AN ANALYSIS OF GIRLS' PARTICIPATION IN WORLD ROBOT OLYMPIAD

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THEME: Engaging students in STEM education

BACKGROUND AND AIMS

Robotics competitions play an important role in promoting STEM education, but the gender differences in this field have received relatively little attention, especially the research that lacks students' participation. This study focuses on the World Robot Olympiad (WRO), which aims to promote robotics in STEM education worldwide, explores the participation of girls and tries to understand the reasons behind it.

The research questions are as follows: In the final of WRO held for the last five consecutive years (2015-2019), what was the level of girls' participation? From the perspective of four categories and three age groups, what were the characteristics of girls' participation?

Table 1: Characteristics of four categories in 2015-2019 WRO and definitions of corresponding age groups

Competition Categories *(Characteristics)*	**Corresponding Age Group**	**Age requirement**
I. Regular Category *(Clear rules and standard answers, easy to get started)* **II. Open Category** *(Creative and unique works, time-limited team presentations)*	Elementary School	Up to 12 years old
	Junior High School	13 -15 years old
	Senior High School	16 -19 years old
III. WRO Football *(Football match between two robots designed by two teams)*	WRO Football	10 -19 years old
IV. Advanced Robotics Challenge *(High programming ability and on-the-spot reaction ability)*	Advanced Robotics Challenge	17- 25 years old

METHODOLOGY

The research sample is WRO final participants in five years, including 1,031 girls and 4,925 boys. We obtained official and exclusive participant data from WRO Organizing Committee, including the number of boys and girls in the final each year, the percentage of girls in various categories and age groups. All the data were sorted and statistically analyzed by Microsoft Excel software.

RESULTS AND CONCLUSIONS

The results showed that in the 2015-2019 WRO finals, girls remained at a low level (Figure 1), which could reflect their under-representation in computer science and engineering. Among the four competition categories, more girls participated in the Open Category (Figure 2). Gender traits such as better creativity and expressive ability made girls choose this category and give full play to their advantages (Israel-Fishelson et al., 2020). The participation of girls decreased with age, and the participation of Junior and Senior High School age groups was relatively unstable (Figure 3). This may be related to the gradual decline of girl's interest in STEM subjects after elementary school (Sadler et al., 2012). Overall, there were a low girl participation in robotics competitions. In the future, girls should be given more encouragement and opportunities to actively participate in STEM learning and activities, especially in junior high school.

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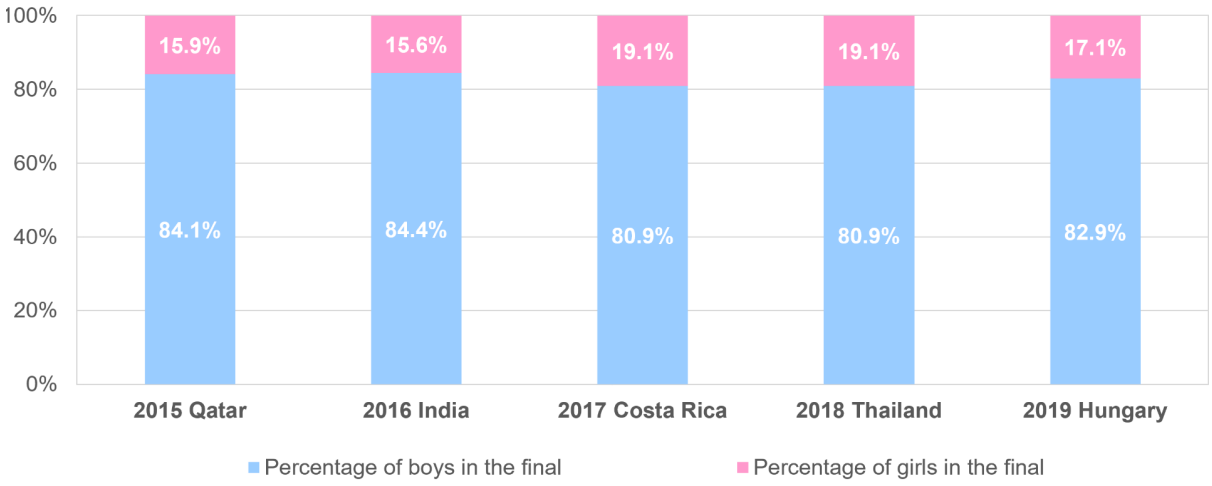


Figure 1: Percentage of boys and girls in 2015-2019 WRO finals

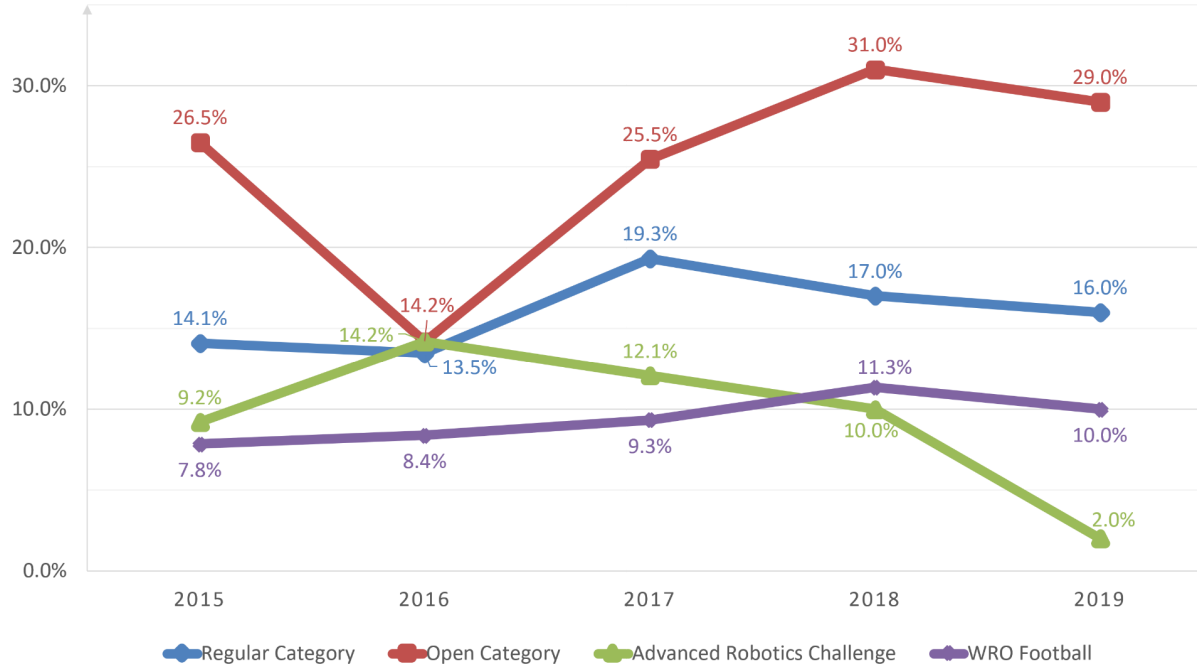
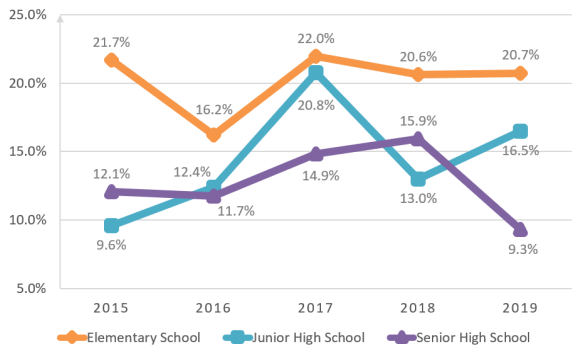
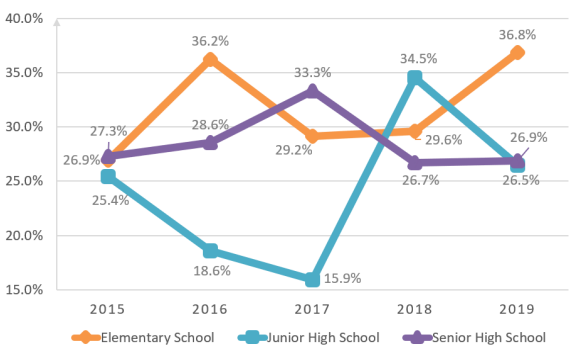


Figure 2: Percentage of girls in different competition categories in 2015-2019 WRO finals



(Fig. 3a) I. Regular Category



(Fig. 3b) II. Open Category

Figure 3: Percentage of girls of different age groups in 2015-2019 WRO finals

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