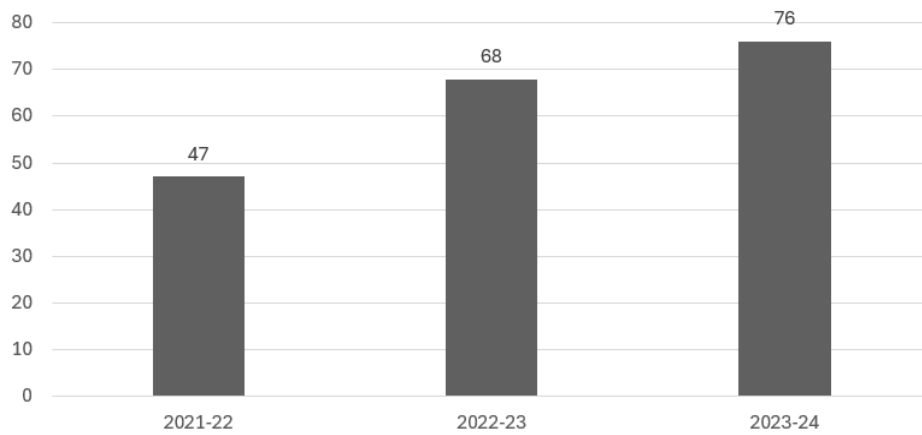

Figure 2. The number of teams participating in the national competition

IT education in Hungary is about to undergo a major change. Not only has the number of lessons increased compared to the previous curriculum, but the emphasis on learning programming has also increased. Last year, students graduating at intermediate level in computer science did not have to program in the practical exam; this year, 15% of the points are given for a programming task. Children's computer science education no longer starts in the sixth grade of primary school, but in the third, so by the eighth grade they would have twice as many computer science lessons as before. The number of regular, four-year secondary school lessons in computer science have increased by a factor of 2.5 (NAT, 2020). We believe that in Hungary we are still in a period of "getting involved" in programming. Our aim is to promote programming and increase the number of competitors. To this end, we have tried to expand the target audience of CodeCup in three areas.

On the one hand, we wanted to give students who are new to programming the opportunity to actively participate in a team competition. But the tasks of CodeCup are not easy for a beginner. In previous years there were several teams that could only solve one or two tasks. This does not mean that they worked on those two tasks for three hours, but rather that they did what they could and then struggled with the rest for a long time.

It has also been a recurring problem in recent years that students have become "isolated". It is not uncommon to have an enthusiastic child learning programming outside of school, and no peers in their school who are similarly knowledgeable in programming. But only teams of students from a single school can enter CodeCup (and later IIOT). This is perfectly understandable, but it would be nice to somehow get these "lone star" students involved in teamwork.

The third question that often arises is how to get more girls on board in (team) programming. This is important because "experience shows that development teams which include women are successful and fruitful" (Vass, 2014), said Szilvia Koleszár in an interview. The (co)founder of Skool and the Equalizer Foundation has also commented on the issue in several interesting interviews (Forbes, 2022; Női Váltó, 2021). However, having a female quota, e.g., mandating that every team should have "at least one girl", can create strange situations. We wanted to make progress in this area, but without the introduction of quotas.

A solution to all three of the above challenges could be competition related to CodeCup, where the tasks are a bit easier, the teammates can come from different schools, and only mixed gender teams can compete. This competition, which is less coding and not so much a cup, is called Program'Petition.

Statistics of the last years

Number of schools

This year, for the first time, it was possible to choose a teer when registerring. Almost 100 students have chosen Program'Petition already in its first year.

As can be seen in Figure 3, on the one hand, there was a “transfer” effect with some students taking advantage of the new opportunity to compete in Program’Petition instead of CodeCup, and on the other, an entirely new group of students became involved with the introduction of the lightweight teer.

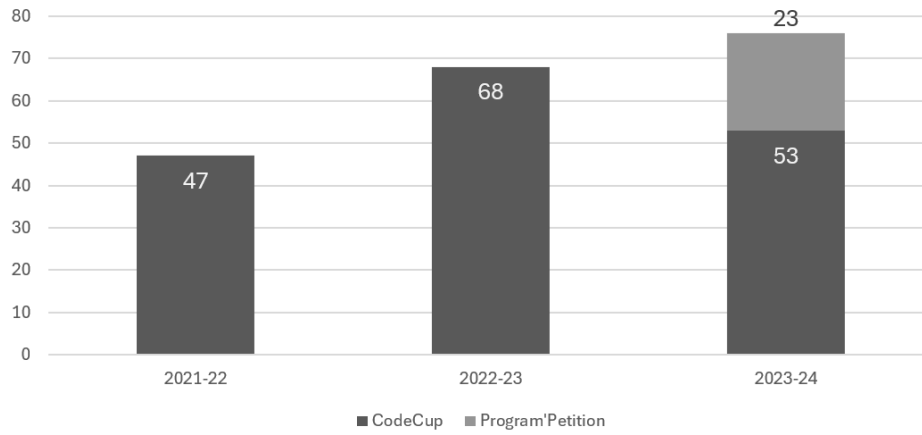

Figure 3. CodeCup and Program’Petition entries

An increase in the number of students does not necessarily indicate the steady expansion of the competition. Another plausible explanation could be that more and more students, even from different schools, try the competition on a single occasion, but do not reenter the following year. To rule out this second explanation, I have looked at how schools have delegated students each year (see Figure 4) and how the specific list of these schools changed from year to year.

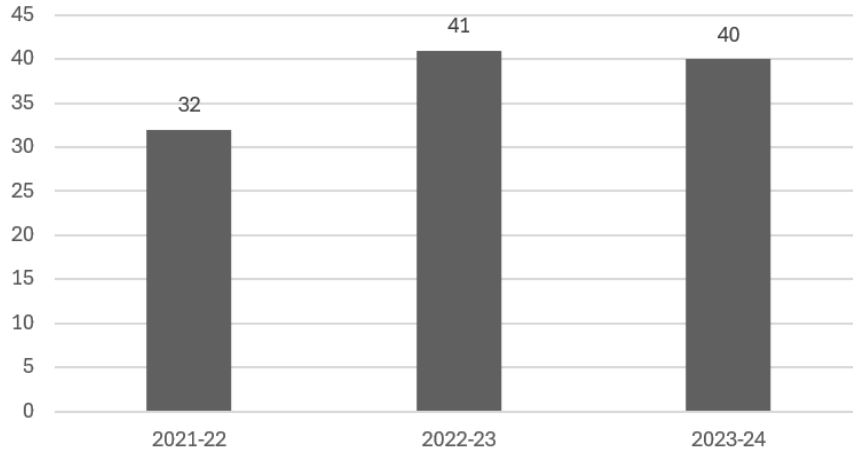

Figure 4. Number of schools entering the competition

The number of participating schools increased in the second year of the competition and remained roughly the same in its third year. Furthermore, the list of participating schools (available on the competition website) did not change significantly between the second and third years. This means that the schools that had been aware of and participated in the competition entered again the following year and delegated more teams and competitors than previously (see Figure 3).

Based on this analysis, we believe that many of the potentially interested schools and students are not yet aware of the competition. Most of the 797 secondary schools in Hungary (168.hu, 2020) have not got involved yet (Figure 5).

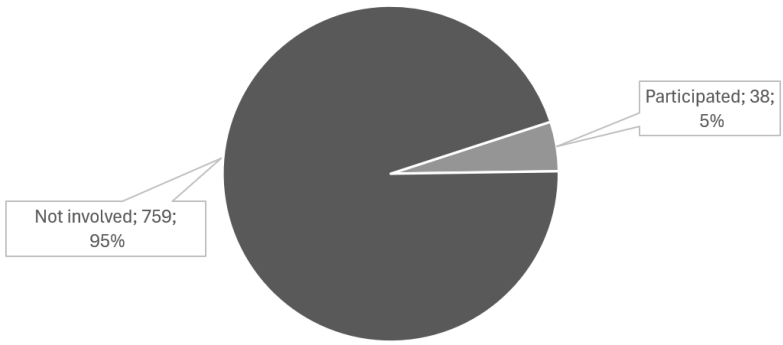

Figure 5. The ratio of the participating secondary schools (2023-24)

Gender ratio

One of the desired effects of the introduction of the new teer, Program'Petition, is an increase in the number of competing girls. Looking at the data, we can see that the number of girls has doubled every year (Figure 6).

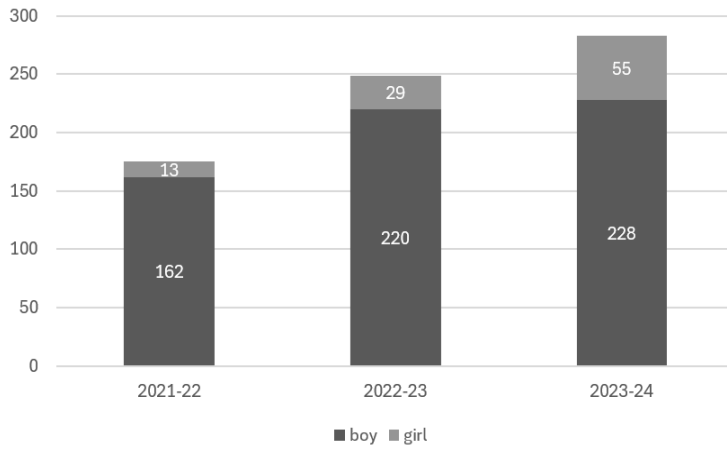

Figure 6. Change in the gender ratio

It should be noted, however, that as the total number of competitors has also increased, almost doubling in two years, it is not the raw number of girls, but rather their ratio in the total population that reflects the progress in this area better. This ratio also shows a steady, albeit slower increase. In the first year (2021–2022), the proportion of girls was 7.43%. In the second year (2022–2023) it rose to 11.65%. And after the introduction of Program'Petition, 19.43% of all competitors were girls, almost one out of every five students (Figure 7).

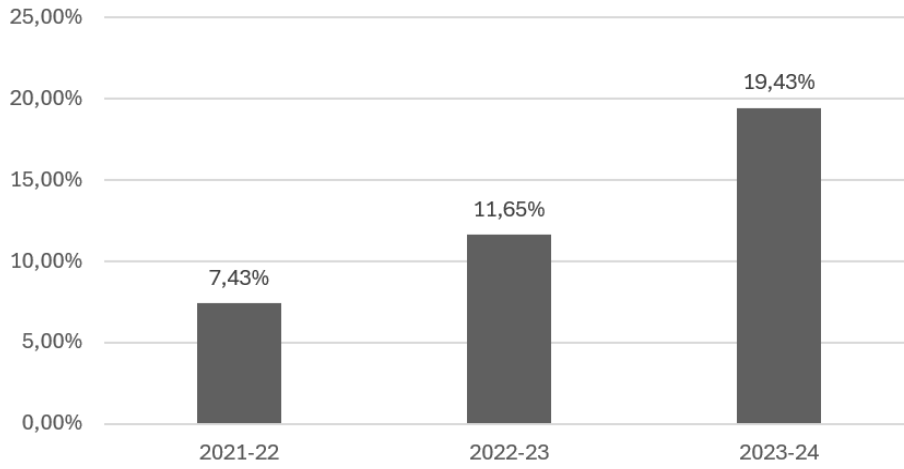

Figure 7. The ratio of girls, as a percentage

Conclusion

In Hungary, the Nemes Tihamér International Programming Competition (Nemes, 1985) has been organized each year for the last 40 years, with more than 200 participating schools and at least 2,500 students per year, all competing individually. CodeCup is a young and less known competition but based on our study and the analogy of the Italian model, we can boldly assume that it has a great future ahead. It is not unrealistic to expect that it can reach the scale of the national individual programming competition in a few years. The long-term impact of IIOT could have a big effect not only on programming skills and programming knowledge, but also on soft skills, such as communication, cooperation, social skills, problem solving, teamwork. Skills that are harder to develop but can be so useful in our lives and professional careers.

Our aim is to get the word out about CodeCup to all potential competitors in Hungary as soon as possible, and to make as many people take advantage of this development opportunity as possible.

The aim of this paper is not only to introduce and promote IIOT, but also to suggest ideas for expanding the competition in the hope of greater involvement.

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