Distribution of Elite Students in Vietnam Revealed by National Olympiads

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Abstract

Vietnamese National Olympiads 2010-2020 has awarded elite students more than 24,000 prizes. Provinces in the Red River Delta and the North Central Coast with their high schools for the gifted led the country in the number of elite students and the proportion of highest achievers. In comparison with social science test subjects, natural science subjects were more characterized by younger students and male students and less represented by ethnic minority students.

Introduction

National Olympiads [Kỳ Thi Chọn Học Sinh Giỏi Quốc Gia Trung Học Phổ Thông] are organized annually by the Ministry of Education and Training, Vietnam (MoET) to identify and foster talented students at the upper secondary level. A majority of participants are grade-12 students, although candidates in grade 10 and grade 11 are allowed to compete. Each student can only take one of 12 test subjects comprising Mathematics, Informatics, Physics, Chemistry, Biology, Literature, History, Geography, English, French, Russian, and Chinese.

Students are delegated by administrative contest teams which are 63 Provincial/Municipal Departments of Education and Training (hereinafter “provincial teams”), seven universities having affiliated high schools for the gifted (i.e. Vietnam National University, Hanoi (VNU Hanoi), Vietnam National University, Ho Chi Minh City (VNU HCM), Hanoi National University of Education (HNUE), Ho Chi Minh City University of Education (HCMUE), Vinh University (Vinh Uni), Hue University (Hue Uni), Tan Tao University (TTU)), and the Ministry-affiliated ethnic minority boarding school (VCVB) [Trường Phổ thông Vùng Cao Việt Bắc]. For each subject, each contest team can nominate six students or up to ten students if the team performed well in the last two years (MoET 2014). The Ha Noi team is an exception with 12 to 20 students due to its administrative boundary adjustment in 2008 that subsumed former Ha Tay province into the capital. Nominated students often originate from high schools for the gifted or specialized classes of ordinary high schools and they had passed a series of rigorous local contests to be qualified (Le and Le 2010).

According to MoET (2014), less than 50% of contestants win a prize that is classified as first, second, third, or consolation. Among awarded prizes, first prizes must not exceed 5% and the total of first, second, and third prizes must be less than 60%. Awarded students are given the privilege of direct entry into nationwide universities and colleges. Highest achievers also have chances to be the representatives of Vietnam in Regional and International Olympiads.

This article reports the distribution of talented high school students in Vietnam based on the result of the National Olympiads over 11 years (2010-2020).

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Table 1: Overall team ranking and rankings by subject 2010-2020.

Team	Overall	Mathematics	Informatics	Physics	Chemistry	Biology	Literature	History	Geography	English	French	Russian	Chinese
VNU Hanoi	1	1	1	1	2	1	NA	NA	NA	3	7	9	3
Nghe An	2	2	3	2	1	6	3	5	1	8	11	7	NA
Nam Dinh	3	7	6	4	3	12	4	4	3	12	4	1	NA
Hai Duong	4	5	8	12	8	3	7	2	4	14	6	4	NA
Vinh Phuc	5	6	11	7	4	3	10	1	2	15	10	NA	NA
VNU HCM	6	9	3	5	6	11	14	NA	NA	1	NA	NA	NA
Hai Phong	7	8	5	12	11	13	1	19	12	4	1	6	1
Ha Tinh	8	3	9	6	21	2	11	7	5	9	5	NA	NA
Ha Noi	9	17	10	10	12	7	12	12	25	5	3	3	NA
Thanh Hoa	10	10	14	3	13	8	9	8	11	19	23	10	NA
HNUE	11	4	2	18	19	3	19	NA	23	10	NA	NA	NA
Bac Giang	12	23	18	9	13	21	2	9	16	25	19	NA	7
Phu Tho	13	11	24	24	17	15	7	3	9	21	17	NA	NA
Ha Nam	14	12	24	15	22	20	6	10	5	40	NA	5	NA
Quang Ninh	15	20	7	23	27	25	19	14	8	16	8	NA	8
Da Nang	16	12	17	11	9	17	15	28	27	11	15	NA	NA
Thua Thien Hue	17	23	23	14	22	9	18	23	18	6	9	NA	NA
Ho Chi Minh	18	26	15	20	5	13	34	30	34	2	2	NA	2
Thai Nguyen	19	44	32	33	24	10	5	5	13	23	15	2	4
Thai Binh	20	14	34	18	25	18	12	12	7	18	NA	NA	NA
Bac Ninh	21	18	19	16	10	23	16	17	14	30	NA	NA	NA
Binh Phuoc	22	23	20	8	7	18	29	15	9	37	NA	NA	NA
Ninh Binh	23	26	13	17	26	23	23	11	19	27	11	11	NA
Hung Yen	24	16	15	21	15	26	23	17	15	29	NA	NA	NA
Dong Nai	25	29	11	33	16	16	25	36	36	12	NA	NA	NA
Hoa Binh	26	30	27	29	28	28	28	21	26	44	NA	8	6
Quang Binh	27	15	45	25	36	33	19	16	17	28	NA	NA	NA
Ba Ria - Vung Tau	28	22	30	28	29	27	22	36	35	7	NA	NA	NA
Lao Cai	29	34	30	39	41	29	16	27	20	31	NA	NA	5
Dak Lak	30	39	21	27	19	44	29	29	29	38	20	NA	NA
Binh Dinh	31	20	36	26	18	31	38	32	46	20	NA	NA	NA
VCVB	32	NA	NA	NA	NA	34	45	19	21	NA	NA	NA	NA
Vinh Uni	33	18	26	35	31	47	NA	NA	NA	31	NA	NA	NA
Lam Dong	34	42	22	29	32	29	46	36	37	26	18	NA	NA
Tuyen Quang	35	34	42	42	NA	32	32	22	22	NA	NA	NA	NA
Quang Nam	36	28	42	32	33	34	37	23	28	47	NA	NA	NA
Yen Bai	37	42	37	21	37	39	36	25	23	45	NA	NA	NA
Son La	38	NA	NA	44	NA	NA	26	35	NA	NA	NA	NA	NA
Dien Bien	39	NA	NA	36	46	NA	27	30	42	NA	NA	NA	NA
Khanh Hoa	40	39	33	31	34	46	56	49	50	17	13	NA	NA
Quang Tri	41	33	28	39	40	49	32	42	31	39	NA	NA	NA
Binh Duong	42	NA	35	NA	43	40	38	42	33	31	NA	NA	NA
Can Tho	43	48	28	43	43	37	52	52	42	22	14	NA	NA
Dong Thap	44	34	37	45	47	22	34	55	37	NA	NA	NA	NA
Lang Son	45	46	NA	45	37	40	42	26	30	50	NA	NA	NA
Ben Tre	46	34	39	39	43	40	56	49	47	31	21	NA	NA
Phu Yen	47	32	NA	38	37	NA	43	54	45	31	NA	NA	NA
Ha Giang	47	NA	NA	NA	NA	NA	40	NA	NA	NA	NA	NA	NA
Quang Ngai	49	30	45	36	30	51	46	40	37	46	NA	NA	NA
Tien Giang	50	NA	41	NA	NA	38	56	NA	44	41	21	NA	NA
Gia Lai	51	46	NA	45	42	34	29	46	40	41	NA	NA	NA
Kon Tum	52	44	NA	48	34	45	43	33	32	48	NA	NA	NA
Cao Bang	53	NA	NA	NA	NA	NA	49	33	41	NA	NA	NA	NA
HCMUE	54	NA	NA	NA	NA	NA	62	NA	NA	24	NA	NA	NA
Lai Chau	55	NA	NA	NA	NA	NA	40	42	49	NA	NA	NA	NA
Binh Thuan	56	34	NA	NA	NA	43	56	NA	47	NA	NA	NA	NA
Ca Mau	57	49	NA	NA	48	NA	49	36	50	NA	NA	NA	NA
An Giang	58	NA	NA	NA	NA	NA	52	NA	NA	41	NA	NA	NA
Vinh Long	59	39	NA	NA	NA	48	62	41	NA	49	NA	NA	NA
Tay Ninh	60	51	47	NA	NA	NA	46	48	NA	NA	NA	NA	NA
Tra Vinh	61	NA	NA	NA	NA	NA	49	NA	NA	NA	NA	NA	NA
Long An	62	52	NA	NA	NA	49	62	52	NA	31	NA	NA	NA
Kien Giang	63	NA	39	NA	NA	NA	60	49	50	NA	NA	NA	NA
Dak Nong	64	NA	NA	NA	NA	NA	60	42	53	NA	NA	NA	NA
Hau Giang	65	NA	NA	NA	NA	NA	52	NA	NA	NA	NA	NA	NA
Ninh Thuan	65	NA	NA	NA	NA	NA	52	NA	NA	NA	NA	NA	NA
Soc Trang	67	NA	42	NA	NA	NA	67	NA	NA	NA	NA	NA	NA
Bac Lieu	68	49	NA	NA	NA	NA	62	NA	NA	NA	NA	NA	NA
Bac Kan	69	NA	NA	NA	NA	NA	66	47	NA	NA	NA	NA	NA
TTU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hue Uni	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: Non-provincial teams are in blue. Teams with less than 11 prizes were not ranked (NA).

Data Wrangling

The lists of awarded students from 2010 to 2020 were retrieved from the web portal of MoET (<https://en.moet.gov.vn/>). Information about a total of 24,151 awards consisting of the participation year, contest team, high school, grade, ethnic, gender, test subject, score, and prize of students was extracted and stored in a data frame (<https://doi.org/10.5281/zenodo.3764691>). This dataset was then analyzed in R (R Core Team 2019) using chiefly *tidyverse* packages (Wickham et al. 2019).

Team Performance

For each subject, teams were ranked by the number of prizes achieved during 11 years (Table 1). The number of prizes of the Ha Noi team was standardized by dividing in half due to its double size of participants. Teams with less than 11 prizes for the whole period were ignored from ranking as it is likely that they did not join the contest annually. Overall rank was then assigned based on the average of individual subject ranks. The top ten consisted of eight provincial teams - Nghe An, Nam Dinh, Hai Duong, Vinh Phuc, Hai Phong, Ha Tinh, Ha Noi, and Thanh Hoa and two national university teams - VNU Hanoi and VNU Ho Chi Minh. The VNU Hanoi team was ranked first overall and also in Mathematics, Informatics, Physics, and Biology.

The overall rank of provincial teams was combined with the administrative areas data of Vietnam (Hijmans, Garcia, and Wieczorek 2018) in Figure 1. The Red River Delta and the North Central Coast are two regions that hosted highly ranked teams while the performance of teams in the Mekong River Delta was poor.

Figure 1: Overall rank of provincial teams displayed on the country map.

The proportion of first prizes was calculated for all teams to explore its correlation with the overall rank (Figure 2).

Generally, highly ranked teams attained a higher ratio of first prizes, which suggests that prize quantity and quality went hand in hand. Most teams with an above-average proportion of first prizes were in the top 20.

Figure 2: Proportion of first prizes versus overall rank. The solid line corresponds to a LOESS smooth and the dashed line represents the average proportion of first prizes.

Provincial teams are often represented by a group of high schools in the area. The proportion of prizes obtained by the province-leading school was calculated for all provincial teams (Figure 3). Half of teams relied on a school, usually their high school for the gifted, for over 93% of the prizes. Noteworthy, six schools contributing to 100% of the prizes of their teams were Phan Boi Chau High School for the Gifted in Nghe An, Le Hong Phong High School for the Gifted in Nam Dinh, Nguyen Trai High School for the Gifted in Hai Duong, Vinh Phuc High School for the Gifted in Vinh Phuc, Bac Giang High School for the Gifted in Bac Giang, Bien Hoa High School for the Gifted in Ha Nam, and Thai Binh High School for the Gifted in Thai Binh; all these teams were in the top 20. Some teams had a few high schools for the gifted that competed internally for prizes so the proportion of prizes achieved by the most dominant one was lower. For example, the Ha Noi team (rank 9) only had the proportion of less than 60% (data not shown) because its well-known schools such as Hanoi-Amsterdam High School for the Gifted, Nguyen Hue High School for the Gifted, Chu Van An High School all performed well.

Figure 3: Empirical cumulative distribution function of leading school prize contribution to provincial teams. The dashed line represents the median of leading school prize contribution.

Grade, Gender, and Ethnic Distribution

The proportion of students in grades 10 and 11 in each test subject is shown in Figure 4. In total, two thirds of awardees were students in grade 12. Young students were relatively more popular in Informatics and Mathematics and rarer in Chinese, Russian, History, Literature, Geography. It might be interpreted that training and learning have more impact on the success in the latter subjects while giftedness is crucial for the former subjects.

Figure 4: Proportion of grade-10 and grade-11 students in test subjects. The dashed line represents the average proportion of these young students.

The gender distribution of students in each test subject is shown in Figure 5. The male-female ratio was about 49:51 on average. Male students dominated in Informatics, Mathematics, Physics, and Chemistry while female students dominated in Literature, History, Geography, and all language subjects. It does not necessarily imply that male students performed better in natural science subjects and female students did better in social science and language subjects but reflects the gender distribution of students taking the tests. In other words, boys may prefer studying natural sciences over social sciences and languages.

Figure 5: Gender distribution of students in test subjects. The dashed line represents the average distribution.

The proportion of ethnic minority students in each test subject is shown in Figure 6. Students from ethnic minorities accounted for over 4% of the total prize number. For ethnic minority students, the proportions of prizes in Mathematics, Informatics, Physics, Chemistry, and Biology were in deficit while the proportions of prizes in Literature, History, and Geography were in excess compared to the average.

Figure 6: Proportion of ethnic minority students in test subjects. The dashed line represents the average proportion of these students.

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References

- Hijmans, Robert, Nell Garcia, and John Wiecek. 2018. *Global Administrative Areas Database (GADM) Version 3.6*. <https://gadm.org/>.
- Le, Hai Chau, and Hai Khoi Le. 2010. *Selected Problems of the Vietnamese Mathematical Olympiad (1962-2009)*. Mathematical Olympiad Series. World Scientific.
- MoET. 2014. *Quy Chế Thi Chọn Học Sinh Giỏi Cấp Quốc Gia*. Government Gazette. Government Office, Vietnam. <http://congbao.chinhphu.vn/noi-dung-van-ban-so-22-vbhn-bgddt-12940>.
- R Core Team. 2019. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy McGowan, Romain François, Garrett Grolmund, et al. 2019. "Welcome to the Tidyverse." *Journal of Open Source Software* 4 (43): 1686. <https://doi.org/10.21105/joss.01686>.