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Examination of students' success in the use of artificial intelligence

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The purpose with this mixed-methods research was to examine students' success in using artificial intelligence. The research sample consisted of 50 first-grade primary school students, 239 parents, and 25 primary school teachers studying in Almaty, Kazakhstan. A descriptive analysis technique was used to analyse the qualitative data. Findings are explained in themes. As a result of the research, it has been observed that parents' attitudes towards their children's use of technology were high. Most primary school teachers who participated in the research stated that students were interested in artificial intelligence, they supported the use of artificial intelligence technologies to some extent, and they found the students partially successful in this regard. Students participating in the research defined artificial intelligence as technology, computers that think like humans, smart machines, entertaining and educational computer content, robots that obey given commands, and technological devices that make life easier. Most students stated that they liked using artificial intelligence and that they found themselves somewhat successful in using artificial intelligence.

Keywords: artificial intelligence; parent opinions; primary school students; teacher opinions

Introduction

Artificial intelligence refers to a system's capacity to accurately interpret external data, learn from it, and apply this knowledge to accomplish specific objectives and tasks through adaptable methods, characterised as the intelligence demonstrated by machines (Utepbayeva, Zhiyenbayeva, Assylbekova & Tapalova, 2022). Artificial intelligence, which is emphasised more and more every day, is artificial systems that are expected to perform cognitive functions or autonomous behaviour that are unique to humans; are software algorithms and techniques that enable computers and machines to optimally emulate human perception and decision-making processes. Artificial intelligence is involved in all areas of life such as health and safety and education services (Chai, Lin, Jong, Dai, Chiu & Qin, 2021).

Theoretical and Conceptual Framework

Using technology in teaching has special importance (Al-Momani & Alrabadi, 2022; Uzunboylu, Bicen & Cavus, 2011). In recent years, there have been many scientific studies focused on technology, especially studies on the brain and learning (Abdi, 2022). The swift evolution of science and technology impacts both individual and communal existence (Rosli & Siregar, 2022). The objective of the modern education system is to cultivate individuals who are adaptable, innovative, and proficient in generating and applying knowledge (Devedzic & Devedzic, 2019).

Intelligence technology has become an important issue that has been frequently emphasised in recent years within the framework of contemporary education (Chassignol, Khoroshavin, Klimova & Bilyatdinova, 2018). Artificial intelligence is defined as the ability of a computer or computer-assisted software to perform tasks related to processes that require logic, such as finding human solutions, understanding and interpreting, generalising and learning through past experiences (Yang & Kyun, 2022). Artificial intelligence is aimed not only at physical progress that accommodates human abilities, but also a near-perfect thought system for processing and transferring information (Karim, Sandu & Gide, 2020). When the concepts of education and artificial intelligence come together, artificial intelligence is defined as an improved way for education by processing real-time data in an individualised, flexible, inclusive and interesting way (Pu, Ahmad, Khambari & Yap, 2021).

Artificial intelligence, which provides almost error-free calculation of probabilities and processing of information, is used in all areas of education today (Dimitriadou & Lanitis, 2023). Artificial intelligence will soon affect almost every aspect of life, and children will benefit the most from these effects (Kueper, 2021).

Artificial intelligence brings risks as well as opportunities (Renz & Hilbig, 2020). Thanks to adaptive artificial intelligence applications, personalised learning opportunities, more advanced and efficient supply-demand matching, preventing the wastage of resources and time, obtaining and easily processing large amounts of data in fields, using the potential of the individual better thanks to faster access to information supports individuals' physical and cognitive and social access (Agarry, Omolafe, Animashaun & Babalola, 2022).

When the advantages of artificial intelligence for children are evaluated, it becomes clear that it will carry the learning processes beyond time and space – education will become both more common and more effective (Malindi, Ndebele & Gobingca, 2023; Peng, Xie, Xiong & Liu, 2023). In terms of education, artificial intelligence technologies hold many benefits for children such as supporting individual education, identifying learning difficulties at an early stage and producing solutions for these. In addition, it can provide effective teaching practices for children with special needs, create global classes for children with different types of disabilities (hearing, vision, etc.) (Balasuriya, Lokuhettiarachchi, Ranasinghe, Shiwantha & Jayawardena, 2017) and provide education services for children who cannot attend school due to various reasons, such as illness. When evaluated in terms of its contribution to children's education, it can be said that artificial intelligence creates opportunities and encourages the use of inclusive, flexible and individualised educational technology tools. The incredible speed of advancement of technology affects lives both positively and negatively (Tejedor, Cervi, Pérez-Escoda & Jumbo, 2020). Unlimited, uncontrolled use of the opportunities obtained from using information and communication technologies, without legal obstacles, cause young people to experience problems in social relations, deterioration of their mental health such as depression and stress, and a decrease in educational success.

Related research

From a search in the Education Resources Information Center (ERIC) database, no studies by African or South African authors on the educational applications of virtual reality could be found as it seems that African or South African studies are more focused on the use of artificial intelligence (AI) in human resources management (Chilunjika, Intauno & Chilunjika, 2022), transforming academic library operations (Echedom & Okuonghae, 2021), and emerging digital technologies (AI) and nanotechnologies in Africa (Badaru & Mphahlele, 2023). When research in the field is examined further, it is seen that many studies deal with the use of AI in the field of education in different contexts (Aljohani, 2021; Cope, Kalantzis & Searsmith, 2021; Guerreiro-Santalla, Bellas & Duro, 2020).

Guo (2010) measured student satisfaction in his study using AI networks and statistical techniques. Results from 43 courses between 2002 and 2007 were used to create the dataset, and AI networks produced better outcomes than statistical techniques. Kardan, Sadeghi, Ghidary and Sani (2013) concentrate on determining possible elements that influence how satisfied students are with the online courses they select. Through surveys, the students provide the data needed in the application. The findings include the categories that influence students' selection of courses and the extent to which these categories have an impact. Chou and Fen (2014) used a family environment scale and a parent attitude scale to measure how families used information and communication technology (ICT). They observed that, in contrast to authoritarian families, families where parents were accepting of their children's use of technology had healthier communication and support systems and fostered a trusting atmosphere.

Jeffs, Behrmann and Bannan-Ritland (2005) focused on the characteristics, interactions and attitudes of parents regarding their children's use of assistive technologies in education. Parents in the study agreed that using technology, the learning task was customised and individualised, which in turn provided more opportunities for participation and interaction. Popenici and Kerr (2017) investigated the impact of AI technologies in higher education on student learning styles, institutional teaching processes, and the developmental status of these processes.

In this context, it has been concluded that teacher candidates who are trained to guide the education and training process in the future should recognise AI and be aware of the applications of this technology. Considering the above, we can say that artificial intelligent has emerged as a new learning environment in the field of educational technology. While education and training are considered acculturation processes, there is a need for research on the implementation of new learning technologies such as artificial intelligent in the Kazakh education system.

Objective of the Study

The aim with our study was to evaluate students' effectiveness in using AI. Alongside this objective, responses to subsequent inquiries were also pursued. The research questions were the following.

1) What are the perspectives of parents regarding their children's engagement with technology?
2) Do parents' perspectives on their children's engagement with technology vary based on the proximity factor?

3) What are the opinions of the teachers on students' tendencies to use AI?
4) How do students evaluate their success in using AI?

Methods and Materials

In this section we include information about the research method, the study group, the development of the data collection tool, the collection and evaluation of data, and the ethical process of the research.

Research Design

This study was structured as a mixed-methods research design. A mixed-method design integrates both qualitative and quantitative data collection methodologies. This design incorporates two preferred methodologies inside a single study, aiming to deliver a more nuanced and thorough investigation of a phenomenon by leveraging the strengths of both qualitative and quantitative approaches (Sandelowski, 2000). We employed a quantitative research method to assess parents' attitudes on children's technology use, while the perspectives of instructors and students were analysed using a qualitative approach.

Participants

The research sample comprised first-grade primary school students, their parents, and primary school teachers in Almaty, Kazakhstan. Two hundred and fifteen parents, 50 first-grade primary school students, and 25 classroom teachers participated in the research. The findings section presents the proportionate and percentage distributions of the participating parents in the research. Of the students participating in the research, 29 were female and 21 male. Sixteen male teachers and nine female teachers participated in the research.

The participant selection process began by obtaining a list of schools in Almaty city. Schools were visited and a random class was chosen. A scale called the scale of parents' attitudes towards children's technology was distributed to parents in sealed envelopes, with instructions on how to complete the scale. A school for the student group was also selected at random.

Data Collection Instruments

We used a scale measuring parents' views regarding their children's use of technology – which was adapted for the target language – as well as an interview form that we developed for both students and teachers – to compile the data for the study.

Parents' attitudes towards children's technology use scale

The original form of the scale was developed by Türel and Gür (2019). The scale consists of 18 items. The factors of the scale, which has a three-factor structure are Educational use, Controls and restrictions, and Adverse effects. Cronbach's alpha reliability coefficient of the whole scale was calculated as 0.77.

Language reliability study

The parents' attitudes towards children's use of technology scale was translated into Kazakh by three experts in the field of linguistics who were fluent in Kazakh and English. The translations were examined by taking the expert suggestions into account and a temporary Kazakh form was created. To avoid any differences in meaning between the original and the translated form, the Kazakh form was translated back to the original (English) language by experts 2 weeks later. The Kazakh translation was compared with the original scale and the final Kazakh version of the scale was created using the closest translations.

Application

During the data collection phase, 215 parents of children in the first grade of primary school were studied. Of the parents participating in the study, 103 were mothers and 112 fathers. Parents who participated in the research declared that they participated voluntarily.

Exploratory Factor Analysis

Primarily, it was examined whether the adapted scale had a normal distribution. Kolmogorov-Smirnov was preferred as the normal distribution test. As a result of the analysis of the data set, it was found that the data obtained (p = 0.052 > 0.050) showed a normal distribution. All items in the scale were used for exploratory factor analysis. In this analysis it is necessary to test whether the sample size is sufficient. The 0.76 > 0.70 value obtained from the Kaiser-Meyer-Olkin test shows that exploratory factor analysis could be performed on the data. Then, the values obtained from Bartlett's test of sphericity (χ^2 = 563.883, p = 0.000) showed that the data could be used in exploratory factor analysis. The eigenvalue was determined as one and principal component analysis was carried out, and a three-factor structure emerged from the analysis. When the scree plot was examined in the exploratory factor analysis, the lowest load value was determined to be 0.68.

Confirmatory Factor Analysis

Goodness of fit indices were examined for confirmatory factor analysis. For model fit, χ^2/df (chi-square/degree of freedom), non-normed fit index (NNFI), root-mean-square error of approximation (RMSEA) values were taken as criteria. In the analysis, these values were χ^2/df = 1.354 (p = 0.000), NNFI = 0.89 and RMSEA = 0.066, respectively. Hooper, Coughlan and Mullen's (2013) χ2/df was not retained below 5, NNFI above 0.80, and RMSEA below 0.080. Based

on this view, it was determined that the scale preserved its original structure in Kazakh culture.

The item factor loads and Cronbach's alpha coefficients of the scale, which were finalised from the confirmatory factor analysis, are presented in Table 1.

Table 1 Parents' attitudes towards children's technology use scale item factor loads

Factor	Article	Expression on scale	Item total correlation	Cronbach's alpha
Educational use	1	I like it when my child uses technology in his studies.	0.619	0.796
	2	Technological devices such as computers are an effective tool in attracting students' attention to a lesson.	0.662	
	3	The use of technology provides students with the opportunity to practice and repeat outside of class hours.	0.654	
	4	I support my child to use educational software.	0.611	
	5	My child's success in lessons increases with technology-supported education.	0.638	
	6	Technology-supported activities improve my child's ability to research, analyse, access and share information.	0.629	
	7	I enjoy my child's use of technology for educational purposes.	0.599	
Control and limitations	8	Filters should be used in the internet environment where children are present.	0.592	0.855
	9	The main responsibility for children to use technology effectively and beneficially belongs to the family.	0.565	
	10	I supervise my child's technology use.	0.533	
	11	I deduced that a time limit must be determined in the use of technology.	0.554	
	12	I think my child is responsible for using technology.	0.545	
	13	I do not allow my child to share photos and personal information on social media platforms.	0.509	
Adverse effects	14	Technology use negatively affects my child's health.	0.762	0.821
	15	The use of technology in education hinders the socio-psychological development of students.	0.744	
	16	Internet should only be used for homework.	0.695	
	17	Technology use negatively affects family-child relationships.	0.703	
	18	Technological tools such as computers reduce students' attention to the lesson.	0.772	
		Cronbach's alpha for the entire scale		0.843

Table 1 presents the item-total correlations and the Cronbach's alpha coefficient for the scale measuring parents' attitudes towards children's use of technology, which was developed for data collection purposes. The reliability analysis of the three-factor structure of the scale revealed a Cronbach's alpha value of 0.796 for the sub-dimension on educational use. The control and limitations sub-dimension exhibited a Cronbach's alpha value of 0.855, while the negative effects sub-dimension showed a Cronbach's alpha value of 0.821. The Cronbach's alpha value for the scale assessing parents' attitudes towards children's use of technology was determined to be 0.843. The items in the developed scale were formulated using a 5-point Likert-type rating scale. The score ranges in this rating scale are regarded as equal. Accordingly, range 1.00–1.80 was strongly disagree; range 1.81–2.60, disagree; range 2.61–3.40, partially agree, range 3.41–4.20, agree, and range of 4.21–5.00 was rated as strongly agree. Reverse items in the scale are scored in reverse, from the range of 1.00–1.80 for strongly disagree to the range of 4.21–5.00 for strongly agree.

Teacher Interview Form

During the preparation of the teacher interview form, a literature review was conducted. Then, the questions created for the interviews with the teachers were presented for the opinion of three experts. In line with the experts' opinions, the questions were rearranged, and the suitability of the questions was evaluated by presenting these to two primary school teachers. The questions with meaning validity were prepared in the form of a semi-structured interview form and made ready for application. The questions in the teacher interview form are given below.

1) How do you evaluate your students' interest in AI?
2) Do you support your students to use AI technologies?
3) How do you evaluate your students' success in using AI?
4) Do you create educational content for your students to develop their AI skills?

Student Interview Form

The questions in the student interview form were created by reviewing literature and presenting the questions for expert opinion. Three primary school

students were interviewed to determine to what extent the questions based on the opinion of the four experts were understandable. It was determined that the students found the questions understandable.

Data Collection Process

The quantitative data for the study were collected by applying a scale on parents' attitudes towards children's use of technology via Google Forms. Data from teacher and student interviews were obtained through face-to-face interviews with teachers and students. While it took about 20 minutes for parents to complete the scale on parents' attitudes towards children's use of technology, the teacher and student interviews lasted approximately 20 to 25 minutes. The language adaptation and implementation phase of the scale and the implementation phases of the interview forms were completed in a period of approximately 3 months.

Ethics

At each stage of the study consent for participation in the study were obtained from the parents, teachers and students. The purpose of the research, the ethical principles, information on the confidentiality of the data and research phases were included in the consent forms. Accordingly, research data were collected on a completely voluntary basis. In addition, the necessary permission to conduct data collection was obtained from the schools where the research was conducted. Publication ethics were applied throughout the writing of the research report. This research was approved by the Abai Kazakh National Pedagogical University, Almaty, Kazakhstan Scientific Research Ethics Committee, project number 2023/152.

Data Analysis

We used SPSS 25.0 for exploratory factor analysis and SPSS Amos 25.0 for confirmatory factor analysis for scale adaptation. The research data were analysed using the statistical tool, SPSS 25.0. Normal distribution was determined using the Kolmogorow-Smirnov test which resulted in normal distribution ($p < 0.05$). Parametric tests were conducted on the data set obtained from the scale of parents' attitudes towards children's use of technology. In the analysis of bivariate data, independent samples *t*-test, weighted average, frequency and percentage calculations were done. In the analysis of the qualitative data, the descriptive analysis technique was used. Descriptive analysis is to present the reader with an organised and analysed collection of data derived from interviews and observations (Marshall, 1996). To transform the qualitative data into findings, a structured framework was first developed. In this framework the categories and themes under which the data would be organised, specifying how themes would align with specific categories, were outlined. The data were then processed according to this thematic structure. Care was taken to ensure that participants' responses were consistently grouped within the defined themes. The data were categorised by us on two separate occasions, 1 week apart. A comparison of the two evaluations confirmed that no data fell outside the established framework or indicated a different theme. Thus, the reliability of the framework was affirmed. The data obtained from the teacher and student interviews were categorised by frequency and percentage calculations and presented in tables.

Results

Findings Obtained from the Scale of Parents' Attitudes towards Children's Technology Use

The distribution of the demographic characteristics of the parents participating in the research is presented in Table 2.

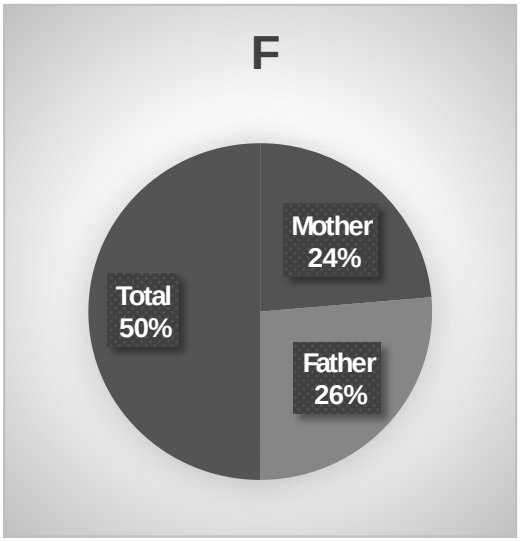

Figure 1 Demographic distribution of parents

Figure 1 shows the demographic distribution of the parents who took part in the study. Forty-seven-point three per cent of the parents participating in the study were mothers and 52.7% were fathers. A total of 239 parents participated in the study.

Table 2 presents the distribution related to the parents involved in the study, along with their attitudes towards their children's use of technology, including the weighted averages and standard deviations of the overall scale.

Table 2 Parents' attitudes towards children's technology use scale weighted average and standard deviations

	M	*SD*
Educational use	3.55	0.672
Control and limitations	4.01	0.489
Adverse effects	3.27	0.885
Overall scale	3.64	0.669

The weighted averages and standard deviations for the educational use sub-dimension (M = 3.55, SD = 0.672), the control and constraints sub-dimension (M = 4.01, SD = 0.489), and the negative effects sub-dimension (M = 3.27, SD = 0.885) were computed. The weighted mean and standard deviation of parents' attitudes regarding children's technology use were computed as M = 3.64, SD = 0.669. The findings indicate that parents possess a strong attitude towards the use of technology for educational purposes, including controls and limitations, while exhibiting a moderate attitude regarding the negative effects of technology. Parents demonstrated a significant level of attitude across the spectrum of attitudes regarding children's use of technology. Table 3 shows that fathers' attitudes were higher than mothers'.

The *t*-test results for independent variables based on the degree of parental closeness regarding their children's use of technology is presented in Table 3.

Table 3 Independent variables *t*-test results

The degree of proximity	*N*	*M*	*SD*	*F*	*p*
Mother	113	2.13	0.811	14.788	0.000
Father	126	4.09	0.679		

The *t*-test results for the independent variables were assessed based on the proximity of parents involved in the study to their children's technology use. The independent variables *t*-test indicated a significant difference in the degree of closeness of parents' attitudes towards children's technology use (F = 14.788, p < 0.5). The analysis revealed a significant difference favouring the fathers. Based on this result, we can argue that fathers were more positive about their children's use of technology than mothers.

Findings Obtained from Teacher Interviews

The participating teachers' answers to the question, "How do you evaluate your students' interest in artificial intelligence?", are presented in Table 4.

Table 4 How do you evaluate your students' interest in artificial intelligence?

Category	*F*	%
They are very interested	5	20
Relevant	14	56
They are somewhat related	3	12
Unrelated	3	12
They are very uninterested	-	-
Total	25	100

The responses to the questions were evaluated and arranged in categories. Twenty per cent of

teachers expressed a high level of interest, 56% indicated that they were interested, 12% reported being somewhat interested, and 12% showed no interest at all. Not a single teacher responded with a lack of interest.

The answers to the question, "Do you support your students to use artificial intelligence technologies?", were evaluated and categorised and the results are presented in Table 5.

Table 5 Do you support your students to use artificial intelligence technologies?

Category	*F*	%
I support a lot	1	4
I support	9	36
I support a little	13	52
I do not support	2	8
I don't support at all	-	-
Total	25	100

Four per cent of teachers indicated that they supported a lot, 36% supported, 52% supported a little and 8% did not support. None of the participating teachers indicated that they did not support at all.

The primary school teachers' responses to the question, "How do you evaluate your students' success in using artificial intelligence?", were evaluated and arranged systematically. Their answers to the question are presented graphically in Figure 2.

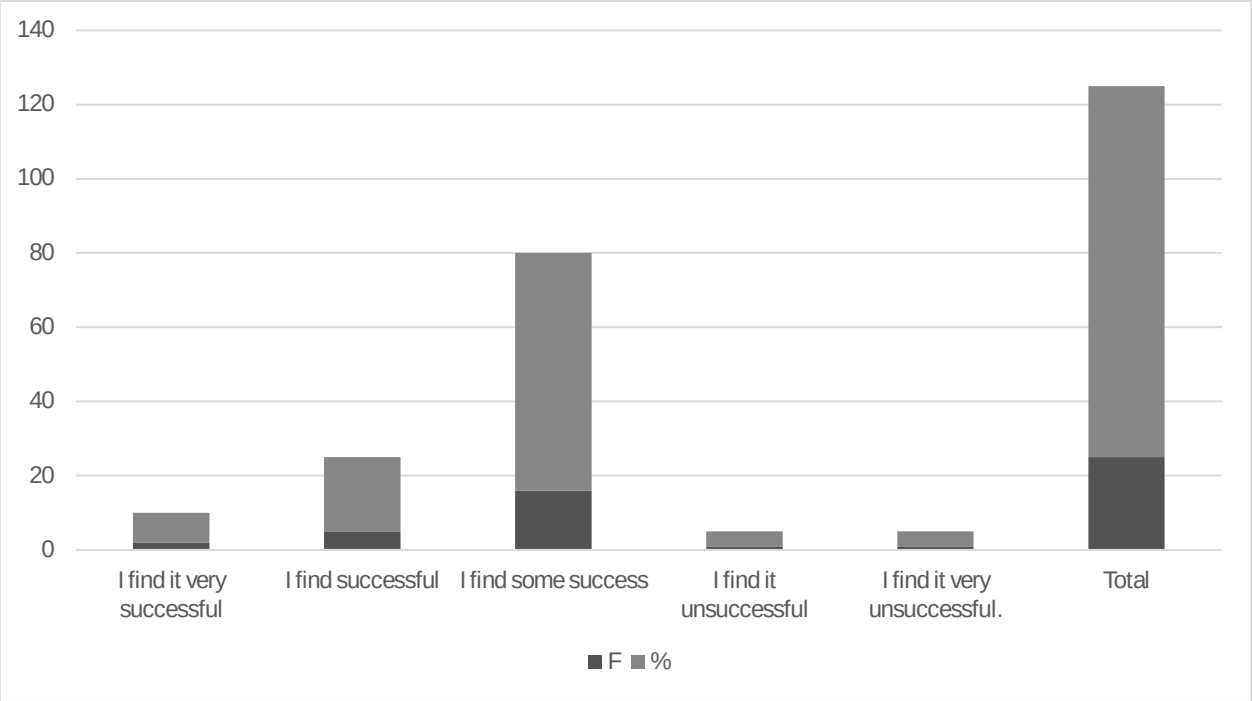

Figure 2 How do you evaluate your students' success in using artificial intelligence?

Eight per cent of the teachers indicated that they found the students' use of AI very successful, 20% found it successful, 64% found it somewhat successful; 4% found it unsuccessful while another 4% found it very unsuccessful.

The primary school teachers' responses to the question of them creating educational content aimed at enhancing their students' AI skills are presented in Table 6.

Table 6 Do you create educational content for your students to develop their artificial intelligence skills?

Category	*F*	%
Always	2	8
Often	17	68
Sometimes	5	20
Rarely	1	4
Never	-	-
Total	25	100

Eight per cent of the educators responded with always, 68% often, 20% sometimes and 4% indicated that they rarely created educational content to develop their students' AI skills.

Findings from the Student Interviews

The students' responses to the interview questions are presented below. Their responses to the question, "What do you think artificial intelligence is?" were assessed and categorised systematically and are presented in Table 7.

Table 7 What do you think artificial intelligence is?

Category	*F*	%
It is technology	39	78
Computers that think like humans	32	64
They are smart machines	27	54
They are entertaining and educational computer content	21	42
Robots that follow given commands	14	28
Technology devices that make life easier	5	10
No idea	4	8

Seventy eight per cent of students said that AI was technology, 64% indicated that it was computers that think like humans, 54% said smart machines, 42% responded with entertaining and educational computer contents, 28% indicated that AI was robots that followed commands, 10% said that it was technology devices that made life easier, and 8% replied that they had no idea (see Table 7).

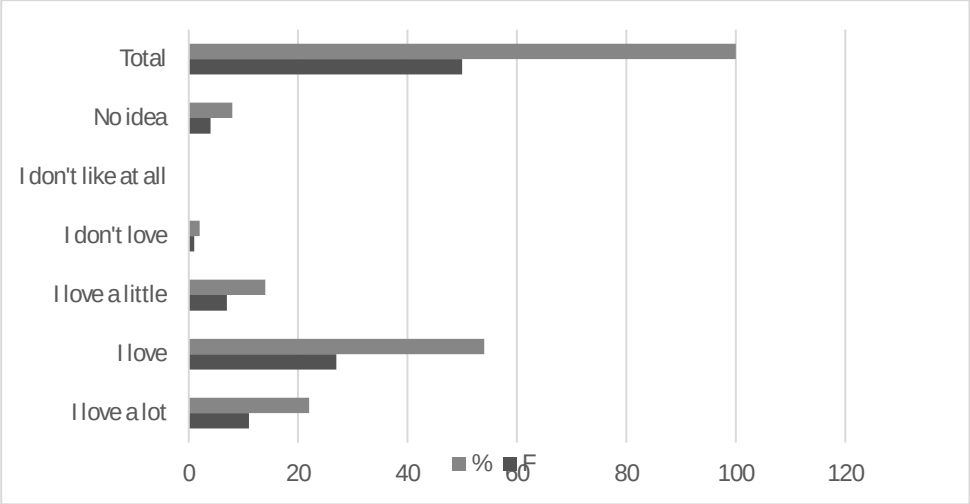

Figure 3 Do you like using artificial intelligence?

The responses to the question, "Do you like using artificial intelligence?" were evaluated and categorised. Twenty-two per cent of the students answered that they liked it very much, 54% loved it, 14% said that they liked it a little, 2% that they did not like it, and 8% had no idea. None of the participating students indicated that they did not like at all (see Figure 3).

The students were asked which activities they performed using artificial intelligence. Their answers to the question were evaluated, categorised and the results presented in Table 8.

Table 8 What are the activities that you perform with the use of artificial intelligence?

Category	*F*	%
Play a game	35	70
Learning new information	24	48
Research	21	42
Do homework	13	26
Make an event	7	14
To design	3	6

Seventy per cent of the students indicated a preference for playing games, 48% for acquiring

new information, 42% for conducting research, 26% for completing homework, 14% for engaging in activities, and 6% for designing.

In Table 9, the participating students' responses to the question, "Do you consider yourself successful in using artificial intelligence?" are presented.

Table 9 Do you consider yourself successful in using artificial intelligence?

Category	*F*	%
I find it very successful	2	4
I find successful	5	10
I find some success	26	52
I find it unsuccessful	8	16
I find it very unsuccessful	3	6
I am not sure	6	12
Total	50	100

Four per cent of the students answered that they were very successful, 10% successful, 52% somewhat successful, 16% unsuccessful, 6% very unsuccessful and 12% unsure.

Discussion

The participating students' parents had showed positive attitudes towards educational use, supervision, and constraints, and moderate opinions about the sub-dimension of negative effects. This finding is supported by other research in the field (Becker & Maunsaiyat, 2002).

According to the degree of proximity there was a considerable difference in the attitudes of the participating parents regarding their children's use of technology. It is evident that the fathers were more positive about their children's use of technology than the mothers. Findings of other studies in the field also show that parents found technology significant in terms of pedagogy (Holloway, Green & Stevenson, 2015; Oluwadare, 2015). Nikken and Schols (2015) evaluated parents' views on their children's technology use in early childhood. The study revealed that parental attitudes affected children's technology use positively or negatively, although fathers' attitudes towards children's technology use were found to be higher. Kennedy (2011) revealed that mothers spent more quality time with their children using digital tools than fathers. However, these results were obtained because fathers were more tolerant towards their children when it came to the use of technology, while mothers were stricter.

Most participating primary school educators indicated that children exhibited an interest in AI – they indicated that they somewhat endorsed the students' use of AI technology and perceived the students' application of AI as relatively effective. Most educators indicated that they regularly provided instructional materials to enhance students' AI competencies. McArthur, Lewis and Bishary (2005) indicate that teacher training institutions ought to implement AI technologies more extensively and incorporate these technologies into their curricula, alongside training on the application thereof in the educational process. Participating students regarded AI as technology, computers that think like humans, smart machines, entertaining and instructive computer content, robots that comply with given commands, and technological devices that made life easier. Most of the students indicated a preference for using AI. The students stated that the activities they performed with AI were playing games, learning new information, doing research, doing homework, doing activities and designing. Furthermore, most of the students reported that they perceived a moderate level of success in using AI. In their study, Touretzky, Gardner-McCune, Martin and Seehorn (2019) revealed that programs equipped with AI technologies allowed children to discover AI at an early age.

Conclusion

With the use of AI, students' learning processes are improved. With AI, students' learning styles, skills and needs are determined and a more customised learning experience is offered. AI identifies the weaknesses of students and provides them with opportunities to practice more. Based on all these, AI's place in education in today's technological world has gained undeniable importance. With this study we aimed at evaluating students' success in using AI. The findings indicate that parents held notably favourable views regarding their children's use of technology. The findings show that fathers' opinions about their children's engagement with technology were notably more favourable than those of mothers. Most of the participating primary school teachers reported that students showed curiosity about AI, moderately supported the integration of AI technologies, and evaluated the students' progress in this domain as fairly satisfactory. Most of the teachers indicated that they regularly produced educational content to enhance students' AI skills.

Students participating in the research defined AI as technology, computers that think like humans, smart machines, entertaining and instructive computer content, robots that comply with given commands, and technological devices that made life easier. Most of the students stated that they liked to use AI and that they considered themselves somewhat successful in using AI.

Although the sample in this study consisted of parents, teachers, and students from Almaty, the findings can be generalised to the broader population of Kazakhstan. Furthermore, the results may apply to teachers, students, and their parents in other developing countries, as Kazakhstan is classified as a developing country by the World Bank.

Recommendations

Based on the results of this study, we make the following recommendations:

1) Teachers should create innovative learning environments by integrating AI applications across various subjects in the teaching and learning processes in schools.
2) Educational programmes should be developed in such a way that parents are informed about AI and other innovative learning technologies, helping them develop more positive attitudes towards AI.
3) Since AI is a newly developing technology, research should continue on its use in the learning process. In addition, research should be conducted to track changes in students' attitudes and achievements toward AI over time, comparing practices across countries or regions within a country.

Authors' Contributions

All authors contributed equally to this article. The final manuscript was reviewed by all authors.

Notes

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