

jBOI – One More Possibility for Increasing the Number of Competitors in Informatics

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Abstract. This article aims to demonstrate a trend in raising the general number of competitors in informatics by creating and supporting competitions like the jBOI. It argues that participation in international competitions from an early age contributes to the participants’ achieving sustainable high results in the future.

It discusses a number of organizational measures as well as sharing experiences in training students for similar competitions in Bulgaria. It also develops a general framework for competitions in informatics for pupils aged under 15.5 years of age.

Key words: competitions in informatics, programming, talents, IOI.

1. Introduction

The role of competitions in the process of learning computer sciences is quite obvious for the people involved in it. That’s why companies like Microsoft and IBM annually initiate a lot of challenging competitions. Learning in competitive environments guarantees success in career.

A number of good ideas for promoting programming contests are suggested by Pohl and Polly who propose using programming contest problems with graded difficulty (Pohl and Polly, 2006).

Creating the jBOI is not a new idea because of the existence of such competitions like the Junior Balkan Olympiad in Mathematics (for students under 15.5 years old) or the International Mathematical Kangaroo. But as far as concerns to informatics it is quite

new. In our opinion after 3–4 years of preparation, students who begin their preparation at age of 11 or 12 years need a stimulus and a measuring ground to compare their progress. Moreover, a lot of students, who are new to this movement, can be attracted to participate; if they are selected and coached adequately they will succeed too.

2. Preparation and Organization of jBOI

So far the Balkan Olympiads in Informatics for Juniors (students under the age of 15.5) has taken place twice. Both times the competition was carried out due to the initiative of specialists from both sides. As of today, there is no organizational body managing the event, neither is there a set of fixed rules, nor a curriculum plan which the participants could use as a guide for their preparation.

Nevertheless both times the competition was carried out with an enormous degree of enthusiasm on the sides of the participants, as well as the organizers. There is also a notable increase in the interest towards the competition: 6 countries took part in the first jBOI 2007 in Serbia (<http://www.math.bas.bg/infos/>), 8 in the second jBOI 2008 in Bulgaria (<http://www.jboi2007.org>). The organizing of the third competition jBOI 2009 is left to the good will of the Greek organizers.

3. Preparation of the Participants in Bulgaria

3.1. Preparation on General Basis

The general preparation of young students in Bulgaria is performed on several levels:

- Local study groups

Local study groups are organized at schools and other centres, where regular classes are taught throughout the whole year and with conformity to an approved curriculum. This type of preparation is coordinated by the National commission for extracurricular work with the Union of Mathematicians in Bulgaria. Such study groups are active in a comparatively small number of towns in the country (see Table 1), as programming is not included as an obligatory subject for students of that age. To an extent, this offers a relative freedom to each centre in the selection of topics for its curriculum and in the selection of methods and approaches.

All the interviewed competitors highly rated the local private school as source of their preparation, and in dependence of the organization in the cities that private school is scholastic or non scholastic.

At the same time, all interviewed participants rely on study books, but only one of them rated them as the most important factor. What calls for attention is that students of the same study groups rate their sources of preparation in the same way, which is indicative of the importance of the organization of study groups and the methods of the teachers.

Table 1
Students (up to 15.5 years old) by grades that took part in competitions

Grade	2001 /2002	2002/ 2003	2003/ 2004	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009
IV				2	12	16	12	6
V	26	35	31	31	19	42	33	42
VI				13	32	21	39	24
VII	43	46	42	17	21	20	14	23
VIII				15	34	33	24	18
Total	69	81	73	78	118	132	122	113
Towns	10	13	11	10	12	9	15	14

- National competitions in informatics

The role of national competitions is undeniable as coordinating agents and as powerful stimulus for better preparation. The practice of analyzing the tasks and their solutions after each competition, which was introduced in 2001, is an important medium for presenting the solution ideas of the authors of the tasks and for discussing different ideas for the level of preparedness of the participants. Even more so is the brochure with the tasks and the solutions, given by their authors, whose publication started in 2005.

- National training camps in competitive informatics

This form of training was introduced on 2006 and aims at intensive (one-week) preparation of the competitors with the best results throughout the year. A detailed description of these camps is provided in Manev *et al.* (2007). All interviewed students consider the preparation in these camps as very useful. Again, depending on their local study groups, they rate the camps as second or third in importance. Only one interviewees rated it lower than third place, and one as the most important.

- Online competitions

Participation in a number of online competitions and in various preparation websites is encouraged. Table 2 shows some of the most popular sources of this type.

A survey made among the students of 15.5 years of age shows that those with the highest ranking in online competitions are also the ones with the highest results in the national rank lists (<http://www.akla.org>) for their respective age. Furthermore, several national online competitions have been carried out. However, they are not yet a regular form for preparation. To the greatest majority of participant's registration in training websites is not done for the sake of registration. It is usually guided by the teacher working on their preparation locally or with the recommendation of the leaders of the national team. They help competitors in choosing the most suitable website and monitor their progress in their self-preparation. Such participations allow the respective mentor

Table 2
Online training competitions

	Training system				N of part
	N of probl.	hours	url	lectures	
TIMUS	10	5	http://acm.timus.ru/	no	7
TOPCODER	3	01:15	http://www.topcoder.com/tc	yes	5
USACO	3	3	http://train.usaco.org/usacogate	yes	7
COCI	6	3	http://evaluator.hsin.hr	no	1
UVA	10	5	http://acm.uva.es/contest	no	1
Z-TRENING	dif	dif	http://www.z-trening.com	no	1
ACM	10	5	http://acm.hit.edu.cn/index.php	no	1

of the student or of the entire team to monitor, control and encourage the individual preparation of each competitor. There are several major criteria for selecting the most suitable website:

1. The form of the online competitions. Ideally these should imitate the form of international student competitions. Regretfully, almost none do. Most online competitions imitate the student competitions organized by ACM. On the bright side, this form requires complete and accurate solutions to the given problems, which trains students to think about even the smallest details.
2. Maintaining an archive of competition problems, so competitors can work on a problem selected by them or by their teachers, and check their solution by comparing it to the original author solution with an 'online submit' option. An online testing system is a great advantage for any training website.
3. Providing lectures on basic topics and solution analyses of basic problems. It is especially useful if competitors working without a trainer can read an analysis of the author solution of a task they have worked on. Analyzing the solutions of other competitors is also useful (TopCoder).
4. Providing up-to-date rank lists of the registered participants. Comparing personal results with those of other participants' is an extremely important stimulus.

Three of the interviewees found online competitions the most important thing in their preparation. Only two students placed them at the bottom of their ranking lists. The majority of competitors cite the internet as one of the main sources for their preparation. Again their opinion is connected to the traditions in their local study groups, which is a further indication that organization at local level is a crucial factor for the future development of competitors. The analysis of the results of Bulgarian participants in internet competitions shows that those with high ranking in online competitions achieve high results in national competitions as well.

3.2. *Preparing the National Team after its Formation*

Selection rules for the national team for students of up to 15.5 years of age are the same as those for the national team for up to 20.5 year-olds. They are set by the National Commission with the Ministry of Education and Science and regulate selecting an extended national team, which – after a series of controls – is shortened to the final national team. The details of the procedure can be found in Manev *et al.* (2007). The preparation for the jBOI starts after the selection of the national team of up to 15.5 year-olds. Practice shows that this preparation is much more effective with the extended national team. Training the extended team achieves several important results:

- the general level of all noted competitors is maintained;
- younger students are greatly motivated if they work in a larger group of peers with similar abilities and preparation;
- strategically such training reduces the risk of losing shape on the evening of the competition;
- if necessity arises, a competitor from the final team can be replaced with another from the extended team, without the risk of lesser training.

Training the extended national team is carried out in several different forms:

- Control competitions

There are two types of control competitions – mock and official ones (carried out for the national team selection). Mock competitions are organized by the trainers of the team, while official ones are organized by the National Commission for the National Olympiads in Informatics with the Ministry of Education and Science. The leaders of the team aim to make both types of competitions as effective as possible. For this purpose after each competition they organize a discussion among the participants and the authors of the competition tasks (if possible). The goal of the discussion is to pinpoint the mistakes of each participant and work towards eliminating them. This is why the preparation of competition tasks, especially those for mock competitions, is extremely important. They are ranked as crucial and one of the most effective forms of training, by the greater part of the interviewees.

- Lectures at national training camps

At this stage lectures are not common and are only used if there are notable gaps in the knowledge of some of the participants. Such gaps may be due to incomplete training, differences in the curriculum, or differences in the organization and methodology of teaching in the different cities. Generally, a well-structured short revision of the school material is considered useful even for students without obvious gaps in knowledge. The gaps in question are discovered mainly by analyzing the results of control competitions. 50% of the interviewed competitors rank lectures (a combination of theory and practice) as the most efficient training method. On the other hand, 40% rank them as the least efficient method. The division here seems once again to be determined by the traditions of the local study group.

- Online training

This is realized through the various communication methods provided by the internet – chats, forums, e-mail. The goal here is to maintain the shape of competitors even when they are not in a period of intense training. Internet communication is also used for control competitions as well as for topic discussions. It is organized and led by the coaches of the team.

4. A Possible Framework for International Competitors for Juniors

We take the framework as a basic conceptual structure used to solve the complex problem of creating competitors in programming.

As a generalization of the situation and the obstacles in Bulgaria we could suggest the following framework for such an international competition in informatics for juniors.

Firstly, some documents or regulations have to be signed between participant countries in order to guarantee the existence of such new competitions. Otherwise some problems may occur during their organization.

There must be clear rules defined about the age of contestants participating in the contest.

Human resources play significant role in such a structure and could be divided into committees as follows: organizing committee, technical committee, scientific committee. It should not be considered a drawback if a person from a country takes part in several committees, if such participation is appropriate. It is helpful if coaches or even contestants have the possibility to communicate with committee members and make suggestions or express their opinions.

Some technical resources like installed compilers, environments, grading system (with rules) and computers are necessary too and the information connected to those issues could be updated and made available regularly.

Probably the two paragraphs above are familiar to contestants, team leaders and organizing committees in informatics competitions.

The next element from this framework is very important – the publicity. This includes not only publishing competition problems and their solutions (as usual), but developing a curriculum, preparing or selecting books, and recommending articles appropriate for the students or teachers involved. We know of an enormous number of books appropriate for the competitors but the different age of contestants leads to some problems concerning the mathematical concepts they are familiar with or the level of language (e.g., English) that they have.

As for the mentioned problems in preparation at a national level, we can summarize the necessity of on-line training system, training camps for students, seminars and workshops for teachers, [e]books and coaching system. The observations in our country show that coaching has different faces because it varies from teacher to team leader, through guardian and psychologist. Some basic issues that coaches have to face are: What to do?, How to do it?, Why do it? The forms of coaching also vary from Face-to-face to online

meeting. And the people engaged in coaching vary: from teachers, university lecturers to parents and classmates, present or ex-competitors. This is the person (coach) who helps contestants to develop their personal plan for individual action or development. And last but not least in this framework is the financial support: sponsorships (companies, foundations), fees, some forms of support by national or local authorities, government or ministry of education of the host country and international (e.g., European Union) funding programs (like Comenius – LLP for students from schools).

5. Conclusions

In conclusion the jBOI is one more possibility for increasing the number of competitors in informatics. jIOI could be one better possibility.

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