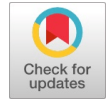# AI Curriculum Design for Korea K-12 AI Education Through Analyzing AI Education Curriculum

Dong Hwa Kim

Abstract: This paper deals with the curriculum design of Korean K-12 AI education. AI is the core technology of 4th wave and it is impact is wide and strong. Therefore, every country has s strong nurture system for AI manpower. However, there are few materials about curriculum design and operation experience documentation because AI was an interest since 2016, and its education is very new. In Korea, they started a program for teacher manpower education in 2020. Therefore, there is no manpower that had an experience in the design and operation of the K-12 AI curriculum. The AI curriculum is a core parameter for AI manpower. So, AI-advanced countries try to develop AI education methods. This paper analyzes the K-12 AI curriculum of the advanced countries, and then designs and suggests Korea's K-12 AI curriculum.

Keywords: Computer Education, AI, AI Curriculum, K-12, AI Education.

I. INTRODUCTION

Many countries have special AI policies to have an initiative because AI and related technologies impact everywhere [35, 37]. The Chap GPT has been released, and its influence is increasing in many areas, such as industry, education, coding technology literature, etc., and some analyzers describe its impact as the steam engine industrial revolution of the 1700s [1, 2]. The ChatGPT has the basic reinforcement supervised learning and RLHF (Reinforcement Learning Human Feedback) of deep learning. Students can use it only when they understand AI structure and development well. Therefore, they have a policy to introduce AI into education from 2016. At that time, DeepMind won against humans at matching play go (Baduck) [3]. However, most countries do not have a policy to introduce AI education into their education program.

Humans have been implementing AI using logical and mathematic methods [4], and they have tried inference for AI using fuzzy since 1965 [5]. There are many tools, such as PSO (Particle Swarm Optimal), BF (Bacterial Foraging),

and ANIS (Artificial Immune System), for obtaining the optimal solution as one AI [6, 7, 8]. Still, they do not have interests because of limited application. Many are interested in machine learning and deep learning, but these tools are one of many AI areas as mentioned [9]. The education method, curriculum, and teaching method for K-12 are quite important because AI areas are wide, and implementation methods depend on the curriculum and teacher's AI thinking method [10-13]. Most countries, including S. Korea, do not have experts with experience in AI education in K-12. K-12 education is not a developing area for high technology, it is education for the AI of K12. It is one stage to provide manpower education for high technology development. It is very important how to teach because when we build a good AI curriculum, students can have interests (or motivation) and select this topic to study. Therefore, it is important to have an experience through education [14-16]. There are two kinds to link with AI. The first one is to manage and operate in the education area. It is to do document writing, hobby of students, statistics about education operation. The second one is directly to teach AI, such as coding, AI thinking, application, economic impact, and job pattern for students' future. Therefore, there are many subjects to teach and need much experience. In the case of S. Korea, they started to nurture teaching for AI teaching in 2020. It means they do not have much time for a correct curriculum for AI teaching in the K-12 site [18]. Some teachers started to learn AI in 2019 at the master course of university and they are publishing some papers to finish their course [19-22, 27-29]. This paper aims to the curriculum design method for Korean K-12 AI education by know-how obtained through AI teaching experience for a long time at a university. This paper also is to provide several materials for the K-12 curriculum design.

II. SUMMARY OF AI EDUCATION HISTORY

Many areas, such as information technology, game, theory, computer programming, and computer science, have long influenced AI education and development. It started in 1943 at the Dartmouth conference, and many game companies have been studying games by AI (machine). The biggest event was the Alphago accident with humans (Lee, Se Dol) in 2016 [3] and the Litrabus AI tool of AI team of Carnegie Melon University, in 2017, won at game matching completely in 2017. Figure 1 shows the history of AI and games, and Figure 2 represents information technology that impacts the mega network of AI.

Dong Hwa Kim*, DSTSC (Daeduck S&T Social Cooperation, S. Korea. E-mail: koreahucare@gmail.com., ORCID ID: 0000-0002-0528-6736
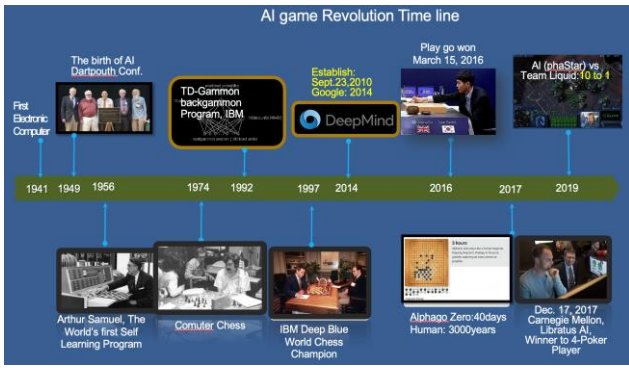
Figure 1. The history of AI and game [30, 31]
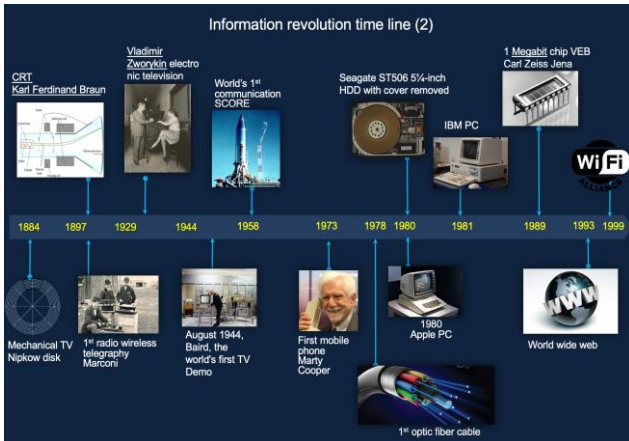

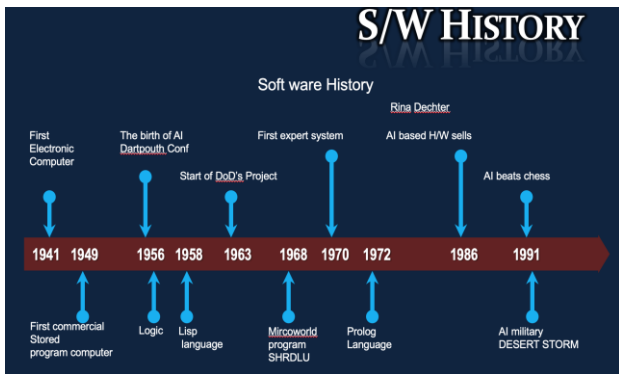**Figure 2. The history of information for AI [32, 33]**

Figure 3. The History of AI S/W [34, 35]

With this mega network, the technology of current AI was developed. This history can differ depending on a person's opinion. Figure 3 illustrates S/W developing history. Python and Pythorch influence on AI history.
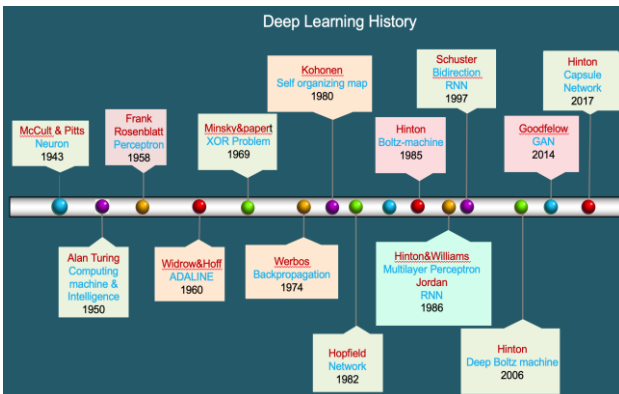

Figure 4. The History of Deep Learning [34, 36, 37]

Figure 4 is for deep learning developing history. Many AI theories have been developed, such as RNN, GAN, and others.
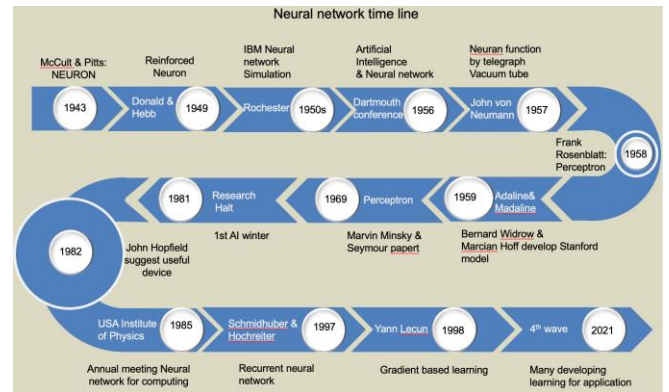

Figure 5. The History of Neural Network

Figure 5 shows the history of deep learning. Deep learning has an overlapping history with neural network structure because it is started from the neural network. Figure 6 summarizes Figure 3, Figure 4, and Figure 5. AI has two winter seasons. The first is 1974-1980, and the second is 1987-1993. During these seasons, many researchers thought that AI was not useful. However, the function ReLU was developed and fast increased application.
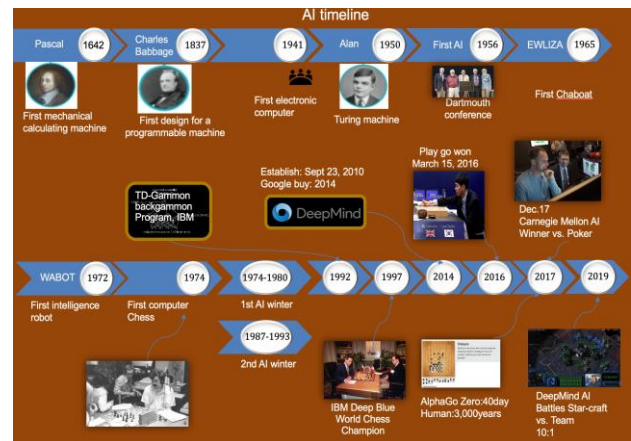

Figure 6. The History of AI

III. ANALYSIS OF AI EDUCATION

Many have been interested in AI for a long time ago. However, most countries had a policy from 2018. China introduced AI education for K-12 in 2018. Other countries have been concerned about AI education for K-12 since 2019 [24]. Therefore, there are very few materials for K-12 AI education and curriculum design. Ref. [25] illustrates the curriculum for the level of K-12. It shown by the general level and special level. Ref. reports on ETRI in S. Korea and shows effective AI education. Ref. presents of USA, China, the UK, and Japan, but it is not about AI education. Ref. describes the EU AI education curriculum.

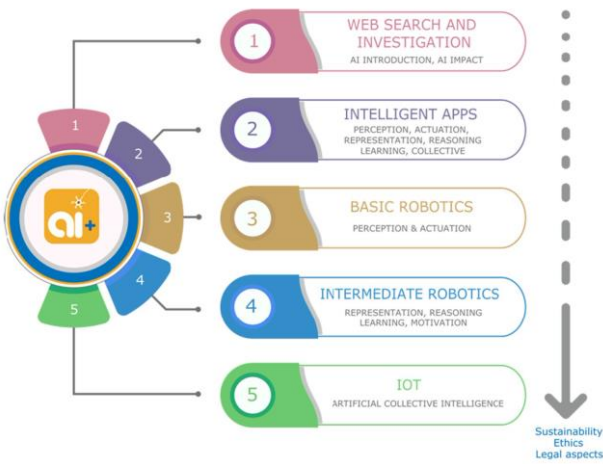**Figure 7 (a). The Curriculum Structure of Reference**

Figure 7 (b). The Application Curriculum Structure of Reference

Figure (7a) describes in detail in Units 1-17. Figure (7b) introduces application areas for AI curriculum design. Ref. illustrates the K-12 curriculum of the UK, Poland, Israel, and New Zealand. Ref describes the kindergarten curriculum. Ref. shows an AI curriculum example of CSTA (Computer Science Teaching Association). Ref. introduces AI tools for K-12 education. Ref. describes the characteristics of AI education in the USA, Finland, Australia, and S. Korea. Ref. shows AI education history, and Ref. presents its impact on the economy and society of AI. Ref. [5] describes the importance of AI education in K-12. Ref. introduces an example of AI education for K-12. Ref. introduces AI S/W for K-12 education and Ref. is a paper for AI confusion, and Ref. shows AI education in kindergarten. Ref. illustrates the core contents for AI education of K-12. Ref. explains why we should teach AI. From these analysis materials, we can see that there was no curriculum for K-12 AI education. Therefore, we must develop a curriculum for our AI education through experience and study.

IV. AI AND EDUCATION

There are two kinds of AI and education. The first one is to use AI as a helper of traditional education, and the second is that we should teach AI technology and application. Many small works include management, homework, quiz assignment, and student credit statistics for class operation and teaching activities. We can use AI tools for those activities. For those, the UNESCO report suggests AWS, Bidu, Easy DL, TensorFlow, IBM Waston, and Azure. The second AI education is AI basic, principle, application, coding, and others. For those, we must design a good AI curriculum.

Table I: UNESCO AI Curriculum Areas.

Category	Topic area	Competency and Curriculum considerations
AI foundations	Algorithms and Programming	Together with data literacy, algorithms and programming can be viewed as the basis of technical engagement with AI
	Data literacy	A major of AI applications run on big data. Managing the data cycle from collection to cleaning, labeling, analysis and reporting forms one of the foundations for technical engagement with using and/or developing AI. An understanding of data and its functions can be also help students understand the causes of some of the ethical and logistical challenges with AI and its role in society.
	Contextual problem-solving	AI is often framed as a potential solution to business-related or social challenges. Engaging at this level requires a framework for problem-solving in context, encompassing things like design thinking and project-based learning
Ethics and social impact	The ethics of AI	Regardless of technical expertise, students in future societies will engage with AI in their personal and professional lives – many do so from a young age already. It will be important for every citizen to understand the ethical challenges odf AI; and the avenues for redress in case of unethical of illegal use of AI, e.g. that which contains harmful bias or violated privacy rights.
	The social or societal implications of AI	The social impacts of AI range from requiring adjustments to legal frameworks for liability, to inspiring transformations of the workforce. Survey respondents were asked about the extent to which their curricula targeted these issues. Trends such as workforce displacement, changes to legal frameworks, and the creation of new governance mechanisms were given as examples.

	Applications of AI to domains other than ICT	AI has a wide range of applications outside of computer science. The survey asked participants whether and to what extent AI applications in other domains were considered. Art, music, social studies, science and health were given as example.
Understanding, using and developing AI	Understanding and using AI techniques	This area included (1) the extent to which theoretical understandings of AI processes were developed (e.g. defining or demonstrating patterns, or labeling parts of a machine learning model); and (2) the extent to which students used existing AI algorithms to produce outputs (e.g. training a classifier). Machine learning in general, supervised and unsupervised learning, reinforcement learning, deep learning, and neural networks were given as examples of AI techniques.
	Understanding and using AI technologies	AI technologies are often human-facing applications which may be offered 'as a service'. NLP and computer vision were given as examples. Respondents were asked about the extent to which learners used existing AI technologies to complete tasks of projects, and/or studies the processes of creating these technologies.
	Developing AI technologies	Developing AI technologies deals with the creation of new AI applications that may address a social challenge or provide a new type of service. It is a specialized field requiring knowledge of a range of complex techniques and skill in coding, mathematics (especially statistics), and data science.

Table II (a): usa AI Strategy Report (2018)

Item		Description
National AI strategy	Support key AI organizational inputs	High-value data, AI skills, publicly funded R&D
National AI strategy	Accelerate public-sector adoption of AI including national security	One of the most straightforward and effective steps government can take spur AI progress is to rapidly adopt AI in support of its own missions.
National AI strategy	Spur AI development and adoption in industry, including through sector-specific AI strategy	Federal agencies should be charged with developing sector-specific AI strategies to shape their policies affecting these industries in ways that support AI transformation
National AI strategy	Support digital free trade policies	Data is at the core of AI, and many nations are enacting policies that restrict cross-border data flows.
National AI strategy	Foster innovation-friendly regulation	If poorly implemented, AI can produce undesirable outcomes
National AI strategy	Provide workers with better tools to manage AI-driven workforce transitions.	AI-enabled automation will increase productivity and per-capita incomes but also will likely modestly increase the rate of worker displacement, which

		can lead to support for policies that restrict how firms can use AI.
Data and AI	Data accessibility	. Relevant federal agencies should support the development of shared pools of high quality, application-specific training and validation data in key areas of public interest, such as agriculture, education, health care, public safety and law enforcement, and transportation.
Data and AI	Data development and trust	. Relevant federal agencies, including the Department of Commerce and the Department of Health and Human Services, should develop and pilot data trusts to facilitate data sharing in specific application areas among academia, businesses, and government agencies.
Data and AI	Digital transformation	. Federal agencies, such as the Department of Housing and Urban Development (HUD), Department of Health and Human Services (HHS), Department of Transportation (DOT), and Federal Energy Regulatory Commission (FERC), should identify and implement policies that can drive digital transformation in relevant sectors.
Data and AI	Policymakers	Policymakers should consider a variety of different approaches to encourage the private sector to share data for public benefit.
Data and AI	Data open	Congress should pass legislation codifying the federal government's responsibility to publish open data.
Data and AI	Data poverty	Relevant federal agencies should ensure data collection efforts emphasize reducing the "data divide" and combatting data poverty.
Data and AI	AI data sharing	Congress should ensure that any national legislation addressing privacy considers the importance of data for the development and use of AI
Developing AT talent	Investment for AI	Congress should invest in cultivating AI talent.
Developing AT talent	AI manpower	Congress should fund and authorize a program at the NSF to provide competitive awards for up to 1,000 academic AI researchers for a period of five years.
Developing AT talent	Foreigner VISA for AI	Congress should enable more foreign AI talent to work in the United States by increasing the cap on H-1B visas to ensure U.S. firms can hire as much AI talent as they need.
Developing AT talent	No-barriers	Federal agencies should address barriers that limit the number of students able to take computer science courses at the university level.

AI R&D	R&D funding for AI basic	Congress should substantially increase R&D funding for AI, with an emphasis on basic and applied research. ⌷SEP
AI R&D	R&D funding for AI application	Federal agencies should support R&D for all kinds of AI applications. ⌷SEP
AI R&D	Tax free for AI R&D	Congress should increase the R&D tax credit to keep pace with competing countries.

Table II (b) usa AI Strategy Report (2018)

Item		Description
Transforming Government With AI	Community	Congress and the administration should support efforts to foster communities of practice and raise awareness about AI within the public sector.
	Ventur capital	Congress should provide agencies with venture capital funds to pilot AI initiatives.
	Spur AI	Federal agencies should establish domain-specific programs to spur AI adoption.
	The roel of White House	The White House should establish a strategic initiative devoted to AI in the CIO Council.
	GSA (General service administry)	GSA should work with state government CIOs to share best practices for AI implementation and develop shared resources ⌷SEP
	Defence AI using	Defense agencies should prioritize the use of AI to support their missions to protect national security.
	Defence and Industry	DoD should create a body with both government and industry stakeholders to accelerate the adoption of dual-use AI technologies by the military.
	Cross-agency of DoD	DoD should establish a cross-agency task force to identify opportunities to simplify the acquisition process for AI.
	Procurement of DoD	DoD should pursue and expand the use of alternative acquisition mechanisms as a workaround for cumbersome procurement policies.
	Relationship of DoD	DoD should foster better relationships between the defense community and the U.S. technology industry
	AI new program of DoD	DoD should establish a new Program Element (PE) specifically for AI to increase the visibility of AI appropriations,
	AI adoption of DoD	Congress should prioritize the development and adoption of AI in defense spending.
	AI adoption for National security	Congress and the administration should support productive conversations about the appropriate way to oversee the use of AI for national security.
	AI benefits for National Security	Congress and the administration should recognize that the benefits of AI to national security.
Spurring AI Development and Adoption in Industry	Supporting for AI adoption	Federal agencies should work with industry to create strategies for supporting AI adoption in relevant sectors of the economy

	AI application	The Department of Commerce should establish organizations designed to advance the development of innovative AI applications in various sectors.
Ensuring trade policy support AI	Foster AI	Congress should direct the Economic Development Administration to enable state governments to foster AI industry development.
	Foster AI	The United States Trade Representative (USTR) should continue to advocate for cross-border data flow protections in all future trade negotiations.
	Intellectual property	USTR should continue to fight source code disclosure requirements other nations may enact to unfairly disadvantage U.S. firms or exploit their intellectual property.

A. UNESCO K-12 Curriculum

Table 1 shows the contents suggested by UNESCO for K-12 AI curriculum. This table has three basic contents, such as AI basic, AI ethics and social issues, AI development. Of course, AI teacher or school should decide the detailed contents or subjects. Finland has a good education in K-12 and they have a strong competitiveness because teachers can decide their subjects by their opinion and ideas. AI education results can be different depend on teacher's idea and teaching style (H/W, S/W, and teaching contents) because there are few experts in education and a very few experienced materials.

B. USA AI Curriculum

a. AI education policy

Ref. Joshua New have suggested an idea to teach for USA AI initiation. He insists that China, France, and UK have a strong policy for AI education, but USA has a weak policy in AI education areas. He describes that USA should teach and have an initiative for national security (Table 2). Table 2 describes they have to have a national AI policy, AI security, data R&D, and defense AI.

Table 2 © deals with AI regular issues, data, AI application, and a new law for AI.

b. Discussion about USA AI education

USA describes AI education in the references. In the Table 2, they suggest computing, network, data, algorithm and programming, and AI R&D.

C. Canada AI curriculum

a. The Basic AI curriculum

Canada AI technology and their capabilities have a very strong and ranking number in AI areas. McGill University and Toronto University have a very good capability and infrastructure due to the good policy and AI education system. Samsung have built R&D center in 2018 (https://research.samsung.com/aicenter_toronto).

To understand Canada AI system, we must understand Canada S&T education system because Canada has AI education system within the S&T education system [22]. Within this area, AI education has a basic content:

- All students can have their own digital projects;
- Critically assess how technology works, shapes our world;
- Use technology to improve our world [24].

Table III: Canada AI Education Basic.

Ares	Contents
Programming	Algorithms Data structures Modularity Modeling & Abstraction Debugging
Computing and Network	H/W & S/W Connected device Troubleshooting Digital connectivity Cyber-security
Data	Storing data Collecting, Organizing, & Visualizing data Modeling & Interfacing Applications of AI & Machine learning Data governance
Technology and Society	Social impacts of digital technologies Digital communication Ethics, Safety, & the law Technology & the environment History of technology Technology & Wellbeing
Design	Program design User design Visual design Universal design

b. Discussion about Canada AI education

Table 3 illustrates the contents of the AI education basic contents of Canada [22, 27]. This content includes algorithm, modeling, debugging, and computer network (H/W and S/W), digital security. They have strategy such as, how to save the data, how to data connect, data visualization, and deep learning and machine application. Data is quite import for AI because if there is no data, AI cannot work.

D. Finland AI Education Curriculum
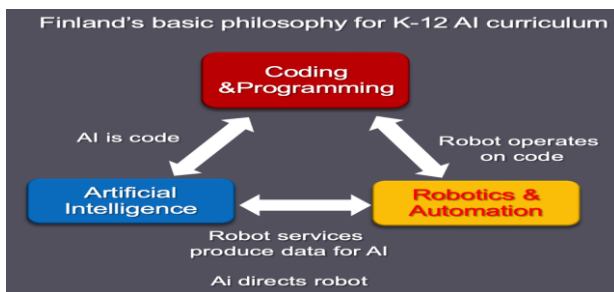
a. Basic AI curriculum

Fig. 8. Finland AI Basic Philosophy.

Figure 8 shows Finland AI education concept [26]. They have a basic philosophy, such as AI, coding, and robotics. It is an important to code for AI education and to implement for AI education results. So, they use robot implementation methods. AI education stage is the 10-step, such as positive step, thinking style, technology, including computational thinking.
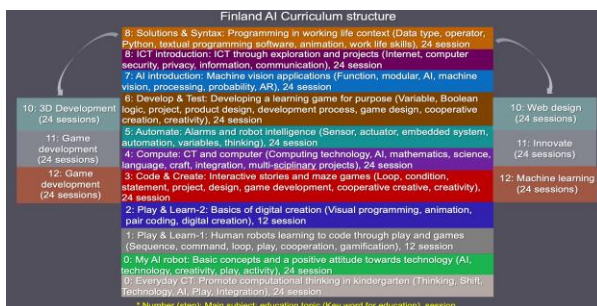

Figure 9. The Structure of Finland AI Education [26]

E. China AI Education Curriculum

China AI capability and the number of researchers, and technology have a top level in the world [23, 24]. The AI education of Chain primary school focuses on real life using bike robot, traffic signal, AI robot, Aduino programming. This is for students' knowledge-understanding about AI and give some motivation for AI. They give knowledge for Junior high school AI education by strong strategy [24, 25].

Figure 10. Global AI index [23]

China has AI road map like Figure 11 till 2030. Table 4 shows China AI content for primary and high school [26]. China has AI education program from kindergarten and use simple traffic signal, chair, desk for AI teach [24, 25, 26].

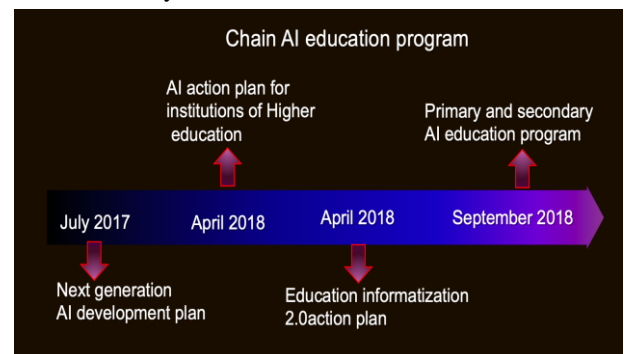However, they do not describe more detailed contents.

Figure 11. China's AI Education Program for K-12 [24]

In high school, they introduce AI engineering concepts for visual expression, program, experience expression. They teach theory, program, inference, search engine, logical inference, knowledge.

Table IV: AI Curriculum of China K-12 (* is This Paper Author's Opinion not in Original Curriculum).

Item	Contents	Goals
Pre- school	Unplugged activities for familiar with robots or intelligent agent	Expression Song, Wake-up Song, Dress-up Song, Small Mirror, Ting-a-Ling, Magazines, Take a Walk in Park, Chairs, Desk, TV, Mom's Couch, My Tiny Closet, Knife, Small Bridge, I Love Guitar, Small Sheep, Fox, Monkey, Tricycle, Red Light Green Light, Greedy Bear Bobby, Monkey goes to School)

Elementary school	Basic Programming with Scratch and Python	Programs named 'New Friend', 'Twinkling Star', etc., Sensing the surrounding environment with Arduino, Familiar with a variety of robots (e.g., AI Robot, Motorcycle Robot, Traffic Light Robot, etc.)
Middle school	*Understand working principle of AI algorithms. Conduct preliminary programming	Introduction to AI, Perceptions of AI, Use many sensors, Solve problems through data and algorithms Python programming (basic and application)
High school	*Working principle of AI algorithms. Conduct mediate programming	Weak AI, AI Ethics, Introduction to NLP, AI Language, Parts of Speech, Natural Language Processing, Word Vectors, Syntax Parsing, Information Extraction, Knowledge Map, Problem Solving, Logic Inference, Expanding Logic Inference, Recognition Framework, Train Decision Tree, Search Engines

Table V: S/W Education (AI Curriculum) of Primary school (Korea).

Category	Grades 1-2	Grades 3-4	Grades 5-6
AI Understanding	AI story (smart robot)	Strong AI Weak AI	Understanding of big data Conceptual understanding of AI Implementation
AI and Data	Various data (video, image, sound, text)	Number guessing with hints	Make aware in a new situation based on the previous data Make a new situation based on the data
AI Algorithm	Classification Finding	Reactions by conditions	Classification by data
AI implementation	AI robot	Machine learning (Classification)	AI drived artifacts
AI and Impacts	Changing by AI	Common & Differences of human-AI	The fourth industrial revolution AI ethics

V. KOREA AI EDUCATION AND CURRICULUM

A. Why we Must Design AI Curriculum?

Korea AI curriculum program from September in 2020 [27, 28, 29]. So, there was no public school before March 2020. Korean government recognizes the importance of AI education. Therefore, they announce that primary school introduces at Sept 2020 for grade 1, 2 of primary school [28] The vice ministry of education of S. Korean government announced that they offer an AI education program for primary schools from Sept. 2020 after testing in March 2019 [28]. They also provided an AI education program for high school from Sept. 2021. Local education office planned AI education program linked with S/W education for Primary school and middle school. They plan that they will provide the advanced AI curriculum for K-12 AI education till 2025. Table 5 AI education curriculum of primary school. For these educations, government announced that the plans the nurture program of AI teachers' master course for school on Nov. 7, 2019 [29]. Therefore, teacher's master degree for AI education will be finished the end of 2022. It means there is no experience in education and AI curriculum design. [18, 19, 20, 21, 27, 28, 29]. This paper aims to provide a good AI curriculum through AI education and site experiences. It is a quite experience to nurture manpower. Especially, the

curriculum design for AI education needs AI education experience for a good teaching as knowledge area curriculum. However, still a very few people in K-12 have experience. Herein we have to provide an AI education curriculum.

B. Analysis for a Good AI Curriculum Design

The UNESCO has the three core contents:
- AI algorithm and programming with data, data collection, labeling, and analysis, and business and social related AI for K-12 AI education;
- Understanding the ethical challenges of AI for Personal & citizen, social impacts of AI for workspace, AI application outside of computer science for frameworks;
- Theoretical understanding of AI, Human-facing applications, The creation of new AI.

C. K-12 AI Curriculum

Figure 12. Education Philosophy.

As the previous of this paper described, S. Korea start K-12 AI education program from Nov. 2019 and officially, there were no AI teacher in the K-12 education site. They started AI teacher's master program from 2020. It means that there is no experts in the K-12 education site. for recovering this issue, this paper aims for K-12 AI education curriculum material and documentation material for Korean style. Basically, AI education is one of program of the K-12 education. So, it has the basic national philosophy and school's purpose. Figure 12 shows the basic education purpose for these targets. For this purpose, teachers must develop their teaching style through seminar, workshop, inviting, and etc.
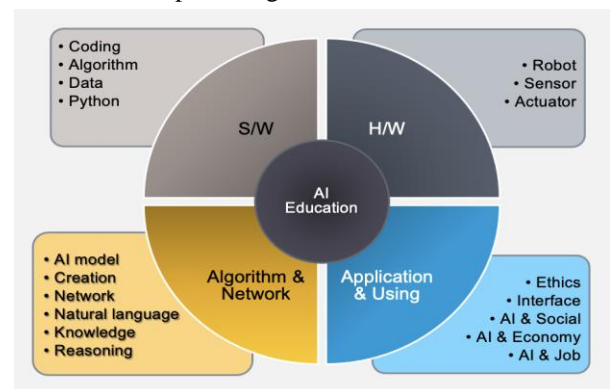

Figure 13. AI Basic Education Contents.

[Figure 13](#) shows the basic idea of this paper for K-12 AI education curriculum. This basic idea of this paper uses. by written for this purpose. AI is one of the technologies. To use it effectively well, we must understand related technologies and literature. [Figure 14](#) is for the designed AI curriculum for K-12 including kindergarten.

Table VI: Suggested AI Curriculum for K-12.

Category	Education area	Curriculum Contents
AI foundations	Algorithms and Programming	AI algorithms (machine learning model, training a classifier, Machine learning in general, supervised and unsupervised learning, reinforcement learning, deep learning, and neural networks), AI programming (Loop, Condition, Statement, Modeling/A&Abstract, Debugging), Machining/Deep learning, Pyhton, Pytorch, AI Model, Speech recognition, Image classification, Text recognition, Multi-recognition
AI foundations	Data literacy	AI applications run on big data. Managing the data cycle from collection to cleaning, labeling, Developing/using for AI. Understanding of data and its functions, Data ethics, Data for AI and society, Data and Machine Learning.
AI foundations	Contextual problem-solving	AI for solution to business-related or society,
AI foundations	Knowledge & Computational thinking	AI based thinking, Thinking based AI, Knowledge development for new AI, Inferences and AI, Natural and AI, Smart life, AI and human being mind
Country Philosophy & Ethics	The ethics of AI	Philosophy and Korean culture, AI ethics, AI law&Safety, AI and society, ChatGPT and AI, Global society and AI trend
Social & Job	Economy & Job	Technology and economic development, Digital technology&Impact, Technology and Smart life, AI technology and economy, AI and new job/disappearing job, ChatGPT, Preparing area/Job, Job changing
Social & Job	The social impact of AI	AI and social impact, Job transforming & pattern
Developing & Using AI	Using AI techniques	AI and computer science, AI and industry, AI and data, AI and music, AI and art (Music, Figure, Design, Novel, Story-telling), ChatGPT
Developing & Using AI	Developing AI technologies	Knowledge for the creation of new AI applications. AI Knowledge and service for a social challenge or provide (coding, mathematics, data science, program design, visual design, universal design, user design)

Figure 14. AI Curriculum for Adult Course.

Figure 15. AI Curriculum for K-12.

Figure 16. Designed AI Curriculum for K-12

VI. CONCLUSION

This paper provides materials and methods for how lecturers can teach well students and beginners through the author's teaching experience. The OpenAI released CHatGPT3.5 on Dec. 2021 and they opened ChatGpt4.0 on March 2023. Its impact is serious in education systems like K-12. It means that the education system should prepare for AI's impact on traditional education. Table 6 and Figure 16 show the designed Korean AI education curriculum. Of course, for this design, this paper analyzed the previous material. provides educational material for machine learning and deep learning by using simple tools on online. The left column of Figure 16 means the education level of AI. An AI will have an impact on student and their job. Therefore, the curriculum should prepare for their like [37].

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Ethical Approval and Consent to Participate	No, the article does not require ethical approval and consent to participate with evidence.
Availability of Data and Material/ Data Access Statement	Not relevant.
Authors Contributions	I am only the sole author of the article

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