EDUCATIONAL, SOCIAL AND ETHICAL ASPECTS OF AI IN THE OPINION OF IT AND PEDAGOGY STUDENTS - A CASE STUDY

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ABSTRACT

Artificial Intelligence (AI) is currently one of the most important and contemporary scientific developments in an interdisciplinary context. The EU approach to artificial intelligence centres on excellence and trust, aiming to boost research and industrial capacity while ensuring security and fundamental rights (A European approach to artificial intelligence). Strengthening the promotion of excellence in AI will enhance Europe's potential to compete globally. At the same time, many challenges and problems remain to be solved. The *problem* addressed in the article is to explore and analyse IT and pedagogy students' attitudes to educational, social and ethical aspects of AI implementation. The *purpose* is to discover and analyse the attitudes of IT and pedagogy students towards the educational, social and ethical aspects of AI implementation.

KEYWORDS

Artificial Intelligence (AI), Educational, Social and Ethical Aspects, Students, Opinion

1. INTRODUCTION

There are numerous definitions of Artificial Intelligence (AI). Some authors (like LeCun, 2022) consider AI as "[…] a possible path towards autonomous intelligent agents, based on a new modular meta-cognitive architecture and a somewhat new self-supervised training paradigm. The centerpiece of the proposed architecture is a configurable predictive world model that allows the agent to plan." The researcher emphasised that "[t]he world model uses a new type of energy-based model architecture called H-JEPA (Hierarchical Joint Embedding Predictive Architecture). H-JEPA offers hierarchical abstract representations of the world that are simultaneously maximally informative and predictable." (LeCun, 2022).

According to (Rosenzweig, 2021) "[…] [w]hen discussing artificial intelligence, or what many prefer to call autonomous learning machines, an important distinction must be made, which lies in the word 'learning'. There are many autonomous machines in existence already. While these machines can operate independent of human control, they're not, generally, adaptive. They don't learn from experience. They don't adapt to unanticipated situations. They only do what they're programmed to do." (Rosenzweig, 2021)

The authors from different countries analyse the educational, social and ethical aspects of AI implementation in different dimensions.

In the study (by Malyshkin, 2019) the author analyses the ethical and religious problems associated with the creation and dissemination of artificial intelligence systems, and proposes ways of legally regulating social relations related to the use of artificial intelligence (Malyshkin, 2019).

Other researchers emphasize that "despite the human rights harms of hiring algorithms, the AI ethics literature has predominantly focused on abstract ethical principles. This is problematic for two reasons." (Yam & Skorburg, 2021).) In particular, the authors identified: "First, AI principles have been criticized for being vague and not actionable. Second, the use of vague ethical principles to discuss algorithmic risks does not provide any accountability. This lack of accountability creates an algorithmic accountability gap." (Yam & Skorburg, 2021).

"The growth of AI and automated processes often create concerns that the human touch will be removed from the health-care delivery process. What the industry is finding, however, is that the opposite is true: AI can extend the resources and capabilities of overworked health-care professionals and vastly improve processes for medical interventions." (How artificial intelligence is making health care more human, 2021)

The aim of the study (Karnouskos, 2022) was to understand a wide range of potential legal and social issues by exploring the interplay of law, robots and society from different angles, such as legal, social, economic, gender, and ethical perspectives. (Karnouskos, 2022)

The research (Ziosi, Hewitt, Juneja, *et al*. 2022) "considers a host of definitions and labels attached to the concept of smart cities to identify four dimensions that ground a review of ethical concerns emerging from the current debate". The authors identify and describe: "(1) network infrastructure; (2) post-political governance; (3) social inclusion; and (4) sustainability, with a specific focus on the environment as an element to protect but also as a strategic element for the future" (Ziosi, Hewitt, Juneja, *et al*. 2022).

Cox, A. (2022) describes eight ethical scenarios for AI that have been developed specifically for information professionals to understand these issues. The author stressed that "[i]nformation professionals need to navigate these ethical issues effectively because they are likely to use AI in delivering services as well as contributing to the process of adoption of AI more widely in their organisations." Cox, A. (2022).

The ethical risks of employing algorithms using international human rights law as a universal standard for determining algorithmic accountability were emphasized by (Yam & Skorburg, 2021). Four types of algorithmic impact assessments were evaluated in terms of how effectively they address the five human rights of job applicants implied by in hiring algorithms. (Yam & Skorburg, 2021)

Some issues of Artificial Intelligence in the Social Context were analysed in the video: AI and diversity – the cultural and societal context behind artificial intelligence. "… Terah Lyons is the Founding Executive Director of the Partnership on AI, which was established to study and formulate best practices on AI technologies and advance the public's understanding of AI." (Lyons, 2019).

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The contribution of the paper is to present the result of the research on the analysis of IT and pedagogy students' attitudes towards the educational, social and ethical aspects of AI implementation in one of the Polish universities. The conclusions will highlight interesting reflections on the variation of attitudes of IT and pedagogy students according to their field of study, age, gender, specialisation, to the subject as well as selected aspects of AI implementation and propose some solutions to improve these results.

The two main hypotheses whose validity is tested in the study are:

- Students still have a relatively low level of AI competence and this needs to be developed.
- Students' perceptions of the possibilities offered by AI and areas of its application differ significantly according to their field of study, gender, year of study and previously graduated school.

2. DATA AND ANALYSIS OF THE QUESTIONNAIRE RESULTS

This section presents a preliminary analysis of the questionnaire results obtained. The survey was conducted in December 2022 and January 2023. Students of the University of Silesia in Katowice, Poland of two faculties – Faculty of Science and Technology, Faculty of Arts and Educational Science – were asked to respond. They were mainly students of two specializations – Computer Science and Pedagogy. A total of 103 responses were received. The questionnaire was prepared and completed online. Invitations to complete the questionnaire were sent to students of all years of study. The response rate was about 50%.

2.1 Sociological Metrics

In order to study the relationship between student characteristics and knowledge of AI or attitudes towards AI, the questionnaire included sociological questions. The sociological characteristics questions and possible responses in the questionnaire are presented below:

- age – <15-18>, <19-21>, <22-25>, <26-30>, >30

- name of previous school, university – open question, (optional question)
- name of current school, university – open question
- gender – male, female
- year of study – 1st, 2nd, 3rd, 4th, 5th, secondary school
- study specialization – e.g. pedagogy, social work, IT, humanities, economics, technical but not AI

Descriptive statistics on the responses obtained related to sociological metrics are presented in Table 1.

Table 1. Descriptive statistics on responses to sociological questions

Age	Quantity/ Percentage	Name of previous school, university	Quantity/ Percentage	Name of current school, university	Quantity/ Percentage
<15-18>	0/0	Technical secondary school	31/30.10	University	103/100
<19-21>	33/32.04	General secondary school	33/32.04		
<22-25>	55/53.40				
<26-30>	10/9.71	University	17/16.50		
>30	5/4.85	Polytechnic	12/11.65		
Gender	Quantity/ Percentage	Year of study	Quantity/ Percentage	Study specialisation	Quantity/ Percentage
Male	54/52.43	1st	18/17.48	Education	42/40.78
Female	49/47.57	2nd	19/18.45	Social	0/0
		3rd	35/33.98	IT	61/59.22
		4th	23/22.33	Humanities	0/0
		5th	8/7.77	Economics	0/0
				Technical but not AI	0/0

Based on the results obtained, it can be concluded that the majority of respondents are between 22 and 25 years old. They are mainly secondary school graduates – the vast majority of them received not technical but general education. All students are currently studying at the University of Silesia in Katowice. In terms of gender, it can be said that the sample is balanced – an almost equal number of men and women were interviewed, with only 5 more men than women. The largest group of respondents is currently in their third year of study. Four-year students are also a numerous group. Together they account for more than half of the sample. First-year and second-year students make up about 36% of the total sample. Fifth-year students are the least represented. Students from two specialisations – pedagogy and computer science were surveyed, with computer science students accounting for 59.22% of the total sample.

2.2 Experience and Self-Assessment of AI Competence

The next part of the survey included questions about experience with AI. The main purpose of this part was to find out whether respondents had encountered AI issues at university or in their personal lives, and at what level they rate their knowledge of specific AI issues. The questions in this part and possible responses to the questions, defined using the Likert scale to the 7-point scale included in the questionnaire, concern their encounter with AI; the definition of AI; identified own level of AI competence (designated as question 1) in seven-point qualitative scale, 1 being the lowest level, 7 being the highest level, as well as competence in the area of AI supporting in programming languages (e.g. Python); Ethical and social aspects of AI? Data Preprocessing Techniques; Knowledge Machine Learning; Deep Learning; Natural Language Processing; Learning Analytics; cyber security; Recommender systems (designated as questions 2-11).

As many as 98 respondents answered that they encountered AI issues, representing 95.15% of the sample. Five respondents answered that they had not encountered AI, which means that they are not aware of using AI issues on a daily basis through their smartphones or search engines. To the question "What do you think Artificial Intelligence is?", the largest number of respondents indicated intelligent machines (31 responses), followed by learning based on experience (23 responses), machine learning (22 responses), robots (12 responses), all other possibilities were indicated by individual respondents.

Table 2 shows the basic statistics of the responses obtained. Bar charts of the responses obtained related to the assessment of AI competences are shown in Figure 1.

Table 2. Basic statistics of the obtained responses

Question	Average	Median	Mode	Minimum	Maximum	Standard deviation
1	3.0	3	3	1	7	1.3
2	2.5	2	1	1	7	1.4
3	2.9	3	multimodal	1	7	1.4
4	2.8	3	2	1	7	1.5
5	3.4	3	3	1	7	1.5
6	2.7	3	3	1	6	1.3
7	2.5	2	2	1	6	1.3
8	2.7	3	3	1	7	1.5
9	2.3	2	1	1	7	1.3
10	2.6	2	multimodal	1	7	1.5
11	2.7	2	2	1	7	1.4

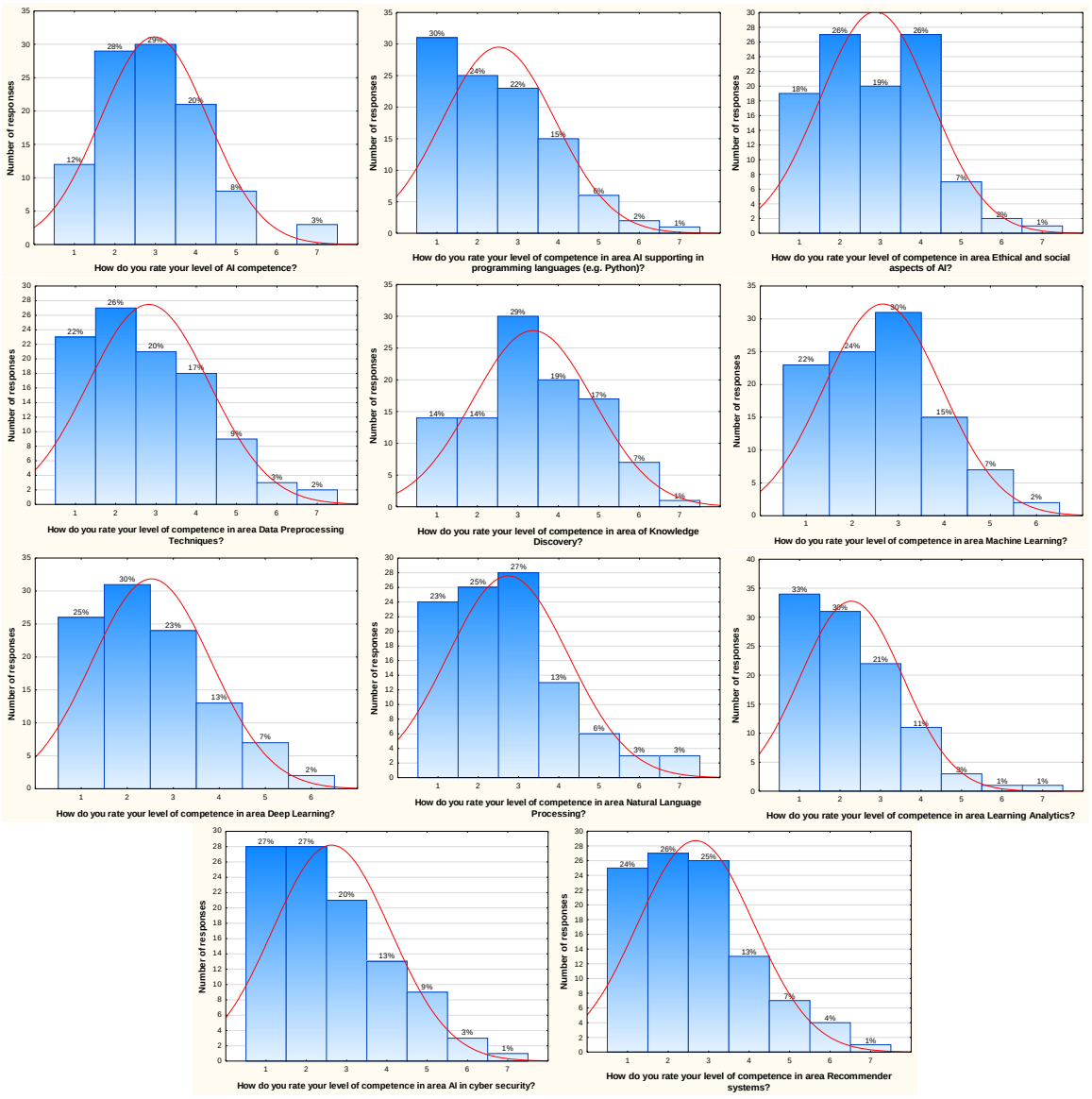

Figure 2. Bar charts of the responses obtained related to the assessment of AI competences

As can be seen from the results, students do not rate their knowledge and competences related to AI highly. For all questions presented in Figure 1, the most frequent answers are 1-3 which means low. It can be concluded that students rated their knowledge and competencies in the following areas: Knowledge discovery and Ethical and social aspects of AI. On the other hand, they rated their competences lowest in the areas of AI supporting programming languages, AI in cyber security and Learning analytics. Thus, the first hypothesis posed is valid.

2.3 AI and Social, Educational and Development Aspects

The next part of the survey is related to the social, educational and development aspects of AI. Also, the questions about the prospects of using AI in education and society were included in this section of the questionnaire. The aim of this study was to analyse the attitudes and concerns about AI among students of different study specialisations, age, gender, year of study and previous schools. The questions in this part and possible responses included in the questionnaire were defined using Likert scales to the 7-point scale listed below e.g.: Can and should AI be used more actively, for example, in education to personalise teaching-learning?; Can social robots be helpful in the development of children including those with special needs? Where could AI be most useful and effective: For people – seven-point qualitative scale, 1 being the lowest level, 7 being the highest level; as well as for education; for medicine; for transport for business, finance and banking; for space and NASA; for economy and management; for IT (Information Technology); for public services; cybersecurity and safety (questions 1, 2, 3a)-3j)). Table 3 shows the basic statistics of the responses. Bar charts of the responses related to the assessment of AI competences are shown in Figure 2.

Table 3. Basic statistics of the responses obtained

Question	Average	Median	Mode	Minimum	Maximum	Standard deviation
1	4.6	5	4	1	7	1.5
2	4.6	5	5	1	7	1.6
3 a)	5.1	5	multimodal.	2	7	1.5
3 b)	4.9	5	5	1	7	1.5
3 c)	5.8	6	7	1	7	1.4
3 d)	5.4	6	7	2	7	1.5
3 e)	5.6	6	7	1	7	1.4
3 f)	5.9	7	7	1	7	1.5
3 g)	5.3	5	7	1	7	1.4
3 h)	6.0	6	7	3	7	1.2
3 i)	5.1	5	6	1	7	1.6
3 j)	5.3	5	7	2	7	1.6

As the figures shows, respondents have no doubt that artificial intelligence can be useful in areas such as: medicine, transport, business, finance and banking, space and NASA, information technology and cybersecurity. In all of these questions, the highest response – rate 7 – was indicated by about 35% to even 50% of respondents. By far the highest responses were given to the use of AI in space and NASA. However, in the case of AI applications for people, education or public services, respondents were not so strongly convinced. In these cases, AI received support, but the results are rather spread around an intermediate intensity: responses of 4, 5, 6 were the most frequent. Respondents also gave moderate support for more active use of AI issues in education to personalise teaching-learning and the use of social robots in the development of children including those with special needs. Negative answers to these two questions were rather rare. But the most frequently indicated answers were average intensities 4, 5, 6.

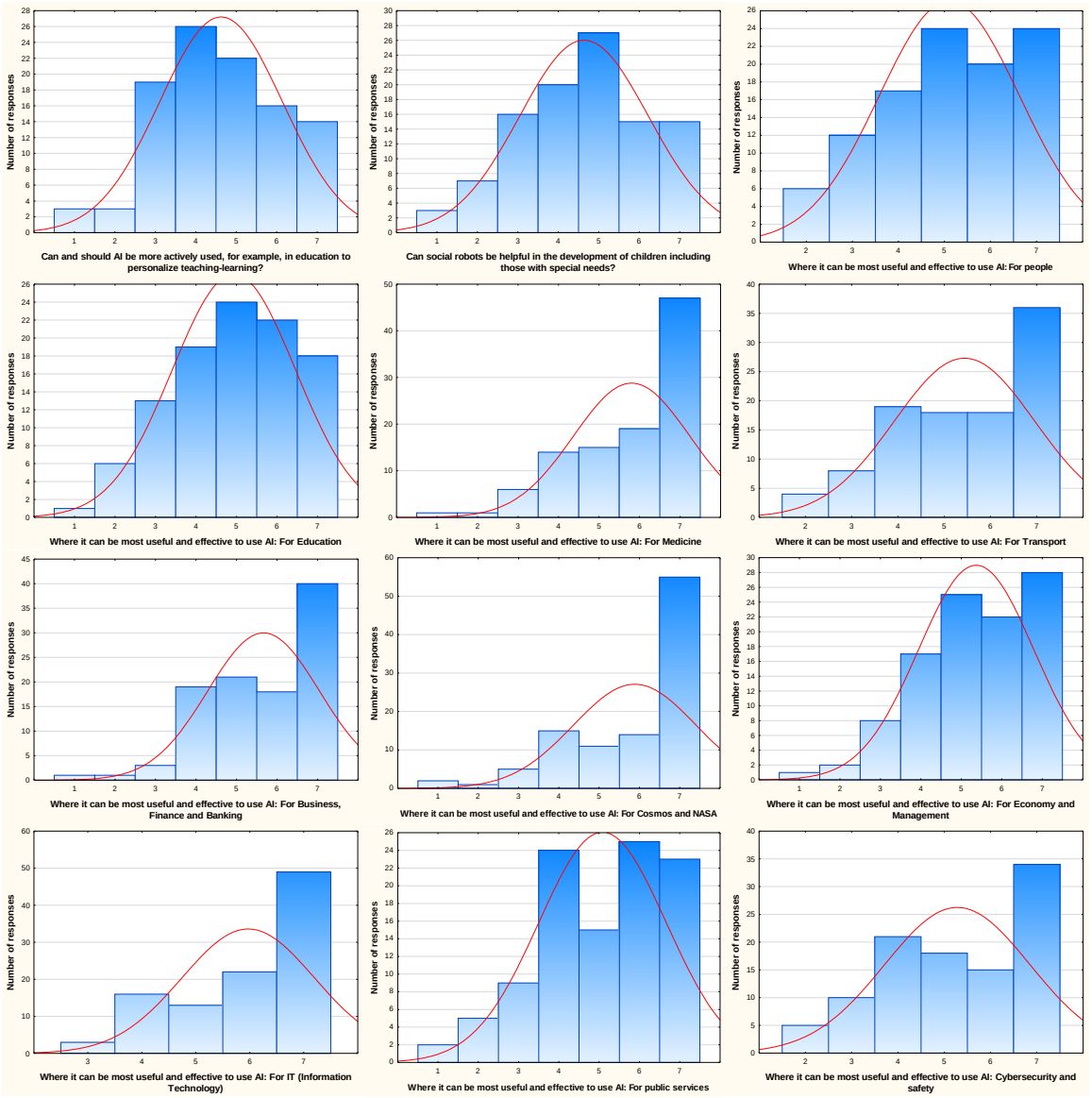

Figure 2. Bar charts of the responses obtained related to social, educational and development aspects of AI

Statistical tests were performed in order to test the significance of differences in the results obtained for groups defined by: study specialization, age, gender, year of study and previous school (each issue was considered separately). All results examined are for the ordinal variable. The Mann-Whitney test was used to detect differences in the two independent samples defined by: field of study and gender. The results obtained are presented in Table 4: sum of ranks across groups and p-value. There are statistically significant differences in the results obtained for all aspects studied – questions 1, 2, 3a)-3j) – in the groups defined by study specialisation. It can be seen that IT students rate the possibility of using AI issues in all aspects studied higher and better than pedagogy students. Perhaps this is due to a greater awareness of the possibilities offered by AI. As far as groups defined by gender are concerned, practically in all questions the differences in ratings are significant – the only exceptions being the questions on: Can and should AI be used more actively in, for example, education to personalise teaching-learning? Where can the application of AI be most useful and effective: cyber security and safety? Analysing the results, it was found that the majority of women study education, and the majority of men study computer science (only 7 women in IT specialisation took part in the questionnaire, the remaining 54 were men). Thus, the results obtained for groups defined by gender are probably also related to the specialisation of students.

Table 4. The Mann-Whitney test results for groups defined by study specialization and gender

Question	Groups defined by the study specialization: education and IT			Groups defined by gender: male and female		
	Sum of the ranks for IT	Sum of the ranks for education	p-value	Sum of the ranks for male	Sum of the ranks for female	p-value
1	3462	1894	**0.048**	3049	2308	0.106
2	3525	1831	**0.016**	3113	2243	**0.041**
3 a)	3661	1695	**0.001**	3254	2103	**0.003**
3 b)	3515	1842	**0.019**	3101	2255	**0.049**
3 c)	3555	1801	**0.007**	3217	2139	**0.004**
3 d)	3692	1665	**0.000**	3333	2024	**0.000**
3 e)	3626	1730	**0.002**	3150	2206	**0.019**
3 f)	3494	1862	**0.019**	3101	2255	**0.035**
3 g)	3531	1825	**0.014**	3110	2246	**0.041**
3 h)	3509	1847	**0.016**	3104	2252	**0.037**
3 i)	3498	1858	**0.026**	3066	2291	0.083
3 j)	3544	1812	**0.010**	3146	2211	**0.026**

In the next stage of the study, the Kruskal-Wallis tests were performed for groups defined by: age, year of study and previous school (in each case the group size was greater than 2). The significance of differences in responses was analysed for all questions from 1 to 3 j), but for readability, only the results obtained (group size, group rank mean, p-value and test statistic value) for questions at which statistical significance of differences was found are presented in Table 5. Significant results are shown in bold. As can be seen, age, type of previous school and year of study have little influence on the evaluation of the applicability of AI issues in different fields. Among the grouping conditions tested, it can be seen that the year of study has the greatest influence. We notice a regularity that students in the first and fifth year of study rate the applicability of AI for people, education, economy and management and computer science higher than students of the second, third or fourth year of study. This may be related to the first fascination with AI issues in the first year of study, and the greatest knowledge about the possibilities of AI in the fifth year of study. In the final conclusion, we can say that the second hypothesis posed is valid.

Table 5. The Kruskal-Wallis test results for groups defined by age, year of study and previous school

Groups defined by age						Groups defined by previous school				
	<15-18>	<19-21>	<22-25>	<26-30>	>30		Technical secondary school	General secondary school	University	Polytechnic
n	1	32	55	10	5	n	31	33	17	12
Question	Rank avg and results					Question	Rank avg and results			
3 c)	20	43	55	73	41	3 c)	47	38	56	59
	H(4,103)=11.227; p-value=0.024						**H(3,93)=8.543; p-value=0.036**			
3 d)	41	46	53	64	55	3 d)	42	41	60	58
	H(4,103)=3.117; p-value=0.539						**H(3,93)=9.013; p-value=0.029**			

Groups defined by year of study					
	1st	2nd	3rd	4th	5th
n	18	19	35	23	8
Question	Rank avg and results				
	H(4,103)=11.871; p-value=0.018				
3 b)	68	40	46	57	54
	H(4,103)=11.085; p-value=0.026				
3 g)	67	45	43	56	63
	H(4,103)=10.952; p-value=0.027				
3 h)	67	40	46	59	55
	H(4,103)=11.957; p-value=0.018				

3. CONCLUSION

In conclusion, it is possible to emphasise some of the findings regarding the attitudes of IT and pedagogy students to the educational, social and ethical aspects of AI implementation, as well as their competence in AI. Their self-assessment has shown an unsatisfactory level in the main areas of AI, while at the same time the students' attitude towards the prospect of using AI in some social areas was positive. Among the grouping conditions examined, it can be seen that the year of study has the greatest influence. We notice a regularity that students in the first and fifth year of studies rate the possibilities of using AI for people, education, economy and management and computer science higher than students in the second, third or fourth year of study. This may be related to an initial fascination with AI issues in the first year of study and the greatest knowledge about the possibilities of AI in the fifth year of study. Their interest in the topic is the motivation for the development of a platform and courses in the research area for students to deepen their knowledge and use it in their education and future professional career, which is what the FITPED-AI project serves (Skalka, & Drlik, 2022; Smyrnova-Trybulska, Drlik, & Skalka, 2023).

ACKNOWLEDGEMENT

The following grant funded this research: European Commission under the ERASMUS+ Programme 2021, KA2, grant number: 2021-1-SK01-KA220-HED-000032095 “Future IT Professionals Education in Artificial Intelligence”.

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