

Examining Physics Education in Taiwan

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Taiwan is one of the top performing countries at the annual International Physics Olympiad for high school students. Interviews were conducted with three professors from the premier science education university in Taiwan, and academic authorities, teachers and students from the top boys' school and the top girls' school in the country. Classroom observations of these two schools were also done. The interviews and observations are compiled and analyzed to investigate factors that may have contributed to the success of the Taiwanese. This is done with the intention of providing ideas for improving physics education in the United States of America.

Interviewees

National Taiwan Normal University (國立臺灣師範大學) :

- Dr. Chun-Yen Chang (張俊彥), NTNU Chair Professor, Director of Science Education Center at NTNU, Adjunct Professor of Graduate Institute of Science Education and Department of Earth Sciences at NTNU, and Visiting Professor at Taipei Medical University and Université Paris 8 in France.
- Dr. Chih-Ta Chia (賈至達), Dean of the College of Science and Professor of the Department of Physics at NTNU
- Dr. Fu-Kwun Hwang (黃福坤), Professor of the Department of Physics at NTNU

Academic authorities, teachers and students from

- Taipei Municipal Jianguo High School (台北市立建國高級中學), a boys' school
- Taipei First Girls High School (臺北市立第一女子高級中學)

Factors Influencing High Performance in IPhO

External Influences on Learning

- Parents' high expectations of academic success due to the belief that it leads to lucrative careers
- Peer influence
 - Students collaborate in class and possibly elsewhere
 - Older students teach younger ones while preparing for physics competitions

IPhO Preparation and Selection Procedure

- Some students participate in other competitions, including International Junior Science Olympiad, before participating in IPhO
- Students compete within their own school, then nationwide
- Competitive IPhO selection process
 - 300 students selected from 3000 who take an exam
 - 30 selected from the 300 in second exam
 - 5 selected from the 30 in third exam
- Intense preparation
 - The 30 students usually study about 10 hours a day
 - Competitors prepare for 2 to 3 months

Culture of Success

- Physics and other sciences are highly respected in Taiwan
- Taiwanese educators appear to easily critique their educational system with the intent of constantly improving

Rigor of Curriculum

- Taiwanese students learn science and math earlier and with a more meticulous approach than U.S. students
- All students, including those in the arts stream, are required to take physics
- In the 2nd year of high school, students take fundamental physics
- Exceptional students are given extra classes and materials
- Students in the special stream, usually called gifted/talented program in the U.S., finish their courses in 2 years, and attend class in the university in their 3rd year
- Greater focus on concepts instead of procedural learning with the intent of expanding physical concepts beyond class
- At the end of high school, students prepare to take major national exam

Student Flexibility

- Teachers in JGHS have a somewhat equal relationship with students
- Some students are allowed to miss classes to pursue other science activities
- Teachers give methods to search instead of direct answers
- At JGHS, students are given a two-year project where in the first year, they familiarize themselves with research methods

Teacher Support

- Teachers in FGHS spend lots of time outside class, often even overnight, to assist students in experimentation
- During middle school, teachers give outstanding students extra materials to study
- From primary school through university, teachers guide students through problem solving process
- Department of Education writes and publishes textbooks according to its standards
- Taiwanese government invests vast amounts of funds in physics education, enabling schools to provide good facilities and equipment

Recommendations for the U.S.

- Identify IPhO team by holding national competition for high school students
- More schools to use inquiry-based approach in learning
- Students to work collaboratively within and without the physics classroom
- Encourage external influence such as parental support, mentorship and peer support