

Informatics and Programming Education at Primary and Secondary Schools in Japan



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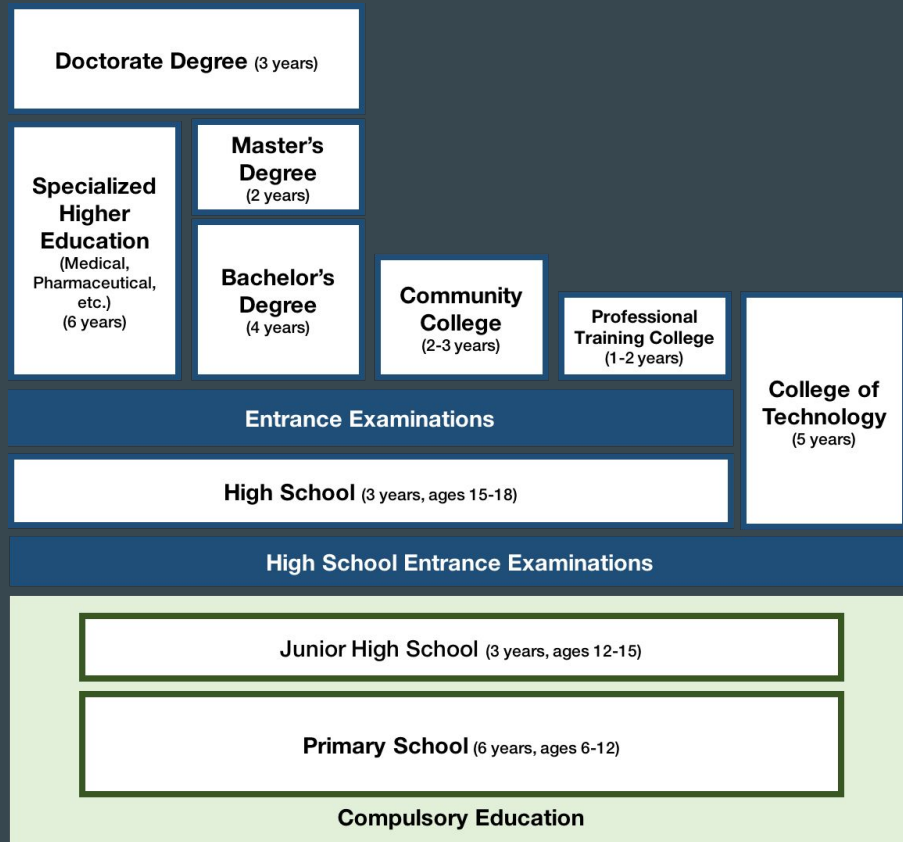
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Current Japanese Education System

Education System in Japan

- Compulsory Education
 - Primary school for 6 years
 - Junior high school for 3 years
- Rate of enrollment in high school > 97%
- Rate of enrollment in higher education > 78%



Current Japanese Education System

Government Curriculum Guidelines and Textbook authorization

- MEXT (Ministry of Education, Culture, Sports, Science and Technology) publishes the government curriculum guidelines
- Every teacher should follow the guidelines in Japan

- No textbooks for elementary and secondary schools should be adopted without the authorization of MEXT

Public education is strictly managed by MEXT

Current Japanese Education System

Subjects of Primary and Junior High School

| Primary | | | Junior High |
|-------------------------------|----------------|------------------------------|----------------------------------|
| Grade 1, 2 | Grade 3, 4 | Grade 5, 6 | Grade 1 ~ 3 |
| Integrated Studies | | | |
| Japanese Language | | | |
| Arithmetic | | | Mathematics |
| Living Environment Studies | Social Studies | | |
| | Sciences | | |
| | | Foreign Language Activity | Foreign Languages |
| Physical Education | | | Health and Physical Education |
| Music | | | |
| Art and Handicraft | | | Art |
| | | Home Economics | Technology and Home Economics |
| | | | |

Current Japanese Education System

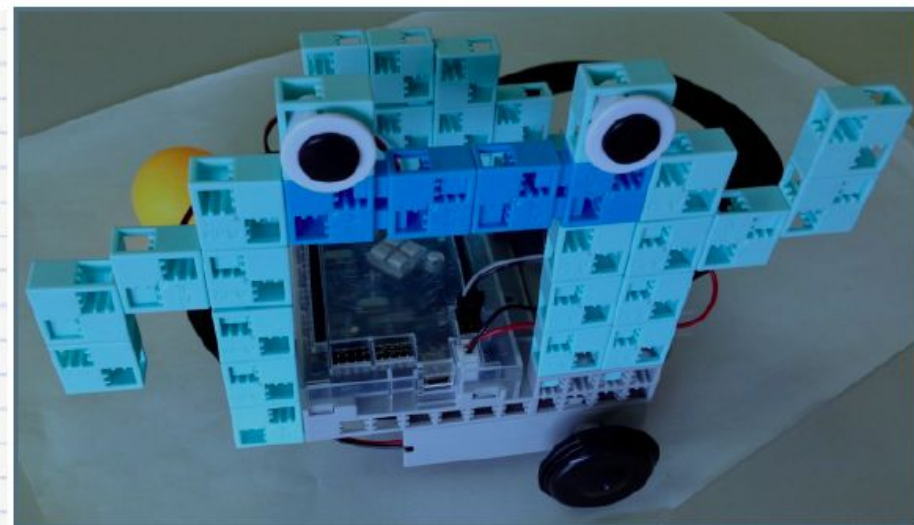
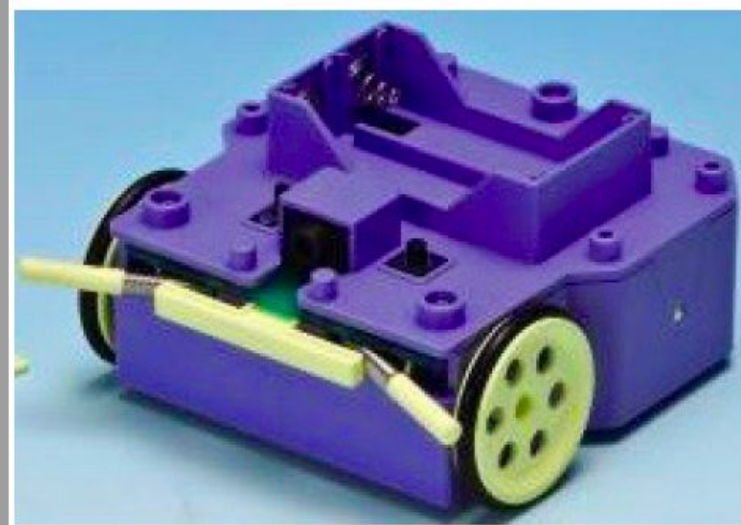
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No
Information
Education

Information
and Computer:
25% of class
hours

Measurement
and Control



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Current Japanese Education System

“Information” in Senior High School

- Compulsory subject area “Information” started in 2003
- Revised in 2013
- Just only 2 units of 74-90 total units (during three years)
- Consists of two elective subjects:
 - Information Study for Participating Community (Society and Information)
 - No informatics, no computer science
 - Information Study by Scientific Approach (Information Science)
 - Only 25% students study Information Science

Current Japanese Education System

MEXT Revises the Curriculum Guidelines Every Decade

- The next curriculum will be installed beyond 2020

Current Japanese Education System

MEXT Revises the Curriculum Guidelines Every Decade

- The next curriculum will be installed beyond 2020
- ● ●
- The Central Council for Education started to discuss the next curriculum in 2014
- The prime minister of Japan declared “Japan will make programming education compulsory from primary school” in April 2016
- The Central Council for Education reported the policy of the next curriculum in December 2016
- For primary and junior high schools, published in 2017
- For senior high schools, will be published in 2018

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Computer Science and Programming in New Curriculum

Summary of CS and Programming in the Current Curriculum

- Main goal of information education in Japan during the past two decades:
 - Practical skills in using information activity
 - Positive attitude towards today's information society
- In primary school, none of CS and programming
- In junior high school, programming treated in only “Measurement and Control”
- In senior high school, compulsory subject area “Information” in high school started in 2003, but only 25% students Information Science

Computer Science and Programming in New Curriculum

New Goal of information study in Japan

All Japanese citizen become to understand the nature of computing



- In primary school, experience programming
- In junior high school, “Network Communication” in addition to “Measurement and Control”
- In senior high school, combine two elective subjects into one compulsory subjects
 - All students study algorithms and programming

Computer Science and Programming in New Curriculum

Comparison between the new and current curriculum

| Current | | Primary | Junior High | Senior High |
|---------|-------------|-----------|--------------|-------------|
| | Literacy | partially | partially | ✓ |
| | Programming | – | ✓ (M/C) | 20% |
| | CS | – | partially | 20% |
| New | | Primary | Junior High | Senior High |
| | Literacy | partially | partially | ✓ |
| | Programming | partially | ✓ (M/C, COM) | ✓ |
| | CS | – | partially | ✓ |

Computer Science and Programming in New Curriculum

Compulsory Programming Education in Primary School

- Starts in 2020
- Students learn logical thinking and/or computational thinking through programming experience
- No subject to teach programming
- In arithmetic, science, or integrated studies

Ex. Drawing regular polygons in arithmetic

Ex. Making automatic door or crime preventing light with human sensor in science



マッチ棒を使って、正三角形を横にならべます。正三角形を10個ならべるとき、マッチ棒は何本使うでしょう。

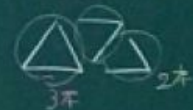


- ・実際に作るのは大変
- ・規則性を見付けねばよいかも

規則性を見付けて簡単に本数を求めよう。

②考え方

| | | | | | | | |
|----|---|---|---|---|-----|----|-----|
| 個数 | 1 | 2 | 3 | 4 | ... | 10 | ... |
| 本数 | 3 | 5 | 7 | 9 | ... | 21 | ... |



$$\frac{2 \times \text{個数} + 1}{\text{おとし}} = 2 \times 10 + 1 = 21$$

$$\frac{3 + 2 \times (\text{個数} - 1)}{\text{おとし}} = 3 + 2 \times (10 - 1) = 21$$

②練習 友達が指定した個数を求める

ルール

...あるおとしが規則的

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Future Tasks

- Development of educational materials
- Retraining teachers

Future Tasks

- Development of educational materials
- Retraining teachers
- Trials
 - Teacher training course by Information Processing Society Japan
 - Activities by the Japanese committee for IOI
 - Bebras Challenge / CS Unplugged events

Thank you for your attention

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