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Implementation of Artificial Intelligence (AI) Technology in Students' Academic and Non-Academic Activities in Higher Education: A Wright Map Analysis

Yudha M Saputra[1], Enjang Yusup Ali[2], Rahmat Fadhli[3]
Universitas Pendidikan Indonesia[1,2], Universitas Muhammadiyah Bandung
yudhamsaputra@upi.edu, enjang@upi.edu, r.fadhli@umbandung.ac.id

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Abstract

The aim of this study was to analyze the implementation of artificial intelligence (AI) technology in assisting student activities in higher education, both academically and non-academical. Mixed-method is used as a research method by combining quantitative data and qualitative data using a convergent mixed-method design. The subjects in this study were 138 students (29 male and 109 female) at UPI Regional Campus Sumedang. The instrument used is a questionnaire consisting of 14 questions distributed via Google Form. Quantitative analysis includes percentages, while qualitative analysis uses the Rasch model, namely Wright Map analysis, and also from questionnaire analysis. The results are described based on the five main analyzes of AI implementation in accordance with the answers of UPI Sumedang Campus students. In general, AI technology has been used effectively for student academic and non-academic activities. There are several obstacles, one of the biggest is the internet connection or network. There are several reasons and student expectations regarding the AI technology used. It can be concluded that AI technology has been implemented for academic and non-academic activities of higher education students. In the future, students hope that existing AI technology can be further optimized.

Keywords: academic activities, Artificial Intelligence (AI), non-academic activities, wright map analysis

1. Introduction

In an era known as the Industrial Revolution 4.0, humans need to be more technologically literate in the fields of industry and education (Schwab, 2018). There needs to be a new approach to driving real progress in education. This can be done with today's digital literacy efforts. The ability to understand and utilize information from various sources that can be accessed via a computer is referred to as digital literacy (Jalil et al., 2021; Spante et al., 2018; Tang & Chaw, 2015). In the 1980s, when microcomputers became more prevalent in both business and society, computer literacy increased (Rahm & Fejes, 2017). However, it was only in the 1990s that networked information technology made it easier to compile, access, and distribute information so that widespread information literacy emerged (Priyono et al., 2020). As a result, technical skills in accessing, compiling, understanding and disseminating information are more closely related to digital literacy.

In education, learning design problems often occur that use learning techniques and methodologies that are incomplete and inefficient (Kimmons & Veletsianos, 2018). In understanding the material that has been given, educators and students often misinterpret it. To minimize these problems, there needs to be an innovation system that can improve competency and mindset. Furthermore, this will affect the rate of progress in the instructive goals. Therefore, if there is a system that supports it, such as artificial intelligence (AI), the quality will be higher and better (Kuleto et al., 2021; Ouyang et al., 2022).

Artificial Intelligence (AI) is conventionally heavily associated with computers. However, it is evident, from a review of the various articles, particularly within the context of the education sector, that while computers may have formed the basis for the development of artificial intelligence, there is gravitation away from the computer alone, the hardware and software, or the equipment, as being artificial intelligence (Chen et al., 2020). Embedded computers, sensors, and other emerging technologies have facilitated the transfer of artificial intelligence to machines and other items, such as buildings and robots. As a field of study, computer-based intelligence is a review region in software engineering whose pursuits are pointed toward tackling different mental issues generally connected with human knowledge, for example, learning, critical thinking,

and example acknowledgment, and thusly adjusting. The development and application of computer systems with the capabilities of human beings, specifically intelligence and the capacity to perform tasks that require human intelligence, such as visual perception, speech recognition, decision-making, and language translation, is guided by AI as a theoretical framework.

Artificial Intelligence is defined by Sharma et al. as machines that can approximate human reasoning (Chen et al., 2020; Dwivedi et al., 2021). In a similar vein, Pokrivcakova (2019) provided an education-specific definition and description of AI, stating that it is the result of decades of research and development involving system designers, data scientists, product designers, statisticians, linguists, cognitive scientists, psychologists, education experts, and a great number of others to develop education systems with some level of intelligence and the capacity to perform a variety of functions, including assisting teachers and assisting students in developing their knowledge and adaptability for a world. The creator set that artificial intelligence utilizes further developed capacities of projects and programming, for example, algorithmic AI, which gives the machines a capacity to perform various assignments that require human-like knowledge and capacity to adjust to the prompt climate (Chowdhury et al., 2023). Comparative perceptions are made by Geetha & Reddy (2018), who defined artificial intelligence as the capacity of machines and computers to imitate human thought and behavior.

For the most part, artificial intelligence, from these definitions and depictions, envelops the improvement of machines that have some degree of insight, with the capacity to carry out human-like roles, including mental, getting the hang of, decisionmaking, and adjusting to the climate. Thusly, there are explicit qualities and fundamentals that emerge as key for artificial intelligence. Insight or machine capacity to exhibit some degree of knowledge and play out a great many capabilities and abilities that require human-like capacities, emerges as a vital trait of artificial intelligence from this definition and conversation of artificial intelligence.

In recent years, a lot of research has been done on how AI and machine learning can be used in mobile devices to improve the quality of computation and open up new applications like face unlock, speech recognition, natural language translation, and virtual reality (Bhar et al., 2019; Chen et al., 2020; Sarker, 2021). Notwithstanding, AI requires colossal calculation capacity to perform complex preparation and learning. The specialized improvement of simulated intelligence in cell phones takes versatile schooling to a more elevated level, which gives comfort by aiding understudies quicker than expected and accomplishes intelligent and customized learning. For example, computer-generated reality works with the growing experience past the learning space to make a worldwide homeroom since simulated intelligence can interface understudies to the virtual study hall. Additionally, AI-based chatbots transform instructor conversations into personalized online learning. This innovation can survey the understudies' degree of understanding.

The development of machine intelligence, which can think and act like humans, is a key focus of the artificial intelligence (AI) subfield. For example, speech recognition, problem-solving, learning and planning. Because the adoption rate of AI in Indonesia has not reached a sufficient level, it is necessary to improve the education system (Priyahita, 2020). It is also seen that the implementation of AI in the academic and non-academic activities of students at UPI Regional Campus Sumedang is inadequate. AI can be used in a variety of ways in student learning, including adaptive learning, AI tutoring, chatbots, learning data analysis, teaching evaluation, plagiarism identification, student admissions systems and campus management systems. Some examples of AI products in higher education are Smart Sparrow, Blackboard Learn, Cognii, Turnitin, IBM Watson Analytics, Carnegie Learning and Coursera.

The study from Alexandra & Budiyantara (2022) regarding the design of Artificial Intelligence for learning curricula in Higher Education. Currently, in the world of formal education, the curriculum is only made using learning materials, with results that are in accordance with the majors taken but not adapted to the needs of the company's work. For now, companies need more curriculum designs that can meet job position requirements. With the help of AI technology, a new approach is needed to develop a curriculum whose design can directly adapt to the needs of the company's work due to the dynamic nature of the basic curriculum. With the help of Artificial Intelligence technology, graduates are expected to have knowledge in their chosen field. It is hoped that the holding of curriculum development will also increase the level of higher-quality education.

Research by Cucus et al. (2019) regarding Chatterbot for academic consultation in Higher Education. Researchers developed an NLP-based Chatterbot application. Natural Language Processing is a field of computer science, artificial intelligence, and linguistics that deals with the interaction between computers and natural human languages, such as Indonesian or English. The main goal of studying NLP is to create machines that are able to understand and understand the meaning of human language and then respond accordingly. With the NLP-based Chatterbot application, it can help students carry out academic consulting activities more effectively.

In addition, much of the research found focuses on reviewing the literature on AI technology (Chen et al., 2020; Kabudi et al., 2021; Tahiru, 2021). In these articles, it is explained how the implementation of AI in student learning can provide benefits in improving learning outcomes, efficiency of study time, and personalization of learning for each student. There is also discussion on AI applications in learning, such as adaptive learning, AI tutors, chatbots, and learning data analysis. In addition, these articles also discuss challenges and opportunities in using AI in student learning. These articles provide an in-depth understanding of the implementation of AI in student learning. Some of the topics covered include learning adaptation, personalized learning, AI tutoring, chatbots, and data analysis. There is also a discussion of the challenges that may be faced in implementing AI in learning and how to overcome these problems. The articles provide a comprehensive overview of recent developments in the use of AI in education.

Some of the research above is mostly a literature review and has not implemented AI technology in student academic and non-academic activities. AI theory aims to fully understand intelligence and make machines more useful in education to facilitate and improve the quality of learning. Therefore, this research topic is focused on analyzing the implementation of artificial intelligence (AI) technology in assisting student activities in the higher education, both academically and non-academically. The analysis was carried out through the Rasch Model analysis, especially the Wright Map analysis.

Wright Map (or Item Person Map or Variable Map) is a device in Rasch model estimation that gives far reaching standpoint of the information (Sumintono, 2018). This guide, likewise called a building map, outlines individual capacities and thing troubles, which utilize the equivalent logit ruler that give data about the consequence of a test. This Wright map depicts the things organized by the levels of trouble on one side of the band and the people situated by the level of capability on the opposite side (Abdullah et al., 2017; Hatta et al., 2020a; Jimam et al., 2021). In a Wright map, the vertical dashed line addresses the requesting of the persons and things from less to best (base to top). The things are arranged on the right and arranged from the most straightforward (base) to the most troublesome (top). With respect to the people, the ordering goes from the less shrewd or less concur (bottom) to the most astute or concur (top of the upward line). At the focus of the upward line is the letter “M” which indicates the mean for the item and the people. The letter “S” reflects one standard deviation away from the mean value while “T” demonstrates two standard deviations away from the mean worth.

2. Research Method

Mixed-method is used as a research method by combining quantitative data and qualitative data using a convergent mixed-method design. Convergent mixed-method design is one stage plan where both quantitative and subjective information gathered and examined, then analyzed the examination of quantitative and qualitative information to check whether the information affirms or disconfirms one another (Hatta et al., 2020b). Quantitative data was obtained from the questionnaire results, while qualitative data was obtained also from the questionnaire and Wright Map analysis.

The subjects in this study were students at UPI Regional Campus Sumedang. This sampling technique uses purposive sampling in which the researcher determines the sample with certain considerations and criteria in accordance with the research objectives. The consideration is that college students are required to be literate in technology. The sample criteria are college students who belong to the digital native generation category. The final sample was obtained from 138 college students (29 male and 109 female).

The instrument used in this research was developed from AlDhaen's (2022) research entitled “The use of artificial intelligence in higher education–systematic review”. The instrument used is a questionnaire distributed via Google Form. The questionnaire consists of 14 questions in the form of closed and open

questions. Closed questions have two to three types of answers: “Yes”, “No” and “Sometimes”. The 14 questions are descriptions of the five main analyzes of AI implementation shown in Table 1.

Table 1. Description of Questions in the Questionnaire

Main Analyzes of AI Implementation	Questions’ Number
Overview of existing AI technologies for student academic and non-academic activities	Q1, Q2, Q8, Q9
The effectiveness of existing AI technology for student academic and non-academic activities	Q3, Q4, Q10, Q11
Constraints experienced by students in using AI technology for student academic and non-academic activities	Q5, Q12
Reasons for the importance of AI technology for student academic and non-academic activities	Q6, Q13
Hope for AI technology for student academic and non-academic activities in the future	Q7, Q14

Test the validity and reliability of the instrument using Rasch Model. The validity test results are shown in Figure 1.

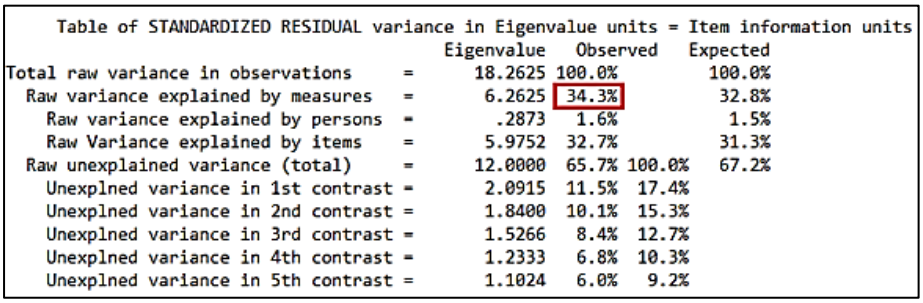
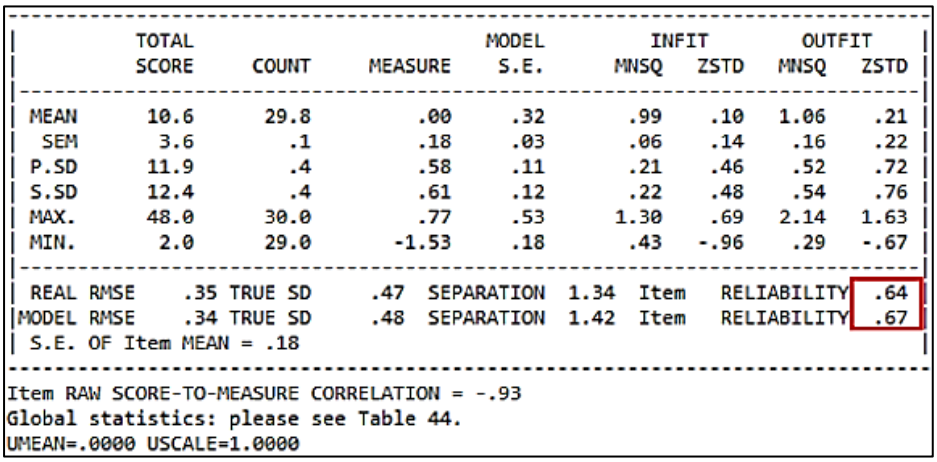


Table of STANDARDIZED RESIDUAL variance in Eigenvalue units = Item information units

	Eigenvalue	Observed		Expected
Total raw variance in observations =	18.2625	100.0%		100.0%
Raw variance explained by measures =	6.2625	34.3%		32.8%
Raw variance explained by persons =	.2873	1.6%		1.5%
Raw Variance explained by items =	5.9752	32.7%		31.3%
Raw unexplained variance (total) =	12.0000	65.7%	100.0%	67.2%
Unexplned variance in 1st contrast =	2.0915	11.5%	17.4%	
Unexplned variance in 2nd contrast =	1.8400	10.1%	15.3%	
Unexplned variance in 3rd contrast =	1.5266	8.4%	12.7%	
Unexplned variance in 4th contrast =	1.2333	6.8%	10.3%	
Unexplned variance in 5th contrast =	1.1024	6.0%	9.2%	

Figure 1. The result of validity test

The index of raw variance explained by measures was 34.3% (more than 20%). Thus, instrument had fulfilled validity measurements. The reliability test results are shown in Figure 2.



	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	10.6	29.8	.00	.32	.99	.10	1.06	.21
SEM	3.6	.1	.18	.03	.06	.14	.16	.22
P.SD	11.9	.4	.58	.11	.21	.46	.52	.72
S.SD	12.4	.4	.61	.12	.22	.48	.54	.76
MAX.	48.0	30.0	.77	.53	1.30	.69	2.14	1.63
MIN.	2.0	29.0	-1.53	.18	.43	-.96	.29	-.67

REAL RMSE	.35	TRUE SD	.47	SEPARATION	1.34	Item	RELIABILITY	.64
MODEL RMSE	.34	TRUE SD	.48	SEPARATION	1.42	Item	RELIABILITY	.67
S.E. OF Item MEAN = .18								

Item RAW SCORE-TO-MEASURE CORRELATION = -.93
Global statistics: please see Table 44.
UMEAN=.0000 USCALE=1.0000

Figure 2. The result of reliability test

The value of item reliability 0.64 and 0.67, which the reliability for an instrument comprised in the sufficient category. Then, data analysis through two analyzes, namely quantitative analysis and qualitative analysis. Quantitative analysis includes percentages, while qualitative analysis uses the Rasch model, namely Wright Map analysis, and also from questionnaire analysis.

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3. Result

The results are described based on the five main analyzes of AI implementation in accordance with the answers of UPI Regional Campus Sumedang students. The first point is an overview of existing AI technologies for student academic and non-academic activities. The first question is whether AI technology has been used for student academic activities. The results obtained are shown in Figure 3.

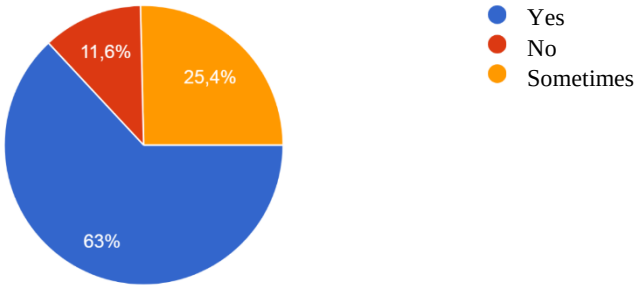

Figure 3. Percentage of Answers in Q1

In Figure 3, the results show that the answer "Yes" is 63%, the answer "Sometimes" is 25.4% and the answer "No" is 11.6%. This shows that AI technology has been used for student academic activities at the UPI Regional Campus Sumedang. Forms of AI technology used for student academic activities (Q2) include student administration needs such as (Academic Information Systems (SIAK), Integrated Online Learning Systems (SPOT), Session Submission Administration Information Systems (SIAS), Chat GPT, digital library, as well as plagiarism check (Turnitin).

The third question (Q8) is whether AI technology has been used for student non-academic activities. The results obtained are shown in Figure 4.

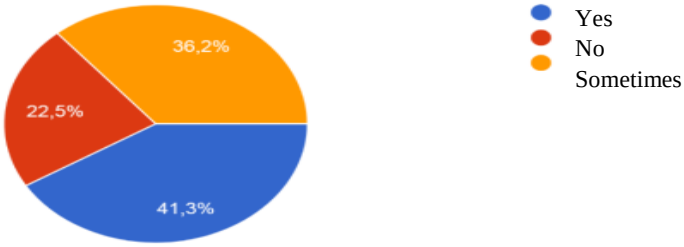

Figure 4. Percentage of Answers in Q8

In Figure 4, the results show that the answer "Yes" is 41.3%, the answer "Sometimes" is 36.2% and the answer "No" is 22.5%. This shows that AI technology has been used for non-academic student activities at the UPI Regional Campus Sumedang. The form of AI technology used for non-academic student activities (Q9) includes Student Executive Body Elections (BEM), video content, photography and several website generators.

The second point is the effectiveness of existing AI technology for student academic and non-academic activities. The question in Q3 is whether the AI technology used for student academic activities is effective. The results obtained are shown in Figure 5.

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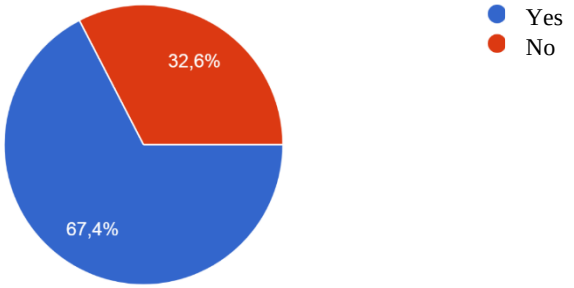


Figure 5. Percentage of Answers in Q3

In Figure 5, the answers “Yes” were 67.4% and “No” were 32.6%. This means that the AI technology used for student academic activities is effective. Q10 asks about the effectiveness of AI technology for student non-academic activities, shown in Figure 6.

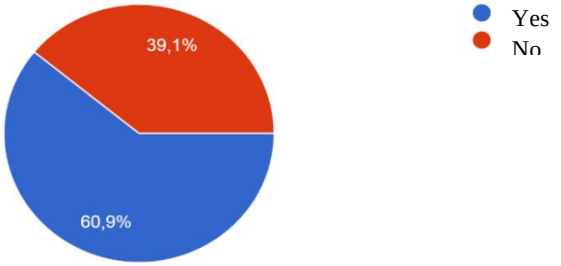
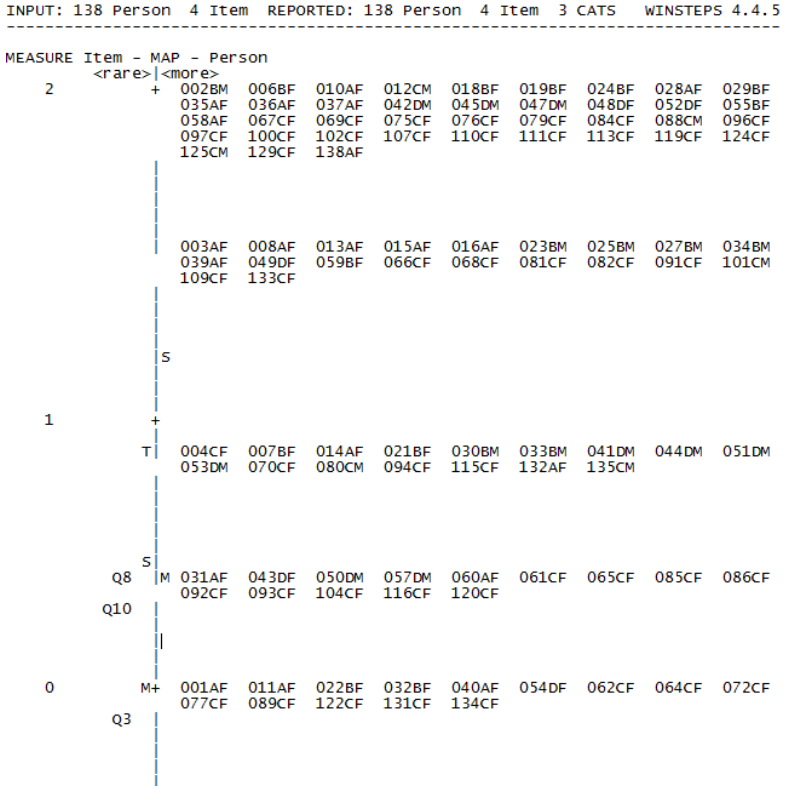


Figure 6. Percentage of Answers in Q10

In Figure 6, the answers “Yes” were 60.9% and “No” were 39.1%. This means that the AI technology used for student non-academic activities is effective.

The overview and effectiveness of existing AI technologies for student academic and non-academic activities can also be analyzed through a Wright Map as shown in Figure 7.



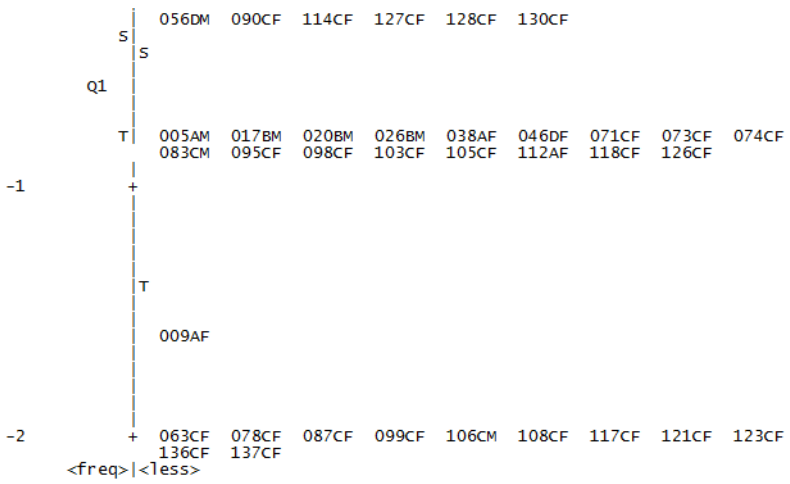


Figure 7. The Result of Wright Map

In the Wright map, the vertical dashed line addresses the requesting of the persons and things from less to best (base to top). The things are arranged on the right and arranged from the most straightforward (base) to the most troublesome (top). With respect to the people, the ordering goes from the less shrewd or less concur (bottom) to the most astute or concur (top of the upward line). At the focus of the upward line is the letter "M" which indicates the mean for the item and the people. The letter "S" reflects one standard deviation away from the mean value while "T" demonstrates two standard deviations away from the mean worth. Based on Figure 7, the left side is the distribution of items (questions) namely Q1, Q3, Q8 and Q10, while the right part is the distribution of persons with the first three numbers being the order of students, the fourth letter being the student study program (A-D) and the last letter being the type gender (Male and Female). The green box shows participants who agreed to all questions, namely 75 students (54.35%). This shows that more than half of the participants agree that AI technology has been used and is effective for the academic and non-academic activities of UPI Regional Campus Sumedang students. The red box shows students who disagree with all questions, namely 29 students (21.01%). While the other students agreed if they were in a higher position than the questions (Q1, Q3, Q8 and Q10).

The third point is the constraints experienced by students in using AI technology for student academic and non-academic activities. Obstacles to using AI technology for student academic activities (Q5) are shown in Table 2.

Table 2. Percentage of Obstacles to Using AI Technology for Students' Academic Activities

Obstacles	Percentage
Internet connection or network	71.01%
Info on how to use or user ignorance	6.52%
Paid features	0.72%
Unsupported device specifications	0.72%
No filling	8.69%
Others	12.34%

Based on Table 2, the highest percentage is due to internet connection or network constraints of 71.01%. The constraints on using technology for student non-academic activities (Q12) are shown in Table 3.

Table 3. Percentage of Obstacles to Using AI Technology for Students' Non-Academic Activities

Obstacles	Percentage
Internet connection or network	63.77%

Info on how to use or user ignorance	7.97%
Paid features	2.90%
No filling	20.29%
Others	5.07%

In Table 3, the results obtained are similar to Table 2, namely the constraints on the internet connection or network.

The fourth point is the reasons for the importance of AI technology for student academic and non-academic activities. The reasons for the importance of AI technology for student academic activities (Q6) include managing student administration, facilitating academic activities, assisting teaching and learning activities, and optimizing time and learning resources. The reasons for the importance of AI technology for student non-academic activities (Q13) include facilitating access to information, helping non-academic activities run smoothly, and increasing student abilities, innovation and creativity.

The fifth point is hope for AI technology for student academic and non-academic activities in the future. Students' hopes regarding the use of AI technology for academic activities (Q7) include that the system should be improved and developed so that it is more optimal and efficient, used as it should be, and more familiar with its use by socializing it. Students' hopes regarding the use of AI technology for non-academic activities (Q14) include optimizing and maximizing it specifically for non-academic activities so that it does not focus on academic activities only, there is socialization, and it is used properly.

Discuss

The 21st century is marked by the influx of internet technology. This has actually created opportunities as well as challenges for universities to constantly adapt and innovate in carrying out teaching and learning activities. This requires universities to always integrate technology in every activity, both academic and non-academic. This is necessary so that each of these activities can run efficiently. Therefore, the implementation of artificial intelligence (AI) technology in tertiary institutions is needed as a real effort in increasing the effectiveness of student activities at UPI Regional Campus Sumedang in its contribution to realizing 21st century learning and utilizing AI technology in efforts to succeed the teaching and learning process in the 21st century.

The research results obtained are related to five important points regarding the implementation of AI technology in student academic and non-academic activities. The first is related to the current description of AI technology for student academic and non-academic activities. AI technology has been implemented in student academic and non-academic activities. The implementation of AI technology in academic activities such as (Academic Information Systems (SIAK), Integrated Online Learning Systems (SPOT), Session Submission Administration Information Systems (SIAS), Chat GPT, digital library and plagiarism check (Turnitin). SIAK is the only academic service for UPI students, which contains all the main activities of academic administration. This system uses UPI Single Sign On as an authentication feature. The Integrated Online Learning System (SPOT) is an online-based learning application program for lecturers and students within the Universitas Pendidikan Indonesia (UPI). The learning program is based on the use of internet technology (online) which can be carried out without the limitations of space and time. The integrated meaning of this application is the integration of this online learning system with the currently stable application system owned by UPI, namely the UPI System. SIAS is an information system related to the submission of a thesis trial by students to obtain permission from either the thesis supervisor or the study program head. Moreover, chat GPT (Generative Pre-training Transformer) is an AI artificial intelligence system that functions to interact in text-based conversations (George et al., 2023). How to use it starts with inputting questions, then AI will provide relevant answers. Turnitin is a text equation application that can compare the originality of written works with various written sources on the internet, such as articles, journals, books, and others (Vani & Gupta, 2016).

In non-academic activities, AI technology has been implemented, for example in Student Executive Body Elections (BEM), video content, photography and several website generators. Voting activities at universities are activities that adopt the election system implemented by the General Election Commissions

(KPU), which is preceded by conveying the vision and mission of the candidate for the BEM chair in front of all students or through posters (Yusri & Amrizal, 2020). With AI technology, the election of BEM chairpersons can be carried out more effectively and efficiently. Students for non-academic activities in terms of developing their skills can use video content, photography and several website generators. Furthermore, AI technology used for student academic and non-academic activities has been effective. This can also be seen in the Wright Map analysis, which shows that more than half of the participants agree that AI technology has been used and is effective in helping students' academic and non-academic activities.

The third point shows the difficulties students face in using existing AI technology. Difficulties in both academic and non-academic activities are almost the same, including internet connection or network, info on how to use or user ignorance, paid features, unsupported device specifications and others. The most dominant percentage is the internet connection or network constraint. Most of the answers point to the server being down when it is heavily used by students. A down server is indeed a separate obstacle when many students are accessing it simultaneously. A possible solution that can be applied is that the server capacity must be adjusted to the number of users, or also schedule access to the academic system so as to reduce the risk of system downtime due to shared access.

Furthermore, AI technology used for student academic and non-academic activities is considered important because it can manage student administration, facilitate academic and non-academic activities, assist teaching and learning activities, optimize time and learning resources, facilitate access to information, help non-academic activities run smoothly, and increase student abilities, innovation and creativity. The use of artificial intelligence in normal students' education is a vital element for students both as students now and educators later on. It assumes a significant part in the ongoing individual learning advancement and future professional improvement, and it is also an important essential and key variable to understand the modernization of education. Simultaneously, the blend of ordinary schooling and AI has limitless conceivable outcomes. With the coming of the time of insight, the profound mix of AI and normal education will become one of the significant powers to advance the improvement of education (Yang & Bai, 2020).

The last point is that some of the student expectations regarding AI technology that have been implemented at this time, including the system should be improved and developed so that it is more optimal and efficient (specifically for non-academic activities), used as it should be, and more familiar with its use by socializing it. Technology, including existing AI technology, should continue to be developed and optimized so that it can be used efficiently. In addition, with the existence of the latest technology, especially those intended for students, socialization and guidance should be carried out regarding procedures for use. This is very necessary because students are diverse and not necessarily all students can use the technology provided by the university

4. Conclusion

Based on the results obtained in accordance with the five important points related to the implementation of AI technology, it can be concluded that AI technology has been used effectively for academic and non-academic activities of students at higher education (UPI Regional Campus Sumedang). The implementation of AI technology in academic activities such as SIAK, SPOT, SIAS, chat GPT, digital library and plagiarism check (Turnitin). Implementation of AI technology in non-academic activities such as Student Executive Body Elections (BEM), video content, photography and several website generators. In its implementation, there are several obstacles experienced by students, especially obstacles related to internet connection or network.

Students' impression that AI technology is important to support their academic and non-academic activities, so the current AI technology should be developed and optimized, and socialization of the use of existing technology is carried out and used accordingly. The implementation of AI in universities does promise many benefits, but keep in mind that AI can only be a tool in the learning process and higher education operations. Therefore, universities must ensure that the application of AI is carried out carefully and pays attention to ethical, privacy and data security aspects.

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