

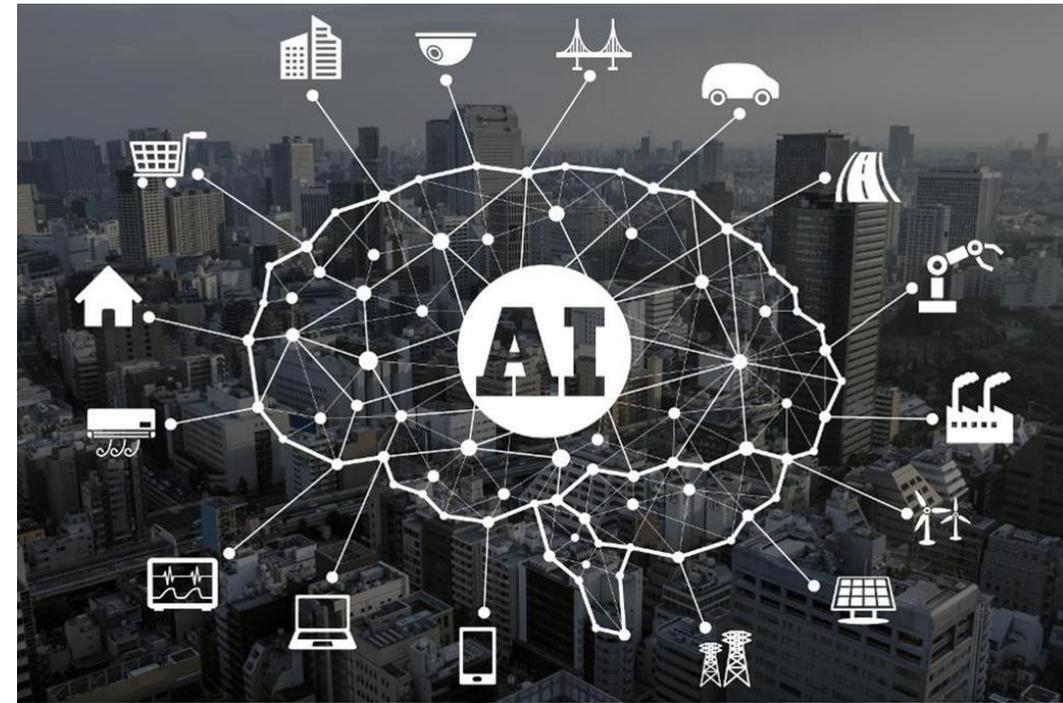
AI for Education: Korean Report for Lesson Study 2.0

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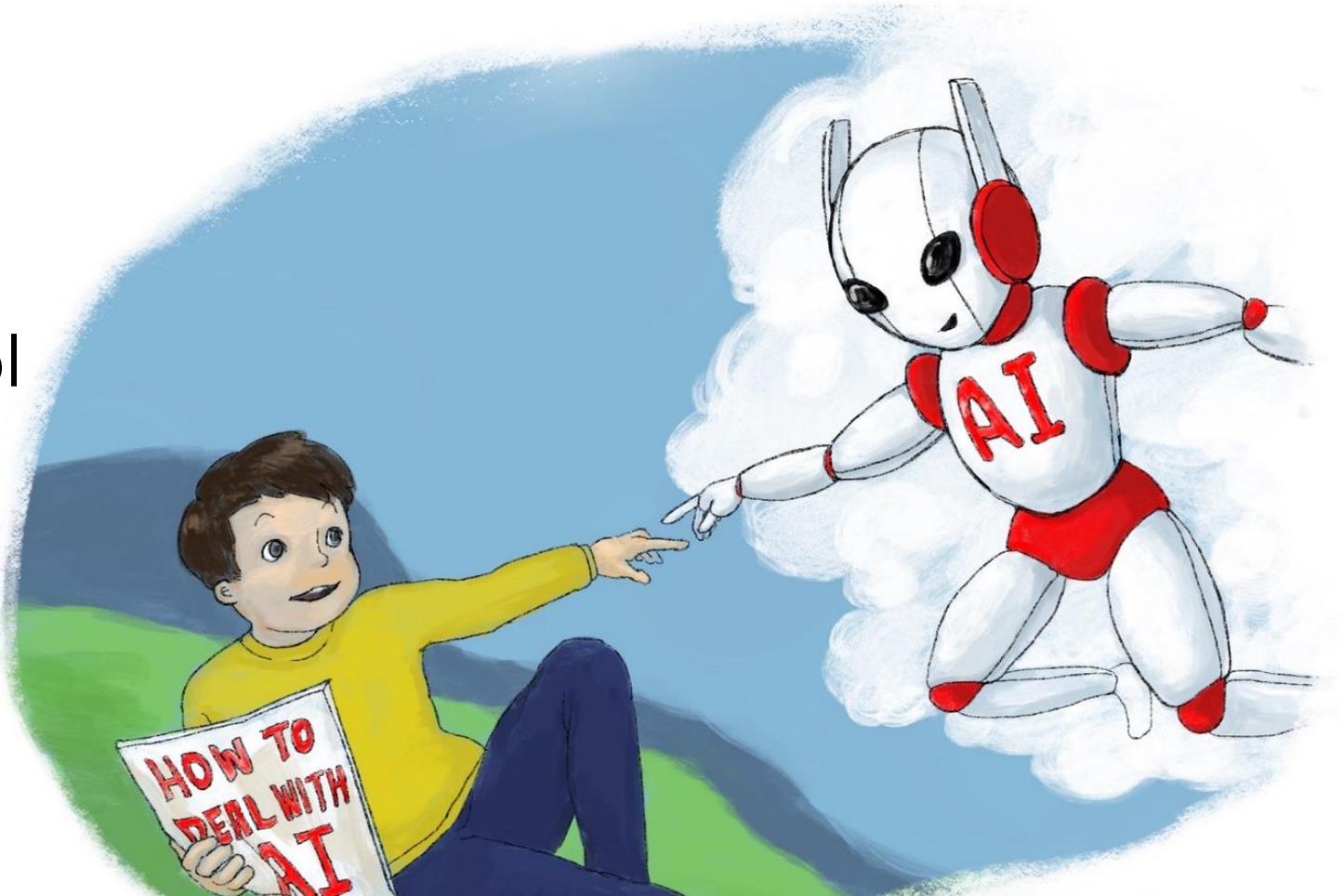
AI in Society 4.0

- AI is a **cornerstone** of our current society in that it is a basis of highly sophisticated technologies driving the 4IR.
- AI is a **machine system** to implement a variety of **recognition, thinking, and learning** that have been performed by only human intelligence.
- Autonomous driving car with AI can recognize and make a decision for passenger's safety.



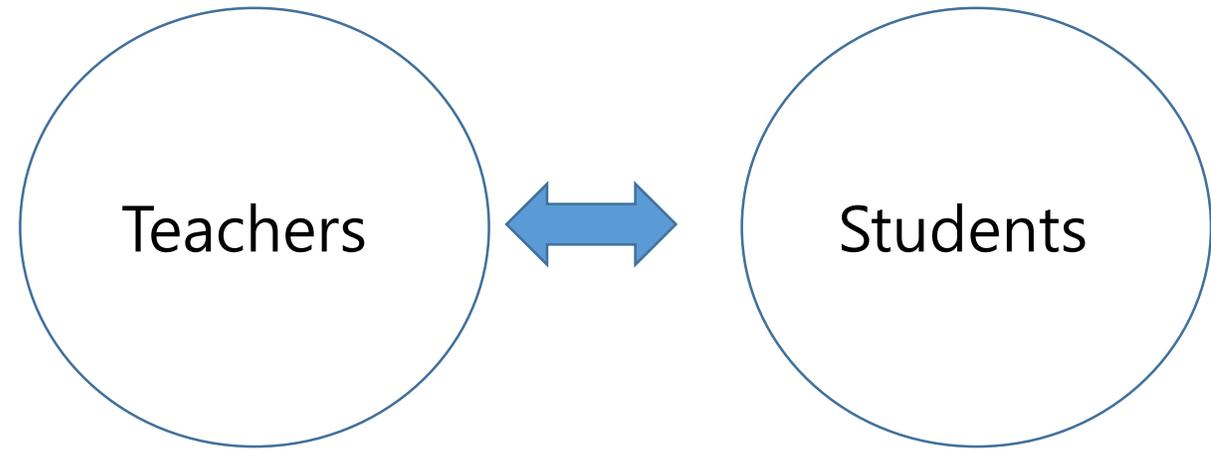
AI in school

- Many people consider that AI is enough for high-level experts only and worry that AI education might be **too much burden** for ordinary students.
- However, Korean government decided in 2019 that AI should be taught urgently in school curriculum as early as 2022.
- Nobody knows about success or not!!
- We need Lesson Study!!



Lesson Study for AI

- Lesson study is a study to improve **educational relationship** between teachers and students in classrooms.
- However, it is very **complex** in that it has many factors like curriculum, textbook, teacher training, classroom environment, student previous experience, educational culture



Curriculum

- “AI Basic (informatics)” and “AI Mathematics” **were** already developed **as** the new chapter of the current 2015 national high school curriculum in 2020.
- Additionally, their new curriculum is being developed for the next national curriculum, which begins in 2025.

AI Basic

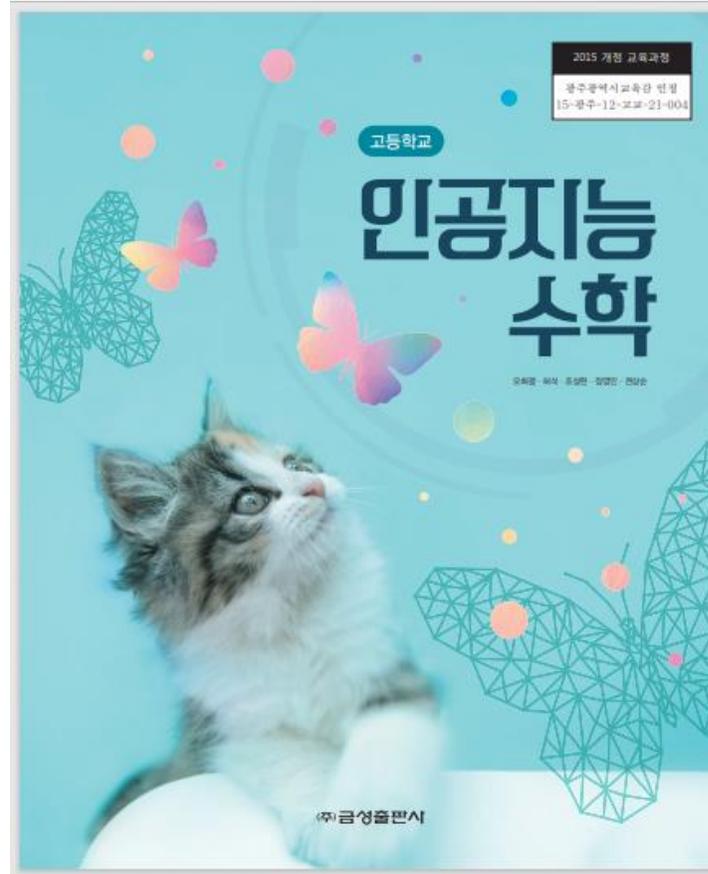
Key concepts
AI and Agent
Recognition
Exploring and Reasoning
Learning
Data
Machine Learning Model
Impact of AI
Ethics of AI

AI Mathematics

Key concepts
Mathematics related to AI
Representation of Text Data
Representation of Image Data
Classification of Data
Tendency and Expectation
Optimization and Decision Making

Textbooks for high school mathematics

- 6 kinds of high school textbooks for "AI Basic" and "AI Mathematics" were already developed for public education in 2021.
- These have used from spring semester of this year, 2022 **in some schools**, as a selective subject for students who want it.



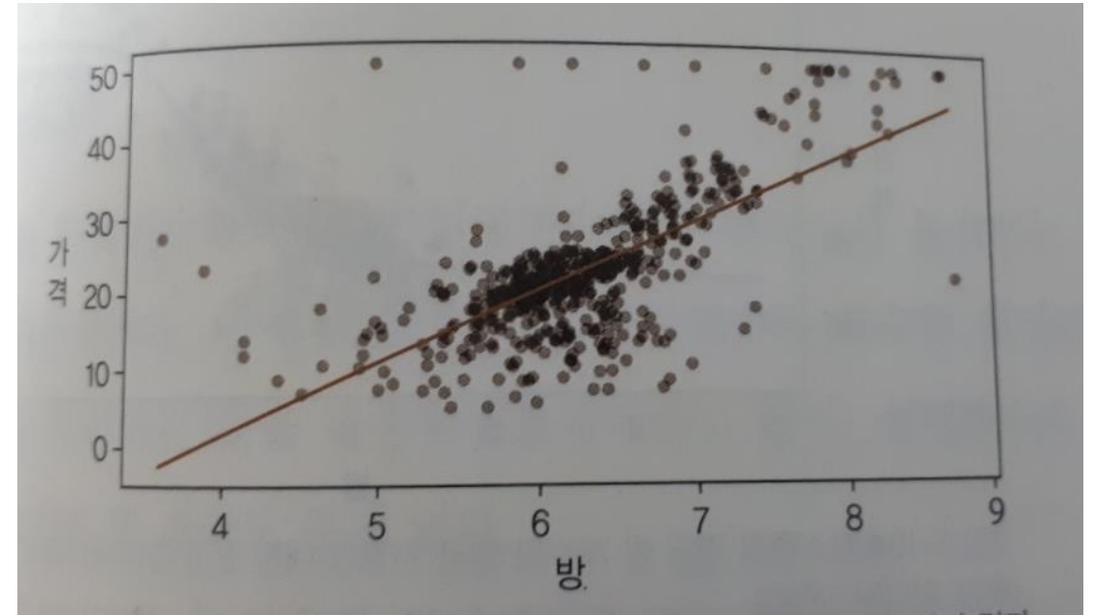
Example 1: Visual Image Recognition

- What is different between these two pictures?
- Machine with AI can recognize the difference easily than human. **How?**
- **Mathematics** can make it possible!!



Example 2: Pattern & Rule Recognition

- **AI** can effectively find patterns and rules inherent in data through machine learning.
- If the basketball score is x and the soccer score is y , **AI** can find the best trend line $y=ax$ that predicts the soccer score from the basketball score.
- Mathematics can make it possible through simple regression analysis and the gradient descent method



Student	Basketbal I	Soccer
A	4	4
B	5	7
C	8	10

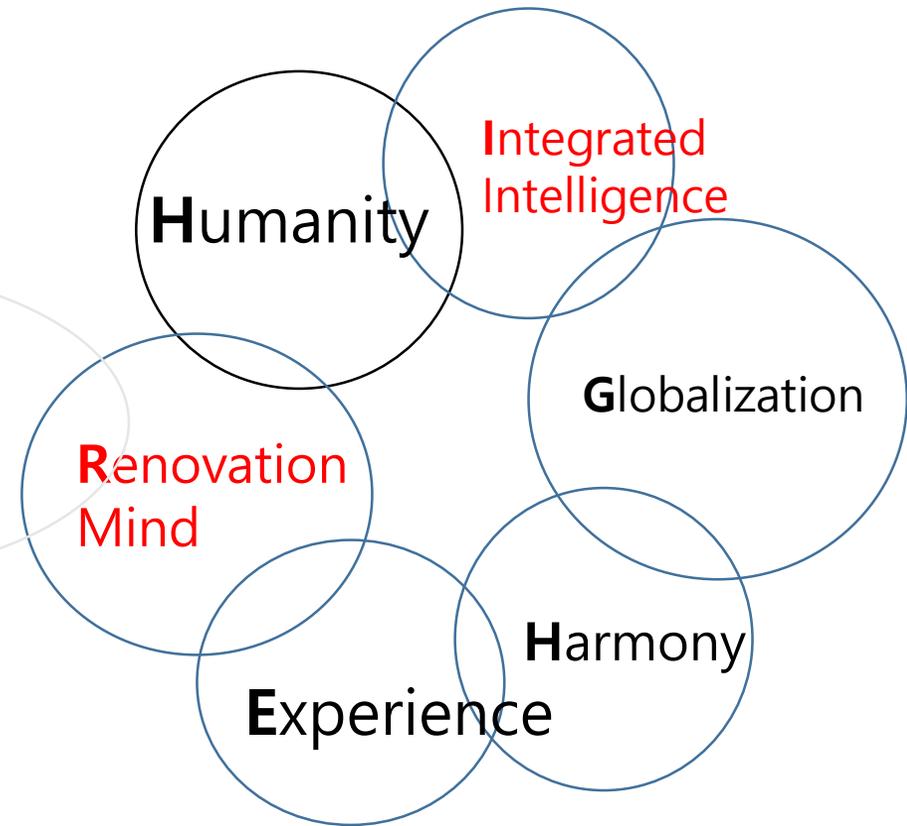
Example 3. Spam Mail filtering

- AI automatically filters spam mails sprayed indiscriminately on the Internet.
- It is Bayesian estimation that supports this process.
- This process increases probability of filtering spam mails through adding information.



AI in teacher education

- In 2019 South Korean Government decided to train 5000 AI teachers for leading high school students in the new era of the fourth industrial revolution.
- For 5 years, they have taken master degree course from the second semester of 2020.
- KNUE also launched the course for 140 teachers each year in 2020 based on its H-I-G-H-E-R vision.



"HIGHER" Vision of KNUE

KNUE AI Teacher Education

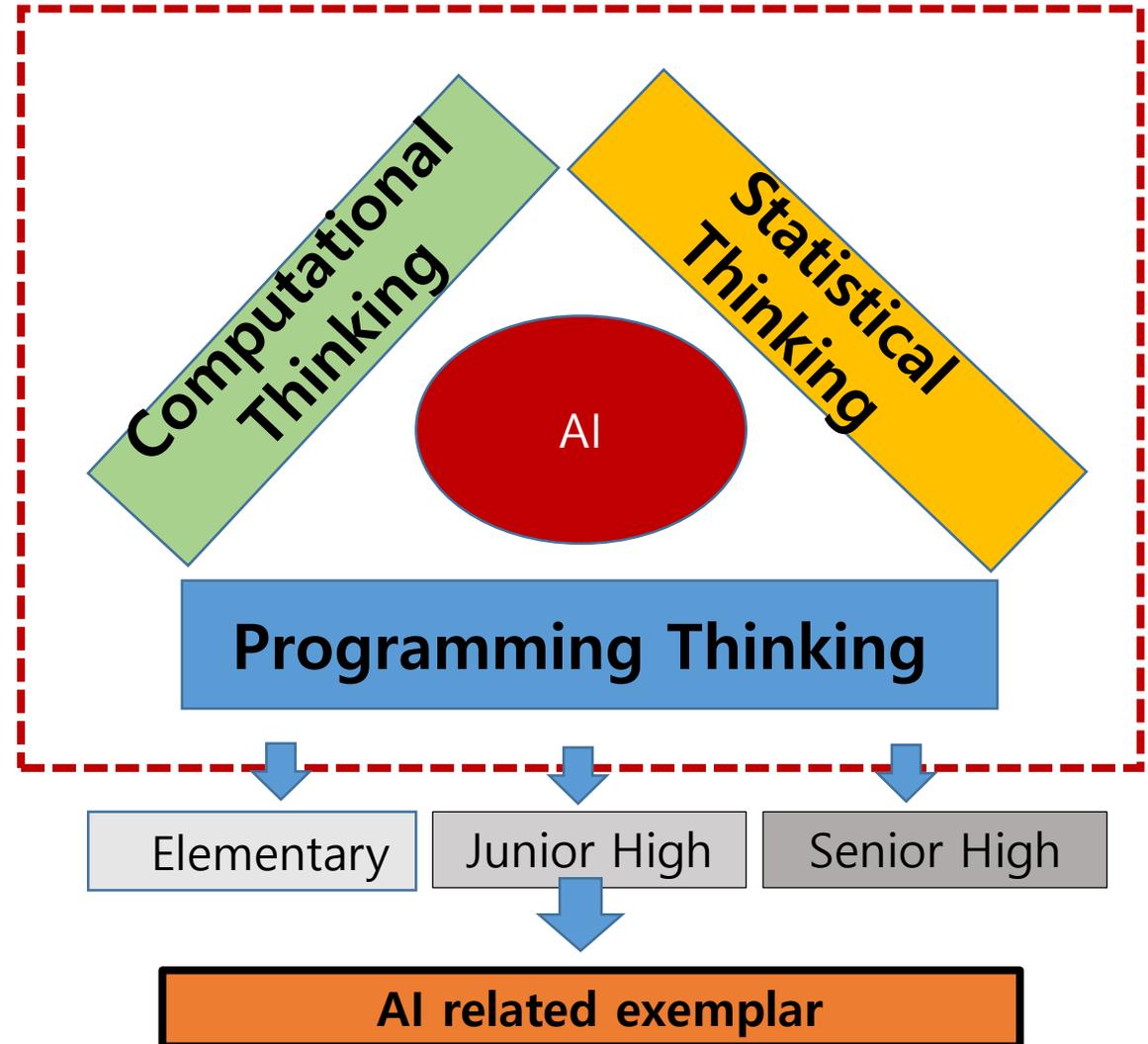
- The program was launched with the goal of convergence education related to AI which is to develop a **converging eye** through viewing their subjects from the AI related perspective.
- **Compulsory: 18 credits** of 6 courses including **AI programming I, II** and **AI Education I, II**, **AI and school** and **AI Ethics and Education in School**.
- **Elective: 9 credits** of 2 courses and 1 independent study course (for thesis) in each department of student's major subject.
- **Two elective courses** for mathematics education major are "AI mathematics education" and "Topics in AI mathematics".



Lecture Note Cover of AI Programming I for KNUE AI Teacher Education

Framework of “AI mathematics Education”

- Based on [APEC InMside](#) “AI mathematics education” chose the following three thinking as teaching goals:
 - Computational thinking
 - Statistical thinking
 - Programming thinking
- The course discusses teaching exemplar within K-12 mathematics education



Algeomath: mathematical Block Coding Platform

- Algeomath is the new platform for mathematical block coding.

“When the area of rectangle becomes maximum in case that its perimeter is constant?”

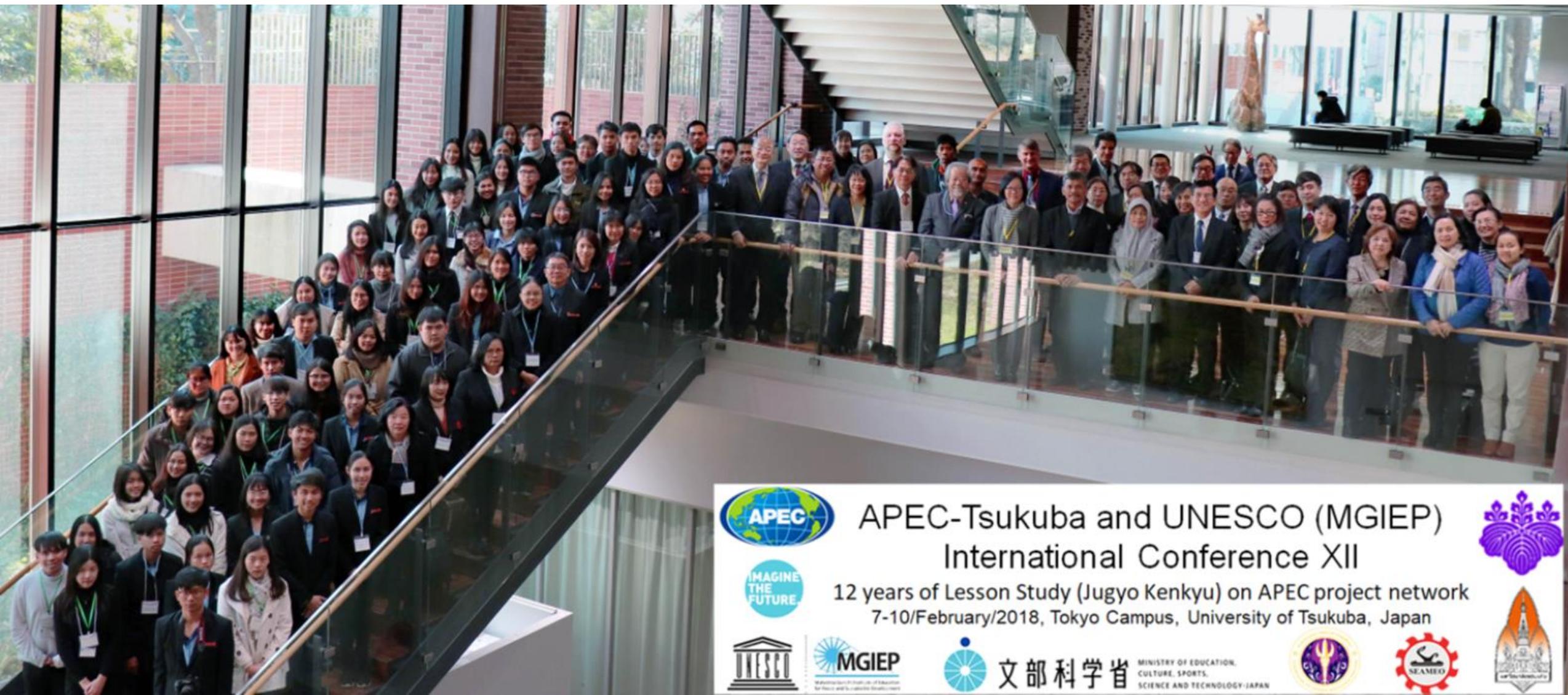
Looking at the changes in the graph, the area is maximized when the width is $a/2$.

Final Remark: International Lesson Study

- AI and Data Science for education is on totally new teaching situation.
- We have no enough information in each country.
- That is why we need international Lesson Study 2.0 for sharing classroom information on AI and Data Science.



See you again in Lesson Study 2.0



APEC-Tsukuba and UNESCO (MGIEP)
International Conference XII



12 years of Lesson Study (Jugyo Kenkyu) on APEC project network
7-10/February/2018, Tokyo Campus, University of Tsukuba, Japan



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