

# Change Management in Preparing Indonesian Team to IOI

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**Abstract.** Indonesia has been participating at the International Olympiad in Informatics (IOI) since 1995. The process of selecting the four contestants remains unchanged. All medalists in the national level competition were invited to take a series of training camps to select competitively the candidates. In the first two decades of participation in IOI, Indonesia have collected two gold medals, and these surprising achievements were merely more because of luck, and not as a result of a reliable training/selection process. We believe reliable and good training is a basis to predict and expect a stable achievement. Through careful observations and reflections, a change of course of action is needed to bring Indonesia's achievement to the next level. This paper shares Indonesia's experience in changing and implementing strategies during the national training camps to better prepare the four contestants to IOI. What are the changes taken by the coaching team that have been exercised that made it possible for Indonesia to achieve three gold in the last four consecutive years?

**Keywords:** informatics, olympiad, training, national report, secondary education.

## 1. Background

Indonesia began to participate in the International Olympiad of Informatics (IOI) in 1995 (Kurnia & Marshal, 2010; Isal *et al.*, 2014), represented by one contestant who won a silver medal. This surprising achievement was covered and echoed by many news media and gained support from many parties to continue Indonesia's participation in future IOIs. The government recognizes IOI as a very prestigious competition which puts the country's reputation at stake, and hence deserves endorsement and support.

The quality of training process is crucial to select the best four contestants. Despite many challenges, since 1995, Indonesia continued to participate in IOI. In the early

years, the selection process was conducted simply by inviting students through school to take the selection process, and then followed by a series of crash training camps. As time went by, beginning in 2002, a more proper and formal competition was conducted nationwide for several international olympiads in science – including informatics – in the form of Olimpiade Sains Nasional (OSN). This annual event is supported by the Ministry of Education and Culture (MoEC) of the Republic of Indonesia and has attracted more participating students. Through a lot of qualifications, there will be around 100 students attending OSN and only 30 students get medals.

Every year, all the OSN medalists of that year are invited to take part in the selection process which consists of four national training camps (Liem, 2016), as shown in Fig. 1. In P1, X represents the number of students who participated in previous year's P1 and P2 that are not qualified to the next stage but still eligible for this year's IOI. In P2 and P3, Y and Z represent the number of students who participated in previous year's P3 and P4 respectively but are still eligible for this year's IOI. Each training camp takes two to three weeks and is held in one university which can provide all the necessary facilities for the training. In each training camp, a set of tasks and various activities are prepared to be done by all the participants. All these activities are designed to select the best four participants who meet some criteria in a competitive and objective manner. The tasks and activities will be described and discussed in detail later in this paper.

Hosting a big international event such as IOI surely requires strong intention, resources and huge concerted efforts to make it happen successfully. However, the experience and lessons learned from its complexity usually gives a “jump/leap” in improvements in many aspects, including the achievement. After its participation in IOI for more than two decades, it was about time for Indonesia to offer and dare to become the host of IOI. The first bidding was proposed in the International Committee (IC) Meeting of IOI 2017 in Teheran, but it was unsuccessful. In the following year, with more determination and preparation, our proposal to become the host of IOI was granted in the IC Meeting and was announced in the last General Assembly Meeting of IOI 2018 in Tsukuba.

Shortly upon returning from Tsukuba, some preparation as the future host of IOI took place with two objectives: success as the host and success to get a higher level of achievement. Until 2018, one silver and one bronze are achievable each year. Table 1 shows the achievement of medals during past IOIs, grouped by interval of three years. See also from Table 1 the fact that since 2016, we managed to get one medal for each contestant, indicated by 0 in the “No Medal” column. This stable achievement reflects the effectiveness of the national training camps (Liem, 2016).

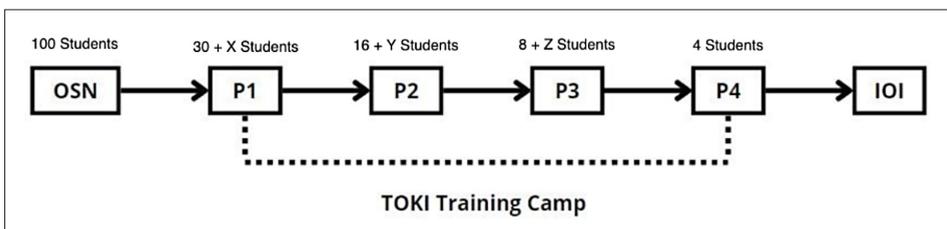


Fig. 1. Preparation Stages to Select the Indonesian Team to IOI.

Table 1  
Indonesian Participant Medal Achievements at IOI 1995–2022 (grouped)

Year	Gold	Silver	Bronze	No Medal
2022 (host)	0	3	5	0
<b>2019–2021</b>	<b>3</b>	<b>6</b>	<b>3</b>	<b>0</b>
2016–2018	0	4	8	0
2013–2015	0	4	7	1
2010–2012	0	3	6	3
2007–2009	1	2	8	1
2004–2006	0	5	2	6
2001–2003	0	1	2	5
1998–2000	0	2	3	7
1995–1997	1	1	1	7

How can getting a gold each year be feasible? The two golds that have been collected in the previous IOIs were believed more as luck than a result of a reliable training process. With “GO GET GOLDS” as our motto, several changes in strategies to conduct training camps were made and exercised. In short, as shown in Table 1, one gold was collected each year during 2019–2022 for three consecutive years.

In summary, in the last four years, Indonesia achieved its best results so far in IOI with 3 gold medals, 9 silver medals, 8 bronze medals. These results are new achievement records for Indonesia, and kicked off the “Golden Era of Indonesia” – cemented Indonesia to be a top performing country<sup>1</sup> in the IOI which can be seen in Fig. 2. The aim of this study is to reflect on the changes made during this period for better reshap-

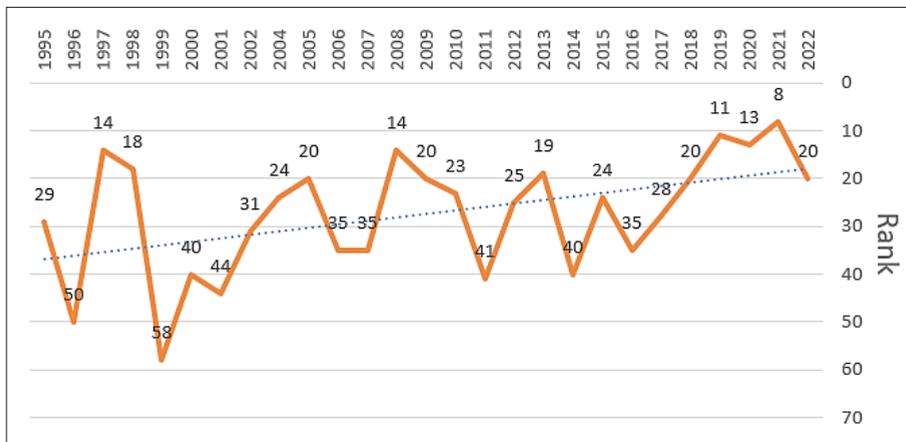


Fig. 2. Plot of Indonesia's Country Ranking in IOI from year to year.

<sup>1</sup> [https://stats.ioinformatics.org/delegations/2019?sort=medals\\_desc](https://stats.ioinformatics.org/delegations/2019?sort=medals_desc)  
[https://stats.ioinformatics.org/delegations/2020?sort=medals\\_desc](https://stats.ioinformatics.org/delegations/2020?sort=medals_desc)  
[https://stats.ioinformatics.org/delegations/2021?sort=medals\\_desc](https://stats.ioinformatics.org/delegations/2021?sort=medals_desc)

ing of Indonesia's national training program so that stable gold medals can be achieved. Over the years, the overall achievement tends to improve slightly as shown by the dotted line in Fig. 2.

Despite continuous improvement, several questions for further improvement have to be answered by TOKI, especially by the coaching team during the four national training camps. The rest of the paper is organized as follows. Section 2 describes several noticeable challenges to be considered. Section 3 elaborates and discusses the recent changes in Indonesia's TOKI Training Camps. Next, future works and potential challenges are planned and anticipated in Section 4. Finally, Section 5 concludes the discussion by listing all the good practices exercised and good results observed, and implementing them in the future rounds of national training camps.

## **2. Past Challenges (from 2019 Onwards)**

Given the above problem's background, the coaching team needs to identify several challenges they might face, before deciding and making any changes. The following are the list of the challenges under consideration.

### *2.1. Covid-19*

In the wake of COVID-19, discovering a correct formula to run every important event from the lowest selection in school level until reaching the last TOKI Training Camp was quite challenging. There were a lot of uncertainties and limitations that must be followed during this pandemic outbreak. Reduced overall budget from the Government, and regulations that limit people's mobility just to name a few. Even though an online meeting was always possible, there were some IOI candidate students who had internet connection problems. This made the early stage of the TOKI Training Camp not optimal. Having online meetings as the only option, the interaction between IOI candidate students, coaching team, and the board of supervisors become less and not optimal.

### *2.2. Schedule*

The coaching team wants to make the best schedule so that during every TOKI Training Camp, each IOI candidate student can focus only on the training. However, it is hard to satisfy every IOI candidate student's schedule from many schools. During this pandemic, some of the IOI candidate students also get more homework than usual. Some of the students need to attend A-level, university interviews, and some are still deciding which university they want to go to. Some of their schools also do not give them enough excuses so they must attend the exam – even during the TOKI Training Camp contest.

### 2.3. Skill-gap

Skills gap between the top performer IOI candidate students and the bottom ones is pretty wide. It is inherently hard to make a problem set challenging for the top performer, but still possible to solve for the bottom one. The coaching team considers separating the top performer from the rest, but it is very challenging to maintain balance for both problem sets in the operational level.

### 2.4. Regeneration

Regeneration for a good Scientific Committee (SC) is quite challenging. The coaching team needs to find SC that is committed to supporting TOKI Training Camps to succeed, considering that they also have their own business to take care of. An SC member should have strong integrity that he/she should avoid conflict of interest, especially when they have a close relation with any IOI candidate students. An SC member is also required to have a certain level of knowledge about IOI. Furthermore, not only the regeneration of SC is important; the regeneration of the candidate students is equally important. We do not want to make sure that we get a great result in one year but get nothing in the following year.

### 2.5. Synchronizing Sparring Schedules with other Countries

Synchronizing sparring schedules with other countries is also tricky since each country has their own activity with their own schedule. Fortunately, the sparring partners that we have so far are those countries with at most one hour time difference.

## 3. Changes in Indonesia's TOKI Training Camp

After defining the challenges, the coaching team urged several changes for significant improvement in achievement in the IOI (i.e. getting at least a gold medal in each year) towards hosting the IOI in 2022. The coaching team did some brainstorming and decided to try the new coaching framework. The difference between the new coaching framework and the past will be described in the following subsections.

### 3.1. Restructuring Coaching Team

Previously, the coaching team structure was always the same as presented by Isal *et al.* (2014). There were four different roles: Participants, (TOKI) alumni, (TOKI bureau)

universities, and Government (Ministry of Education and Culture). Nowadays, a slight change has been made. In this paper, we change the term for Participants to IOI candidate students. As for (TOKI) alumni, it is separated into two parts, which are SC and TC (Technical Committee). Our team structure consists of a Board of Supervisors, a Head Coach, and the SC. The SC is responsible to prepare all the materials and the problem set given in each TOKI Training Camp. During the training camp, SC became the closest one that interacts with the IOI candidate students. Around 10–15 active college students who have experience in IOI or ICPC<sup>2</sup> volunteer to be in the SC each year. SC used to consist of only TOKI Alumni (Isal, *et al.*, 2014), but now non-TOKI college students who have experience in ICPC are also welcomed. An SC member can reside anywhere in the globe. Meanwhile, the TC members are those who are responsible for the CMS, to ensure that each round of the National Training Camp runs smoothly and effectively (Isal, *et al.*, 2014).

A new role, called Head Coach (HC), is the one who thinks of the training strategy, decides the curriculum, and oversees the whole progress of the National Training Camp. The (TOKI Bureaus) Universities, represented by the Board of Supervisors (SPVs), are those who give full endorsement and ensure that the TOKI Training Camp will be optimally supported by the government, give advice, guidance, and moral support to the candidate students whenever deemed necessary. SPVs members consist of lecturers appointed by the MoEC who have coached in the past since Indonesia's first IOI participation. The Government (MoEC) remains the same.

With the current structure, the HC, SC, and TC will work closely together in coaching the IOI candidate students on a day-to-day basis, while SPVs support the administration needs. Also, HC is responsible for bridging the information between the SC and SPVs. This scenario aligns with the future works quoted in Isal, *et al.* (2014), in which the involvement and contribution of the TOKI Alumni significantly increase (and the involvement of SPVs decrease) in the execution of each round of the National Training Camps.

### 3.2. Incorporating More Pedagogical Method in National Training Camps

According to Kapur (2020), “Having a well-thought-out pedagogy can bring about improvements in the quality of life of teaching and the way the students can learn.” We feel that the new coaching framework should incorporate more pedagogical methods with careful thinking. The coaching framework is then proposed by borrowing from the following pedagogical concepts.

#### 3.2.1. Goodhart's Law and McNamara Fallacy

According to Strathern (1997), Goodhart's Law is often stated as, “When a measure becomes a target, it ceases to be a good measure.” Fischer (1970) introduced a quanti-

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<sup>2</sup> International Collegiate Programming Contest – the premier global programming competition conducted by and for the world's universities (<https://icpc.global/>).

tative fallacy – called McNamara fallacy – which states that making a decision based solely on quantitative observations (or metrics) and ignoring all other variables often leads to wrong decisions.

Following both the Goodhart's Law and the McNamara Fallacy, we decided not to use a single metric (i.e. points) in determining qualified IOI candidate students in National Training Camps. We also measure outcomes – getting medals in important events. With that being said however, the coaching team track several daily metrics like IOI candidate students' participation in discussions; each IOI candidate student's daily problem solved outside the given contest; how much upsolving they do; how is the performance in each day; etc, only as a signal whether the coaching team need changes or not. This makes the IOI candidate students focus on doing their best in all aspects rather than only when it is in an important contest. We believe that it is important for them to do the practice contest even though its score weight is less than an important contest.

In selecting IOI candidate students that will advance to the next round of TOKI Training Camp, the coaching team also looks into the motivation and behavior aspects. The coaching team do believe that motivation and right behavior can impact each IOI candidate student's performance and growth.

### 3.2.2. Spacing Effect and Forgetting Curve

According to Ebbinghaus (1885) and estimations from Paul (2007), through spacing effect and repetition, the coaching team can minimize the forgetting effect, as shown by the curve in Fig. 3. Based on this consideration, the coaching team incorporates the repetition and spacing effect to our training method by setting the number of repetitions and their schedule.

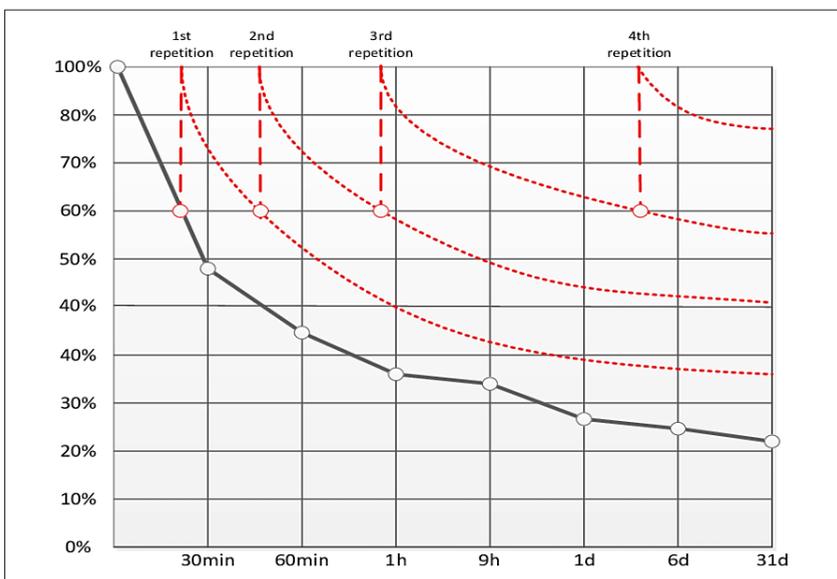


Fig. 3. Alteration of forgetting curve through spacing effect.

Each TOKI Training Camp is usually held in a month period (Liem, 2016). The training activities in the schedule include discussions or knowledge sharings; free time; game time (refer to 3.2.6); practice contests and simulation contests, alternatingly to simulate the spacing effect and repetition. The coaching team encourages IOI candidate students to solve past unsolved problems during the free time session, but it is okay for them to rest if they need to.

### 3.2.3. *Co-Coaching and Community of Practice*

The coaching team essentially have made the TOKI Training Camp a “community of practice” (CoP) for IOI candidate students. In CoP, it is stated by Lave & Wenger (1991) that, “it is through the process of sharing information and experiences with the group, members learn from each other, and have an opportunity to develop personally and professionally”. Research shows that students learn a concept more deeply when they have to teach it to their peers (Fiorella & Mayer, 2013). Thus, we encourage the IOI candidate students to help each other “level up”.

In this community, the coaching team actively tries to create psychological safety so that the IOI candidate students can freely ask and learn from the coach, mentors, or other IOI candidate students. Not to mention that IOI candidate students can also be coached by other IOI candidate students in one way or another. They should feel safe and confident to share the knowledge they have learned with each other because sharing is a way to help master what they share. In that way, the IOI candidate students can enjoy the learning process more in each round of the TOKI Training Camps. Within the community, they also can re-evaluate their understanding of the material when they share it through the feedback and questions from their peers or coach/mentors to see what they are lacking. With this new setup, not only do they improve their hard skills, but also their soft skills (curiosity, communication, public speaking, etc.).

### 3.2.4. *Learn – Unlearn – Relearn*

The coaching team decided to make all the TOKI Training Camp materials available in advance. This resulted in the IOI candidate students not knowing which specific topic came out in a contest. It gives each of them the opportunity to analyze the problem with every material that has been given to them previously. This spaced retrieval technique encourages the IOI candidate student to understand the problem at hand comprehensively and to know more deeply about the problem addressed by the material. After the contest, IOI candidate students that do well need to share the insight that they get during the contest (refer to 2.2.3) to others through a slide presentation. The action of doing the contest, solving the problems, making the slides, and presenting it hopefully triggers what we called the “learn – unlearn – relearn” process.

The IOI candidate students “learn” the way of solving the problem when they work on the problem set in the contest. After that, they need to “unlearn” what they discovered during the contest when making the slides by revisiting and once again carefully examining the problem set and thinking about the whys and its proofs. After that, the process of “relearn” is done when they finish the slides and present it to their peers.

### 3.2.5. *Self-fulfilling Prophecy, Goal Setting and Pygmalion Effect*

The coaching team believes that by setting the goal of getting a gold medal, it will eventually yield the dream result. Chandrasegaran & Padmakumari (2018) claimed that “self-fulfilling prophecies have a significant role in the academic domain. The findings of this research support previous studies, that high teacher expectations produce high student achievement and low expectations produce low achievement”. Based on this claim, it is hoped that each IOI candidate student will have full determination to get a gold medal. Our belief is also supported by a psychological phenomenon called Pygmalion effect in which high goal setting will lead to an improved performance to match that expectation (Mitchell & Daniels, 2003). In every meeting with the IOI candidate students, the coaching team always shows their faith in them that they can get the gold medal.

### 3.2.6. *Emotional Exhaustion (IOI TOKI Students)*

As stated by Wright & Cropanzano (1998), emotional exhaustion is a chronic state of physical and emotional depletion that results from excessive job, personal demands, and/or continuous stress. TOKI Training Camp is a highly competitive environment and the pressure of doing well in a TOKI Training Camp to achieve the “once in a lifetime” opportunity for representing one’s country in IOI can be very stressful for the IOI candidate students. Due to this, the coaching team realizes that emotional exhaustion (or usually called “burnout”) can also happen to our IOI candidate students. Lack of interest in the work being done, decrease in work performance level, feeling of helplessness, and troubled sleeping are said to be examples of the effect of emotional exhaustion (Aamodt, 2016).

In the case of Indonesian IOI candidate students, burnout can be in the form of their losing motivation and even losing ambition to study anymore. To balance that, the coaching team introduces refreshing activities and calls it “game time”. During this “game time”, the coaching team and the IOI candidate students play games, laugh and chat together to relax and release the stress. They choose games that focus on bonding rather than individual results.

### 3.2.7. *Talk & Care*

The coaching team not only cares about each student’s knowledge, but also about their mental health (in a limited capacity – the coaching team currently does not have a mental health specialist). The coaching team has a weekly talk with the IOI candidate students, but when they feel that there is something that is troubling them, an additional talk for them to share their problem is offered. It can start from one SC member who is the closest with the student and if any further help is needed, SC will escalate to HC. If necessary, the HC will have a one-on-one session with the IOI candidate student. The talk does not really have to be formal; it can be informal like text chat, or voice call. The coaching team tries to make the students feel as safe as possible. Some examples are when the coaching team needs to adjust our schedule to accommodate IOI candidate students that are taking exams, or give some makeup contests later than scheduled due to

a certain student having a school issue or family issue to be taken care of. The coaching team needs them to feel that they are being cared for.

Another aspect is the motivational talk by the HC, also TOKI's board of supervisors, and/or government officials. In this talk, the coaching team reminds the IOI candidate students how they should love and make an impact for the country. Not only that, the coaching team felt that they need to give the IOI candidate students a purpose/a dream on why they pursue this path not only for their country, but also for themselves.

### 3.3. *Raising the National Olympiad Lower Bound*

Indonesia also raised the lower bound for the OSN. Some of the material that was given in the First Round of TOKI Training Camp (P1) is now on the syllabus of the OSN.

Another effort is that more TOKI's (even ICPC) Alumni are helping to teach students in the many Provincial Training Camps or schools. With these initiatives, OSN results discover more students that are better in raw talent. It is not uncommon now to have 9<sup>th</sup> grade students become OSN medallists. These efforts are part of an ongoing initiative mentioned in (Kurnia and Marshal, 2010).

### 3.4. *Shifting More Advanced Material Earlier*

Before 2019, the coaching team would give more advanced material based on the IOI syllabus in the Third Round of TOKI Training Camp (P3) or later. Due to 2.3, we can start the First Round of TOKI Training Camp (P1) with the more advanced material on the IOI syllabus. The coaching team also can give more problems that have a similar difficulty with IOI. They also can introduce material that goes beyond the IOI syllabus that gives a good insight to help IOI candidate students in solving problems with a higher level of difficulty.

### 3.5. *Jet-lag Training*

In the Fourth Round of TOKI Training Camp (P4) before IOI, the coaching team tries to replicate it as much as they can so that every contest in the Fourth Round of TOKI Training Camp (P4) is like an IOI contest – we call this “Jet-lag training”. They try to replicate the platform that has been used by IOI that year, the tools, and even the time for the contest. Based on (Mohavedi *et al.*, 2007), the coaching team makes our Fourth Round of TOKI Training Camp (P4) feel like a “mini-IOI” with some other countries joining to be our sparring partners. The coaching team hope that with this setup, the IOI candidate students' arousal level in the practice in the Fourth Round of TOKI Training Camp will be similar to that of IOI.

### 3.6. Multi-countries Sparring

Since 2019, the coaching team has always tried to conduct many sparring contests with other countries like Singapore, Vietnam, Philippines, Malaysia, and Egypt. The reasons for doing the multi-countries sparring are:

1. The sparring contests benefit all the participating countries.
2. The coaching team wants to know how our IOI candidate students perform not only within ourselves, but also with peers from other countries in the contest. For example, the best student in one school does not mean that he/she is also the best student when he/she meets with other best students from other schools. Considering the “Goodhart’s Law”, the relative rank for each student is only known by the coaching team of each country.
3. There are some materials that are more favored in Indonesia’s National Training Camp but not in other countries’ National Training Camp, and vice versa. Now with the sparring contest, our IOI candidate students are more exposed to materials that are more favored in other countries. Thus, this makes our TOKI Training Camp more challenging and rich in content for our IOI candidate students. For example, Geometry is one of the least favored materials in Indonesia, and this makes our students have less interaction with geometry problems. Multi-countries sparring is a way to balance this.

The multi-countries sparring rounds at first happened due to the HC of these countries knowing each other well, and in spontaneous talk they created this initiative. If feasible, increasing the number of participating countries in the contest would contribute to the enrichment of the problem sets.

TLX<sup>3</sup>, a contest management platform, made by the Technical Team from IA-TOKI gives a huge contribution to enable these multi-countries sparring rounds and simulate the contest to be similar to IOI.

### 3.7. Significant Contribution by SC

In each TOKI Training Camp, SC provides materials such as videos, articles, slides, and many more in an internal repository, so that IOI candidate students can learn about the material better. SC also prepares problem sets that are not too difficult but also not too easy with the intention to make them feel better. HC also vetted each problem set so that it is up to standard and TOKI Training Camp syllabus.

Even during COVID-19 period where everything needed to be done online, SC worked hard to produce high quality problems and materials to support the TOKI Training Camp effectively. For example, for each contest in the TOKI Training Camp, two to three SC members had to prepare three to four problems. All of these problems were imported to TLX. Without great teamworks and the significant contributions from SC, the

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<sup>3</sup> TOKI Learning Center – a self-made Online Judge by IA-TOKI Technical Team (<https://tlx.toki.id>).

TOKI Training Camp would not be going smoothly. Having said that, with the diverse experience and background of all SC members, the coaching team is capable of helping the IOI candidate students to reach gold medal level.

### 3.8. *Pre-national Online Training Camp*

As mentioned in (Liem, 2016) about how Indonesia conducts a cycle of training and selections of IOI participants, and also the claimed “One year, or more precisely four training camps three weeks each, is not enough to well prepare IOI participants unless we are lucky to find an extraordinary student”, the coaching team felt the need to further improve the process. Instead of “between two successive camps”, students now will be enrolled in mandatory pre-national online training camp before each phase of TOKI Training Camps. These pre-national training camps aim to equip the IOI candidate students with necessary materials beforehand and plenty of time to do exercises for those given materials.

Oftentimes, the coaching team also asked the IOI candidate students to do mandatory online contests such as other countries OI – COCI, JOI, Google Code Jam, USACO, Codeforces, Atcoder if the schedule of such contests does not collide with the training camps. We asked for the IOI candidate students’ usernames in each of those contests so that the coaching team can gather their performance data. These pre-national online training camps act as a warm-up for the upcoming TOKI Training Camps. This also helps the IOI candidate students against the forgetting effects mentioned in 3.2.2.

### 3.9. *Other Small Things*

During the actual IOI contest, there exist some contestants who feel disturbed by the room temperature, constantly audible noise, slow response of the grader, etc, and this might distract their concentration or even ruin their mood which is most important during the competition. Contestants will lose their valuable opportunity if their time is spent complaining. Without any warning, once in a while the coaching team deliberately sets the room temperature too cold (or too warm), slowing the grader’s response to the extreme, making constant/sudden loud noises and observing candidate students’ reaction to the uncomfortable situation. This trains the candidate students to be physically and mentally adaptive to certain situations. During the contest, maintaining full concentration is far more important than spending the valuable remaining time for something that is tolerable/negligible.

## 4. **Future Works and Potential Challenges**

Despite all of the changes and improvements described above, the coaching team still wants to make further improvements in the future. The first thing that we want to push

is that we would like to go back to onsite TOKI Training Camp. However, because of the experience we have learned during the pandemic era, we would like to keep the pre-national online training camp online. Even though we have made an onsite national training camp in the past, we would have new challenges given the new normal condition after the pandemic.

The other thing is that there are a lot of programming problems in the world. We as the coaching team need to prepare and archive the problems in a good format so that when we need a certain type of problem, we can find it easily. Not only programming problems, we also want to make more advanced materials with more engaging content.

We also would like to have more different countries in our multi-countries sparring so that point 3.3.6 can make more impact. We would like to expand by trying to collaborate with more countries with small differences in our time zone first. We also want to make it more interesting if we can make a joint training camp with these countries. It will be a big challenge since managing a camp with a joint schedule from each country will be difficult.

Finally, every time before the departure of Indonesia's contingent to IOI, the motto "GO GET GOLDS" keeps reminding us that the character "S" in the last word always means PLURAL.

## **5. Conclusion**

We have presented how Indonesia's achievement progresses throughout the years of participation in IOI. A significant leap happened when a gold medal decorated the achievement each year in three consecutive years – we proudly called it as The Golden Era of Indonesia. Several changes have been discussed, implemented, and their effectiveness observed in the previous sections. The determination and timing as to when the changes were begun to be implemented coincides with the time when Indonesia was appointed to become the Host of IOI, resulting in a surprise of getting one gold in each of the following years. Becoming a host surely means inviting many problems, but the extra pressures could also bring significant improvement in many aspects in the country's training ecosystem. This sharing of Indonesia's experience might be relevant to other countries facing similar challenges and inspire them to become future hosts of IOI.

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