

# Development of Convergence Course of Artificial Intelligence and Psychology Applying Team Teaching Method

KyungHee Lee<sup>a</sup>, Hye-Young Park<sup>b,\*</sup>

<sup>a</sup>Department of Innovation and Convergence, Hoseo University, Chungnam, Republic of Korea

<sup>b</sup>Kunsan National University, Deaahk-ro 558, Gunsan-si, Jeonlabuk-do, Republic of Korea

Corresponding author: \*hypark@kunsan.ac.kr

**Abstract**—This study aims to develop a convergence course integrating artificial intelligence (AI) and psychology using a team-teaching approach. By applying the team-teaching method to course development, we have designed a multidisciplinary curriculum in collaboration with experts from various fields. This course aims to merge the fields of “artificial intelligence” and “psychology”, allowing students to explore critical topics common to both disciplines deeply. An expert group of specialists in artificial intelligence, computer education, psychology, and pedagogy was formed to achieve this goal. The AI and psychology convergence course, which was developed through team teaching, was created based on research reviews, needs analysis, and experts’ Delphi surveys. Through the study, the contents of the classes were designed to cross-connect artificial intelligence and psychology under the same theme, and the educational topics were selected as development, learning, problem-solving, mind, coexistence, and nature. The course’s end consisted of group discussions and presentations on artificial intelligence and human ethical issues based on what was learned, providing a practical application of the course’s content. The following implications are supplied because of the operation of the classes with the course developed through this study. The convergence course will help students understand the relationship between artificial intelligence and humans from technical and social perspectives and expand their humanities perspective on human life. In addition, this course will support students in learning to solve problems in a new way by integrating knowledge and technical aspects of artificial intelligence and psychology, as well as cultivating convergent thinking skills.

**Keywords**— Team Teaching; Artificial Intelligence; Psychology; Convergence; Course Development

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## I. INTRODUCTION

Education should not be limited to merely conveying knowledge or information in a rapidly evolving society through technology. Education should focus on helping students develop fundamental abilities and critical thinking skills that allow them to apply their learning and adapt to real-world situations, enabling them to respond effectively and creatively to a fast-changing environment [1]. This approach is essential for cultivating the core competencies required in the future society and should be a key goal of sustainable education. Higher education must evolve into a model that encourages problem-solving through interdisciplinary integration, fostering a broad and deep perspective and insight. The critical challenges of the artificial intelligence (AI) field are not confined to a single field but are complex issues that span multiple fields of knowledge. Without a

comprehensive view, even specialized expertise in a single domain may become ineffective [2].

Artificial intelligence is a core technology of the Fourth Industrial Revolution, driving rapid changes across various fields such as culture, industry, politics, and the economy, and has become an essential element in human life. Artificial intelligence technology provides more than just substantial convenience from a technical standpoint. Still, it is also expected to be extensively applied in areas such as credit evaluation, education, and law enforcement, all of which have the potential to impact society significantly and the economy [3]–[5]. However, AI education at universities focuses on technology-oriented theoretical instruction, highlighting the need for curricular reform integrating AI into different academic disciplines [6]. The main problem of artificial intelligence education in universities is that, first, the curriculum cannot keep up with it compared to rapidly developing technology. Second, it is difficult for students to develop practical skills because there is more theory-centered

education than practice-based education. Finally, there are many cases where social aspects, such as ethical issues, are not sufficiently addressed [7], [8].

Artificial intelligence (AI) and humans each have their strengths and weaknesses. Problems that are easy for AI may be challenging for humans, and problems that humans solve quickly are complex for AI. Humans must learn how to coexist with AI. By reshaping human thought and behavior in understanding and altering perspectives in psychology and social sciences, psychology offers infinite possibilities for convergence with AI [9]. When instructors from different academic backgrounds collaborate in designing and delivering a convergence course, students benefit by being able to approach problems from new perspectives beyond their specialized fields and by seeking innovative solutions [10]. To effectively integrate Artificial intelligence and psychology, it is necessary for experts in psychology who understand the field's unique characteristics to work together with AI specialists to design and deliver the course. Generally, team teaching involves professors from related or other disciplines conducting cross-disciplinary or co-teaching with different topics. However, AI and psychology are conducted so that professors from each major of artificial intelligence and psychology teach each other every other week with the same subject.

Moreover, the course is structured to foster responsibility in technology use by discussing various AI ethics issues and helping students pursue purposeful learning. As positive perceptions of convergence education spread, universities increasingly offer courses that cultivate interdisciplinary perspectives, problem-solving abilities, and collaboration skills using various formats and methods. However, since it is difficult for a single instructor to teach integrated academic content, team teaching—where instructors collaborate to design and deliver the course—has been adopted to address this challenge [11]. Applying team teaching in convergence education allows experts from multiple fields to redesign educational content transcending a single academic framework. This makes it possible to effectively design and manage integrated courses or educational programs that combine knowledge from various disciplines [12].

Additionally, offering interdisciplinary liberal arts education through team teaching at universities equips students with the ability to comprehensively understand and address complex issues that span multiple disciplines in the artificial intelligence field (AI). This method also effectively reflects the diverse social demands and the varied learning needs of students [13]. Therefore, AI and psychology courses have been structured through team teaching, with collaborative instructional design and course operation strategies developed by professors specializing in computer education and educational psychology. This approach aims to enhance the quality of education, fostering students' humanistic literacy and cultivating their convergence thinking skills.

## II. MATERIALS AND METHOD

### A. Team Teaching

Team teaching is an instructional method in which two or more educators collaborate to conduct a class. By integrating

the expertise and experiences of multiple instructors, team teaching aims to provide students with richer and more diverse learning experiences. Through collaboration, team teaching enables the application of various teaching methods tailored to learners' needs and offers opportunities to explore complex topics in greater depth.

Team teaching originated from the educational reform movement in the United States in the 1950s, which was actively implemented, particularly in secondary education [14]. Since then, team teaching has been adopted in various educational settings, and its effectiveness has been emphasized, especially in higher education. In university courses, team teaching is beneficial for interdisciplinary courses, problem-based learning (PBL) courses, and other courses that require multidisciplinary approaches [15].

Smith and McCann [15] argue that team teaching in university courses enhances students' critical thinking skills and improves the quality of learning by allowing students to approach complex problems from multiple perspectives [15], [16]. Moreover, team teaching is positively evaluated to enable instructors to improve their teaching methods through mutual feedback and to make new educational attempts [17]. However, team teaching only sometimes leads to positive outcomes. A lack of smooth communication and role distribution among instructors may decrease learning effectiveness [18], [19]. Additionally, successful team teaching requires high cooperation and preparation among instructors, which demands extra time and effort [20]. Therefore, to maximize the effectiveness of team teaching, precise goal setting, smooth communication among instructors, and clarity in role distribution are essential from the planning stage.

Furthermore, institutional support and continuous professional development for instructors are crucial for the successful implementation of team teaching [19], [20]. This study aims to develop a team-teaching course by designing the content to suit the characteristics of AI and psychology instructors' specializations. This approach will allow students to cultivate interdisciplinary, problem-solving, and convergence thinking skills.

### B. Convergence Course

A convergence course is an educational program that integrates two or more academic disciplines to provide students with new learning experiences, emphasizing the cultivation of interdisciplinary thinking necessary for solving complex problems in modern society. These courses develop students' ability to creatively address real-world challenges by combining diverse knowledge and skills beyond traditional academic boundaries [21]. Multidisciplinary integration is selecting and organizing content from various educational fields around a central theme. Interdisciplinary integration is a method of integrating the curriculum by focusing on standard content across multiple academic disciplines. Transdisciplinary integration starts from real-life contexts rather than specific subjects or disciplines and aims to complete the integration of disciplines and subjects around a central theme [22].

The importance of offering convergence courses has become increasingly prominent, especially with the advent of the Fourth Industrial Revolution. The advancement of cutting-

edge technologies such as artificial intelligence (AI), big data, and biotechnology is blurring the boundaries between various academic fields, prompting universities to develop new forms of convergence courses in response to this trend[23]. Universities provide students with a problem-solving-focused learning environment through these convergence courses, helping them develop complex and creative thinking abilities [24].

There are several critical elements for the successful implementation of a convergence course. First, it is crucial to establish clear educational goals that reflect an interdisciplinary approach from the course design stage. This ensures that the course not merely juxtaposes multiple disciplines but fosters genuine integration that creates synergy [25]. Second, the collaboration among the faculty members and the development of integrative teaching methods are essential. Instructors must leverage their expertise to create a learner-centered education while ensuring effective communication and cooperation [26].

However, there are challenges to operating convergence courses. Heo and Kang(2023) point out that for a convergence course to be successfully implemented, sufficient collaboration time between instructors is necessary, and it may be challenging for instructors from different academic backgrounds to share common goals. Additionally, traditional assessment methods may need to adequately evaluate the effectiveness of convergence courses, necessitating the development of new assessment frameworks [25]. In conclusion, convergence courses have established themselves as essential educational tools for cultivating the creative problem-solving skills demanded by modern society. To successfully implement such courses, thorough pre-planning and close cooperation among instructors are required. Through this process, students can develop broader perspectives and integrative thinking [27]–[29].

Therefore, this study aims to develop a course that enables students to adapt to a rapidly changing society and achieve the goal of fostering convergence thinking skills through genuine integration. By integrating AI technology's fundamental concepts and principles with psychological theories, this course aims to build an academic approach that enables students to understand human behavior and processes, recognize the similarities and differences between AI technology and psychology and ultimately merge these insights.

### C. Research Procedure

Fig. 1 below shows the research procedure for developing a team-teaching convergence course in artificial intelligence and psychology. First, a demand survey was conducted through the ‘Survey on Liberal Arts Courses You Want to Take’ and the ‘Student-Made Liberal Arts Course Contest.’ Second, previous studies on the team-teaching method and the development of convergence courses were analyzed, and implications for course design were derived. Third, the course was selected for course design, and the educational objectives, content, teaching methods, and evaluation methods were determined. A Delphi survey of experts on academic goals and content was conducted. Finally, the AI and psychology team-teaching convergence course was fully developed.

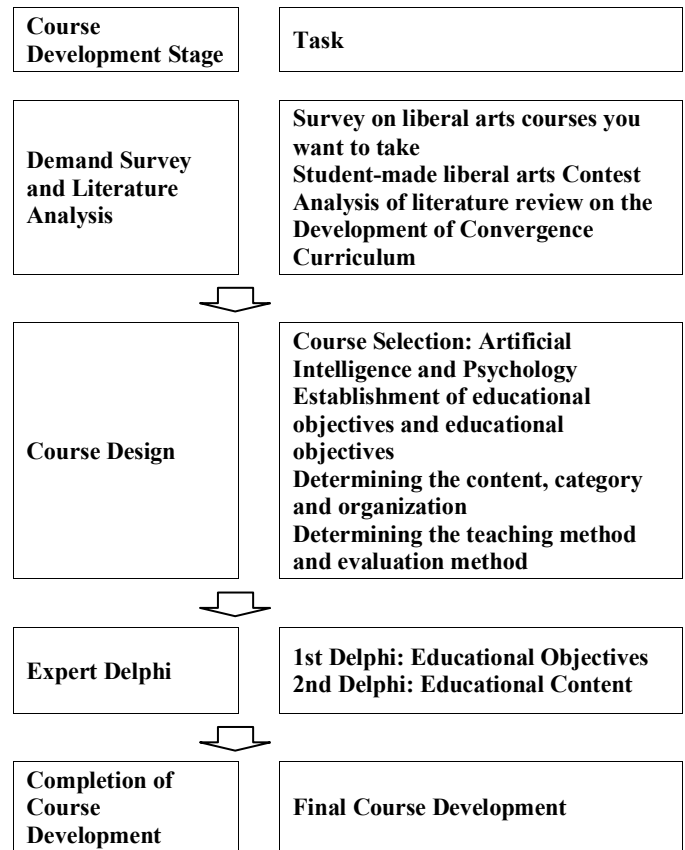


Fig. 1 Research Procedure

### D. Subject of Study

This study's subjects were students from a four-year university. A total of 1,185 students who completed the survey without any missing data and answered all questions were included. Table 1 shows the distribution of the study participants by gender and college.

TABLE I  
DISTRIBUTION OF SUBJECT

Student Characteristic		No.	%
Gender	Male	472	39.83
	Female	713	60.17
	AI Convergence	119	10.17
College	Business	124	10.59
	Engineering	163	13.56
	Life and Health	307	25.85
	Arts and Sports	122	10.17
	Humanities and Social Sciences	350	29.66
Total		1,185	100.00

### E. Demand Survey

Table 2 shows the results of the survey on liberal arts courses that you want to take. The responses showed 23.04% for Artificial Intelligence, 20.93% for Big Data, and 14.09% for Psychology. In the ‘Student-Made Liberal Arts Course Contest,’ a liberal arts course created by converging engineering with humanities or social science won the prize. Based on these results, a literature review was conducted to develop a course that integrates ‘artificial intelligence’ in engineering and ‘psychology’ in social science.

TABLE II  
RESULTS OF SURVEY OF LIBERAL ARTS COURSES YOU WANT TO TAKE

Liberal Arts Courses	No.	%
Artificial Intelligence	273	23.04
Big Data	248	20.93
Psychology	167	14.09
Programming	125	10.55
Finance and Real Estate	124	10.46
Culture (movies, photographs, etc.)	135	11.39
P.E. (dancing, horseback riding, etc.)	42	3.54
Others (certificate, etc.)	71	5.99
Total	1,185	100.00

#### F. Course Composition

The convergence course's educational goals, teaching contents, and teaching methods were designed after the demand survey, and the literature review confirmed the necessity of developing a convergence course on 'artificial intelligence' and 'psychology.' Through the literature review, it was decided to apply team teaching as the instructional method, in which an AI instructor and a psychology instructor would collaboratively develop and conduct the course to achieve interdisciplinary integration.

The educational goal was set as the humanities literacy to be cultivated through the convergence courses of science and humanities and social sciences and the improvement of convergence thinking skills, one of the core competencies of the university to be studied. To meet educational goals, teaching methods, and teaching activities were designed. To converge 'artificial intelligence' and 'psychology,' common significant topics covered by artificial intelligence and psychology were first selected, and theories on artificial intelligence and psychology were examined and then classified into similar issues. The chosen topics were categorized into subjects that could be addressed under the common themes of artificial intelligence and psychology, and then the classes were organized through team teaching.

#### G. Expert Delphi

This study's derivation of educational goals and content for expert Delphi was carried out through three stages. In the first stage, the literature was reviewed to collect the elements, goals, and content indicators of the convergence course, and the collected indicators were classified. In the second stage, the collected indicators were matched with the core competencies of the university, reclassified, and the main topics of educational content were derived to suit the academic goals. In the third stage, it was subdivided into class contents and class activities for each week to enable class progress.

The first Delphi questionnaire was produced to verify the validity and composition of the eight sub-competencies under two educational goals derived through this process. The second Delphi questionnaire was produced by subdividing into the topics of the second Delphi questionnaire, which consisted of closed and closed questions and open questions on a Likert 5-point scale. The expert group in this study

consisted of researchers with a doctoral degree or higher in majors related to this study. The expert group in this study consists of 10 people: 6 people in artificial intelligence and computer education, two in psychology, and two in pedagogy. The number of experts was 10, and the content validity was 0.62 or more based on the CVR(Content Validity Ratio) threshold [30],[31].

The content validity formula is estimated by 1.

$$CVR = \frac{n_e - \frac{N}{2}}{\frac{N}{2}} \quad (1)$$

#### H. Course Design

The convergence course on artificial intelligence and psychology was designed to cultivate humanities literacy and convergent thinking ability based on education's purpose and the expert group's validity verification. In this study, the course was developed according to the ADDIE model. In the analysis stage, the designed convergence course is checked by analyzing the learner's needs and competencies expected to be cultivated through education. In the design stage, the learning objectives of the convergence course, team-teaching method, and media suitability are checked. In the development stage, the learning objectives and contents according to the design are implemented and reviewed. In the implementation stage, the convergence course is opened, and the class is operated by applying the team-teaching method.

Finally, in the evaluation stage, the evaluation targets and tools are selected to measure the educational effect. The first draft of the developed course through these stages is revised and supplemented based on verification of the expert group, and the course development stage is carried out again. The two-week class on the five finally selected topics was organized into one module. The theory of artificial intelligence on the subject is examined in the first class of week 1, and the theory of psychology is dealt with in the first class of week 2. In the second class of each week, the theory learned in the first class is applied by doing individual or group activities. By replacing the midterm and final exams with assignments, it is designed so that students can see and discuss social phenomena from the two different perspectives of artificial intelligence and psychology.

### III. RESULTS AND DISCUSSION

#### A. First Expert Delphi Results

Table 3 shows the results of the first Delphi of the expert group on humanities literacy and convergence thinking, which are the educational goals of the convergence course of artificial intelligence and psychology. The analysis revealed that the average importance was at least 4.60 to 4.80, and all sub-competencies of humanities literacy and convergent thinking were high. The CVR value of the eight sub-competencies of the two educational goals was found to be 0.62 or higher, which is the threshold standard.

TABLE III  
RESULTS OF SURVEY OF LIBERAL ARTS COURSES YOU WANT TO TAKE

Educational Goal	Sub-Competency	M	SD	CVR
Humanities Literacy	Literature literacy (self-understanding, emotional empathy, imagination)	4.60	0.66	0.80
	Philosophical literacy (critical thinking, justification, and synchronization)	4.70	0.46	1.00
	Historical literacy (historical awareness, ability to form perspectives)	4.80	0.40	1.00
	Art literacy (aesthetic sensitivity, expressive ability)	4.80	0.40	1.00
Convergence Thinking	Convergence (comprehensive, analytical, insight)	4.80	0.40	1.00
	Creativity (creative thinking, creative problem solving)	4.70	0.64	1.00
	Consideration (flexibility, understanding)	4.60	0.66	0.80
	Communication (mediation, communication)	4.80	0.40	1.00

### B. Second Expert Delphi Results

The results of the first Delphi on the main topics and educational contents of the convergence course of artificial intelligence and psychology are shown in Table 4. As a result of the analysis, the average content validity was at least 4.30

to 4.80, and the validity of theory on the educational contents of artificial intelligence and psychology was high. Still, the validity of ethics was relatively low. Among the details, the CVR values of all details except for the CVR values of ethics and justice were 0.62 or more based on the threshold value.

TABLE IV  
RESULTS OF SURVEY OF LIBERAL ARTS COURSES YOU WANT TO TAKE

Week	Main Topic	Contents	M	SD	CVR
1	Orientation	- Course outline			
2	History	- Introduction to Artificial Intelligence and Psychology	4.60	0.49	0.80
3		- AI preparatory period			
4	Learning	- AI Ice Age and Spring	4.30	0.64	0.80
5		- History of Psychology			
6		- Human development and Maturity	4.90	0.30	1.00
7	Applying: Problem Solving	- Machine learning	4.30	0.78	0.80
8		- Machine learning Experience			
9		- Human learning	4.60	0.66	1.00
10	Midterm Examination	- Learning Theory	4.80	0.40	1.00
11		- Problem Solving Process and Method of Artificial Intelligence			
12	Characteristics	- Human Problem Solving	4.90	0.30	1.00
13		- Human Creativity			
14	Coexistence with Technology	Examination	4.90	0.30	1.00
15		- Internal processes of robots and the characteristics of the self			
16	Ethics	- Mechanical possibility	4.90	0.30	1.00
17		- Psychoanalysis			
18	Ethics	- Personality Measurement	5.00	0.00	1.00
19		- Future of Artificial Intelligence	4.70	0.46	1.00
20	Ethics	- Future of Human	4.30	0.78	0.80
21		- Artificial Intelligence Ethics			
22	Ethics	- Artificial Intelligence Dilemma	4.40	0.80	0.60
23		- Artificial Intelligence Dilemma			
24	Ethics	- Ethics and Justice			
25		- Ethical Vacancies, Artificial Intelligence and Human Dilemma			
26	Final Examination	Examination			

Experts believe that theories on artificial intelligence ethics and human ethics are important, but there is a strong opinion that discussions in which students discuss their opinions on artificial intelligence ethics and human ethics are more appropriate than learning the theory, so in the final draft, the 13th and 14th weeks were revised to include student discussions and presentations.

### C. Final draft of the Convergence Course

The lecture themes and contents of the final draft of the convergence course applied team-teaching method are shown in Table 5. The course consisted of modules that dealt with

one common theme of the two theories for two weeks, one week each for two professors. Looking at one two-week module, the two theories were easily understood as it was conducted as cross-class artificial intelligence and psychology under the same theme (the same question). By providing the same movie as an activity and dealing with it from two different perspectives, it is instructed so that students can be curious about the theories and apply them easily. The convergence course is finally designed to deal with issues such as society, culture, ethics, and human relations related to the interaction between humans and artificial intelligence, as well as technical aspects.

TABLE V  
RESULTS OF SURVEY OF LIBERAL ARTS COURSES YOU WANT TO TAKE

Week	Theme	Subject	Contents	Materials (Movies & Quizzes)
1	Orientation		- Course outline - What is Artificial Intelligence and Psychology?	
2	How do we develop and mature?	AI	- AI preparatory period - AI Ice Age and Spring	Minority Report(2002, 20th Century Fox), Quiz 1
3		Psychology	- Development and Maturation of Psychology - Development and Maturity of Human	
4	How do we learn?	AI	- Machine learning - Machine learning Experience	Ron gone wrong(2021, 20th Century Studios), Quiz 2
5		Psychology	- Human learning - Cognitive Learning, Insight	
6	How do we solve the problem?	AI	- Problem Solving Process of Artificial Intelligence - Problem Solving Method	Big Hero 6(2014, Walt Disney Studios), Quiz 3
7		Psychology	- Problem Solving Process of Human - Human Creativity	
8	Midterm task	Selecting and watching a movie and interpreting the scene of the film from the perspectives of artificial intelligence and psychology		
9	Can we have a heart?	AI	- Internal processes and the characteristics - Mechanical Possibilities of Robots	Her (2013, Warner Bros. Pictures), Quiz 4
10		Psychology	- Psychoanalysis, Personality - Personality Measurement	
11	Can we live together?	AI	- Future of AI Living with Humans	A.I. (2001, Warner Bros. Pictures), Quiz 5
12		Psychology	- Future of Human Living with AI	
13	What is the nature of artificial intelligence and humans?	AI &	- AI Ethics and Justice Dilemma	Chappy (2015, Sony Pictures Releasing) Group Activities
14		Psychology	- Solving Artificial Intelligence Ethics Problems - Preparation for presentation	
15	Final Project	Group Presentation		

#### IV. CONCLUSION

Modern society is increasingly entangled with complex social and ethical issues driven by technological advancements. In such a context, addressing these problems effectively often requires more than a single-disciplinary approach [8]. Therefore, it is crucial to integrate knowledge and perspectives from various fields to explore new solutions. This course was designed in response to this need. Recognizing the evolving demands of the times and the need for changes in university liberal arts education, this study developed a convergence course combining artificial intelligence(AI) and psychology, applying a team-teaching method by integrating the opinions of both students and experts. The primary goal of the course development was to foster students' humanistic literacy and integrative thinking skills.

The course aims to converge the two fields of AI and Psychology, enabling students to explore the common key themes covered by both disciplines in depth. After covering the theoretical background of AI and psychology, the course adopted a discussion-based team-teaching method that compares and integrates perspectives from both fields on each topic. Through this approach, students gain a deeper understanding of the relationship between AI and humans, not only from a theoretical standpoint but also from a technological and social perspective. Furthermore, students expand their humanities perspective on human life and problem-solving, developing integrative thinking skills that cannot be achieved through knowledge of a single discipline.

This course provides students with the opportunity to learn how to solve complex problems by merging the knowledge and technical aspects of AI and psychology. In the process, students are not limited to solving given problems but also cultivate the ability to discover new problems and address them from creative perspectives. This is expected to enhance their creative problem-solving skills, offering new approaches beyond traditional problem-solving methods. Additionally, through discussions and collaboration on ethical issues, the course offers students the opportunity to understand the social responsibility and ethical concerns that arise from technological advancements and explore ways to coexist within a community. This experience will be an essential learning opportunity beyond academic knowledge, helping students develop collaboration and communication skills in various team projects and collaborative environments. These skills are among the critical competencies required in modern society and will significantly benefit students in effectively cooperating and solving problems in diverse fields in the future.

The convergence course of artificial intelligence developed in this study is expected to cultivate students' ability to solve problems by integrating technological, social, and ethical perspectives, thereby fostering integrative thinking and creative problem-solving skills. Furthermore, through discussions on ethical issues and developing collaboration skills, the course will play a key role in equipping students with the complex competencies needed in the future society.

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