





The Effect of AI-Supported Patriotism Education Based on Folk Tales on Hearing-Impaired Primary School Students: An Experimental Study


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Abstract

This study aims to examine the effect of AI-assisted patriotic education based on Kazakh folk tales on the academic achievement and attitudes towards the lesson of hearing-impaired 3-4th-grade primary school students. The research was conducted using a quasi-experimental design with a pre-test-post-test control group. The study group consisted of a total of 31 hearing-impaired students attending a primary school in Almaty. In the experimental group, 16 students received AI-assisted instruction, while the 15 students in the control group received the same content using traditional methods. The experimental process was conducted for six weeks; AI avatars, visual generation tools, chatbots, story completion applications, and sentiment analysis tools were used in the experimental group. In the control group, teacher-centered instruction, printed visuals, and traditional activities were preferred. The Patriotism Concept Achievement Test and the Attitude Scale towards the Lesson were used as data collection tools. The obtained data were analyzed using non-parametric tests. The findings showed no significant difference between the experimental and control groups before the intervention. However, after the intervention, it was determined that the experimental group had significantly higher scores in both academic achievement and attitude towards the lesson compared to the control group. The results show that AI-supported and culturally-oriented teaching applications facilitate the understanding of abstract concepts by hearing-impaired students, increase their learning motivation, and make values education more effective. The research offers important implications for the use of AI-supported cultural teaching applications in special education.

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Introduction

While education aims to maximize an individual's potential, it necessitates the development of inclusive and innovative approaches that can respond to the educational needs of individuals with special needs. Students with hearing impairments may be at a disadvantage compared to their peers in constructing abstract concepts and achieving academic success due to limitations in accessing linguistic and auditory input (Marschark & Hauser, 2012). This situation becomes more pronounced in areas that inherently contain abstract, cultural, and metaphorical elements, such as social studies and values education (Millar & Vione, 2024). Patriotism education, a fundamental building block of values education, is a critical process that enables students to develop a sense of social belonging and build their cultural identity (Print, 2007). However, for hearing-impaired students, conveying an abstract and broad concept like patriotism through traditional, text-based, or purely verbal methods may be insufficient to achieve the desired lasting learning and positive attitude development (Luckner & Cooke, 2010). In this context, the design of visual and interactive learning environments that appeal to multiple senses is of great importance in special education (Omojemite, 2025). Today, artificial intelligence (AI) technologies stand out in education with their potential to provide personalized learning experiences, visualize abstract concepts, and concretize linguistic inputs for hearing-impaired students (Zawacki-Richter et al., 2019). AI-supported educational technologies have the power to reduce the cognitive load of hearing-impaired students, thereby increasing their learning motivation and academic success. On the other hand, folk tales, which appeal to the cultural codes of students, are highly functional tools in presenting values and patriotism education on a pedagogical basis. Kazakh folk tales, containing themes such as heroism, sacrifice, unity, and love of homeland passed down from generation to generation for centuries, offer a powerful material in patriotism education (Kunanbayeva, 2014).

Advances in technology are improving the quality of life for hearing-impaired individuals, enabling them to communicate more effectively, access information, and participate more actively in society. Assistive technologies consist of devices or systems developed to help individuals with disabilities achieve independence by facilitating tasks they find difficult or impossible to perform due to their disability (Cowan & Turner-Smith, 1999). The inclusion of assistive technologies in educational settings has been shown to improve educational success, increase accessibility, and enhance participation (Bell & Foiret, 2020). It is noted that individuals exhibit positive attitudes towards assistive technologies used in educational settings, and that hearing-impaired individuals are more inclined and adept at using assistive technologies compared to other disabled individuals (Daramola, 2022).

Presenting folk tales, a literary and cultural heritage, to hearing-impaired students by integrating them with artificial intelligence technologies (e.g., algorithms that convert text to visuals/videos, intelligent animations, and personalized digital storytelling tools) will both enrich the visual context and serve as a bridge to overcome language barriers. A review of the literature reveals that AI applications for hearing-impaired students generally focus on language acquisition and reading and writing skills (Easterbrooks & Stephenson, 2006); however, studies that experimentally examine the transmission of abstract values and the impact of these processes on academic achievement and attitudes towards the lesson are quite limited. This research, prepared in this context, aims to

determine the effect of AI-assisted patriotic education based on Kazakh folk tales on the academic achievement and attitudes towards the lesson of hearing-impaired 4th-grade students. It is anticipated that the research will both provide an original contribution to the literature on technology integration in special education and present a concrete teaching model for practitioners.

Theoretical Framework and Literature

Educational Characteristics of Hearing-Impaired Students and Visual Learning

Hearing impairment is a condition that directly affects an individual's language and communication skills, as well as their cognitive and social development processes. Although hearing-impaired children have similar cognitive capacities to their hearing peers, they use different strategies in accessing and processing academic information due to limitations in their access to linguistic input (Marschark et al., 2002). The most prominent feature in the learning processes of these students is the primary dominance of visual channels in information processing. Paivio's (1986) Dual-Coding Theory argues that information is processed both visually and verbally, and that visual codes are more likely to be retained and recalled in memory in individuals with special needs. When verbal or textual symbols alone are insufficient for hearing-impaired students, supporting information with visual symbols, graphics, animations, and sign language ensures the correct structuring of cognitive schemas (Luckner et al., 2005). Therefore, in teaching abstract concepts and social values, it is becoming a necessity to go beyond traditional teaching methods and use enriched visual stimuli (Nkemdilim & Nwazuni, 2026).

Patriotic Education and the Role of Kazakh Folk Tales

Patriotic education is a fundamental dimension of values education, aiming to develop a sense of belonging, responsibility, and love for the society, culture, and state in which an individual lives (Print, 2007). The primary school period (especially 3-4th grade) is a critical threshold in values education because it marks the transition from concrete to abstract operational stages and is when children begin to understand social roles (Piaget, 1964). However, for hearing-impaired 3-4th-grade students, grasping highly abstract concepts such as "homeland," "sacrifice," "independence," and "national identity" can be cognitively challenging.

Cultural narratives and folk tales can serve as pedagogical scaffolding in overcoming this difficulty. Vygotsky's (1978) Sociocultural Development Theory states that learning occurs through cultural tools and linguistic interactions. Fairy tales reduce complex moral and social norms to the world of children through concrete characters and plotlines. Kazakh folk tales (e.g., heroic epics, tales of warriors, and wise sayings) convey love of nature, unity, and homeland defense in an epic and concrete language (Kunanbayeva, 2014). The metaphors in the tales and the characters' motivations for protecting their homeland facilitate children's empathy and internalization of values. However, since reading these texts directly to hearing-impaired children is limited due to language barriers, these narratives need to be transformed using modern technological tools.

Patriotic education is critically important for individuals to develop a sense of belonging to the society in which they live and to internalize national values (Maksiutov & Honcharuk, 2023). This education is even more

important for individuals with special needs. Hearing-impaired students may face additional difficulties compared to their peers in understanding abstract concepts and internalizing social values due to the limited auditory input. Folk tales have been used for centuries as a traditional and effective tool in the transmission of cultural values and social norms. As Frye (2002) points out, tales are not only a means of entertainment but also important pedagogical tools that enable the transmission of cultural memory and value systems from generation to generation. In this context, Kazakh folk tales offer a rich reflection of patriotic values such as heroism, self-sacrifice, love of homeland, and national unity.

An experimental study conducted by Akhmediyeva et al. (2025) examined the effects of teaching activities based on Kazakh folk tales on the attitudes of hearing-impaired primary school students towards patriotism and national values. The researchers used a quasi-experimental pre-test-post-test control group design with 60 students with hearing loss not exceeding 80 decibels, attending schools for the hearing impaired in Almaty and Taldykorgan. After a five-week application period, it was found that the attitude scores of hearing-impaired students in the experimental group towards patriotism and national values were significantly higher than those of their peers in the control group. These findings suggest that folk tale-based activities can be used as an effective pedagogical approach in the patriotic education of hearing-impaired students.

The reasons behind the effectiveness of Kazakh folk tales for hearing-impaired students may be due to their rich inclusion of visual, tactile, and dramatic elements. Multisensory approaches such as visually-supported storytelling, sign language interpretation, and role-playing help hearing-impaired students understand abstract concepts of patriotism by making them concrete. Furthermore, the heroic figures in fairy tales and their sacrifices for their country serve as powerful role models for the students. In this context, research emphasizes the need to give due importance to citizenship education for students with special needs and indicates the need for long-term and qualitative studies in this field (Akhmediyeva et al., 2025). The role of Kazakh folk tales in patriotic education also serves as an important example in terms of preserving cultural heritage and its use in special education.

AI-Powered Applications and Manifestations in Education

Artificial intelligence (AI), one of the most important technological developments of our time, has inevitably led to changes in many fields due to its ability to perform human-like cognitive functions such as learning, problem-solving, and decision-making. AI offers significant opportunities in areas such as economics, education, health, and social sciences, not only increasing technological innovation and economic efficiency but also creating a wide-ranging impact by causing changes in social structures and the daily lives of individuals (Lumsden, 2026). In this context, current technologies such as virtual reality applications and communication tools improve the quality of life for individuals while expanding educational opportunities for students with disabilities. By combining these technologies with artificial intelligence, the barriers to learning and participation in these processes for individuals with disabilities are reduced, and their disadvantages and problems in education are significantly alleviated. With the integration of artificial intelligence, personalized rehabilitation programs are prepared, increasing effectiveness and accessibility in this area (Olawade et al., 2025).

In the field of special education, many assistive technologies have been developed to support the learning process

of students with disabilities using artificial intelligence technologies. These assistive technologies are designed to reduce students' learning disabilities, increase their independence, and enhance their learning potential. For example, for hearing-impaired students, speech recognition technologies can be used to help them communicate with their teachers and classmates. Hearing-impaired individuals already benefit from electronic devices that support listening. Another possibility offered by artificial intelligence for use in the education of hearing-impaired individuals has been supportive alternative communication devices. These enable the generation of spoken speech signals through brain-computer interfaces or by the user quickly reacting to frequently used symbols, thus allowing the learner to convey their ideas to those around them. Similarly, the generation of the same spoken signals is also possible through the translation of sign language into speech using visual descriptors that utilize machine learning (Zdravkova, 2022).

Artificial intelligence not only interacts with individuals but also assists them in communication processes. For example, thanks to translation software, it can translate many different languages into their native languages, or it can facilitate sign language communication with language symbols developed for the hearing impaired. Therefore, in addition to its ability to communicate, artificial intelligence helps overcome communication barriers between people by making communication easier, faster, and more effective. By acting as a bridge that enables individuals to interact, it offers individuals the potential for more natural and efficient communication, facilitating their exchange of information. Used to answer billions of questions every day, artificial intelligence applications are changing how people interact and perceive each other in both pro-social and anti-social ways. More specifically, it increases the speed of communication, the use of positive emotional language, and allows interlocutors to perceive each other as closer and more collaborative (Hohenstein et al., 2023).

In the 21st-century education ecosystem, artificial intelligence (AI) plays a revolutionary role in making learning materials dynamic and learner-centered. AI in education (AIEd) offers systems that can adapt to the individual pace and needs of students (Zawacki-Richter et al., 2019). In the education of hearing-impaired students, AI stands out with its capabilities to create avatars that translate texts into sign language in real time, simplify complex sentence structures, and automatically generate high-resolution, contextually accurate visuals and animations from written texts (Generative AI) (Smith & Okolo, 2021).

Mayer's (2005) Cognitive Theory of Multimedia Learning suggests that people derive deeper meanings from combinations of words and images than from words alone. AI-powered systems instantly transform abstract concepts and historical contexts in Kazakh folk tales into visual elements, creating a "visual library" in the minds of hearing-impaired children. The literature strongly suggests that AI and multimedia applications improve academic achievement in special education, making the classroom less monotonous and positively influencing students' attitudes, motivation, and attention spans (Chen et al., 2020; Zheng et al., 2018). Based on these theoretical foundations, this study aims to experimentally test the impact of integrating AI technologies with cultural tales on the achievement and attitude levels of hearing-impaired students regarding patriotism.

AI-Powered Patriotism Education for Hearing-Impaired Primary School Students

Rapid advancements in educational technologies, particularly the integration of artificial intelligence (AI)

applications into the field of education, have led to the emergence of new and promising approaches in special education. AI-powered educational tools have the potential to offer personalized learning experiences that are sensitive to the individual differences of students. One of the most important contributions of artificial intelligence technologies for hearing-impaired students is the creation of multisensory learning environments. In this context, audiovisual conversion technologies, speech recognition and synthesis systems, interactive visualization tools, and augmented reality (AR) applications stand out. Potential application areas of artificial intelligence technologies in patriotic education for hearing-impaired students can be listed as follows (Alit et al., 2025; Meftoud, 2025; Olatunji, & Olatunji-Olawepo, 2025):

1. Converting patriotic texts into sign language using audiovisual transformation systems.
2. Bringing historical sites and national heroes into the classroom in 3D using augmented reality applications.
3. Establishing interactive dialogues on patriotic topics with AI chatbots.
4. Creating patriotic stories tailored to students' individual interests and needs through personalized content production.
5. Monitoring students' emotional participation in the lesson and providing feedback using facial expression and emotion recognition systems.

In an example implemented at Shanghai First School for the Deaf (2025), the contributions of AI-powered applications to the development of language and communication skills of hearing-impaired students were observed. In the study, the AI video production tool "Jianmeng" transformed scenes from textbooks into dialogue videos, while the AI assistants "Doubao" and "Lingxiaoban," developed by the school, allowed students to ask questions about animals at any time. 3D animal models brought into the classroom with "AR Zoo-Enhanced" technology enabled students to "take photos" with virtual animals and discuss them with their peers. A study by Al Omoush and Mehigan (2024) highlights the potential of AI-powered chatbot applications, developed within the framework of Universal Design for Learning (UDL) principles, to provide personalized learning experiences in the education of students with special needs. If similar approaches were adapted for patriotic education, hearing-impaired students could be offered interactive and individualized learning opportunities about national heroes, historical events, and patriotic symbols.

Significance of the Study

In the context of patriotic education, artificial intelligence technologies will not only increase accessibility but also contribute to the internalization of these values at the emotional and cognitive levels. Three key points highlight why this study is important:

-Disadvantaged Groups and Artificial Intelligence: Hearing-impaired students, by their nature, have a greater need for visual materials and personalized learning processes. Artificial intelligence (e.g., avatars that translate into sign language, AI tools that visualize fairy tales) helps these students concretize abstract concepts (patriotism, self-sacrifice, etc.).

-Transmission of Cultural Heritage: Kazakh folk tales are powerful tools in values education. Blending these tales with modern technology is unique in terms of integrating cultural heritage into the field of special education.

-Contribution to the Literature: The use of artificial intelligence in special education generally focuses on

language and speech skills. This study will be one of the pioneering studies examining the impact of artificial intelligence in the dimension of social studies/values education. This study aims to examine the effect of AI-assisted patriotic education based on Kazakh folk tales on the academic achievement and attitudes towards the subject of hearing-impaired 4th-grade students.

Research Questions

-Does AI-powered patriotic education based on Kazakh folk tales significantly improve the academic performance of hearing-impaired students compared to traditional methods?

-How does AI-powered patriotic education based on Kazakh folk tales affect participants' attitudes towards the lesson compared to traditional teaching?

Method

This section describes the research model, the study group, the data collection tools, the experimental procedure, and the statistical methods used in the analysis of the data.

Research Model

The research was conducted using a quasi-experimental design with a pre-test-post-test control group. In this design, the experimental and control groups were not randomly assigned, but natural classroom environments exhibiting similar characteristics were selected. Both groups were administered the same assessment tools before and after the experimental intervention. The experimental group received AI-assisted patriotic education based on Kazakh folk tales, while the control group received traditional instruction using the same tales. The independent variable of the study was the teaching method (AI-assisted instruction / traditional instruction), and the dependent variables were the students' achievement levels of the concept of patriotism and their attitudes towards the lesson.

Research Group

The study group consisted of 3-4th-grade hearing-impaired students attending a primary school in central Taldykorgan. The study group was selected using criterion sampling, a type of purposeful sampling. Inclusion criteria were:

- Officially diagnosed with hearing impairment,
- Attending 3-4th-grade level education,
- Having received sign language training for at least one year,
- Not having previously received AI-assisted training on patriotism.

A total of 30 students were included in the study. 16 students were in the experimental group and 15 in the control group. The average ages of the groups were similar ($\bar{X}=9.92$ for the experimental group, $\bar{X}=9.95$ for the control group) and the gender distribution was balanced (experimental group: 8 girls, 8 boys; control group: 7 girls, 8 boys). The level of hearing loss (moderate, severe, profound) was distributed similarly in both groups. All students were able to use Kazakh sign language. Informed consent was obtained from the parents before the study.

Experimental Procedure

The experimental treatment was conducted over 6 weeks, with one session per week (40 minutes), for a total of 6 sessions. The experimental and control groups received training in different branches of the school and in independent classroom environments. In both groups, lessons were conducted with the assistance of a sign language interpreter and the same Kazakh folk tales (Aldar Köse, Er Targın, Koblandı Batır, Jalkaurız, Karasay, and Karabash) were used.

Experimental Group Application

AI-assisted instruction was applied in the experimental group. The AI tools used were:

- AI avatar (storyteller, with subtitles and sign language simulation),
- AI visual generator (creating visuals from text),
- AI chatbot (simple question-answer),
- AI story completion tool,
- AI facial expression recognition (emotion prediction game).

In each session, the AI avatar first narrated a Kazakh folk tale, and then the students performed interactive activities with the AI tools (visual generation, talking to the bot, story completion, emotion game). In the 6th session, students created their own patriotic fairy tales with the help of AI and formed a shared digital fairy tale book for the class. Throughout the process, students were accompanied by tangible objects (flags, maps, hero figures), and each activity was supported with sign language. The activities carried out in the experimental group are summarized in Table 1:

Table 1. Summary of the Intervention Procedures Performed in the Experimental Group

Session	Thema	Artificial Intelligence Event	Kazakh Tale
1	What is homeland?	AI avatar narration: “Aldar Köse and Patriotism” (plain language, subtitles + sign language simulation)	Aldar Köse's refusal to leave the country.
2	Heroism and the Flag	AI-powered visual creation: The student writes a description of a flag and a hero, and the AI generates the image.	"Er Targın" (hero who fought for the flag)
3	Independence and Freedom	Ask a fairy tale character questions about their homeland using an AI chatbot (text/signaling).	“Koblandı Batır”
4	Cooperation and Unity	AI-powered group story completion: Each group writes a chapter, and the AI combines it and creates voice/silent animation.	“Jalkaurız” (The Tale of Unity)
5	Symbols of Patriotism	AI facial recognition/gesture analysis for emotion prediction (fun): When a student looks at a national photo, the AI tells you which emotion they see.	“Karasay and Karabash”
6	Project Day –	The student creates their own patriotic fairy tale with AI	A new fairy tale

Session	Thema	Artificial Intelligence Event	Kazakh Tale
	Bringing Fairy Tales to Life with AI	visuals and text, and produces a digital poster, with the support of the teacher.	inspired by all the fairy tales.

Each session utilized subtitled AI narration, sign language translation support and AI simulation, tangible objects (flags, maps, hero figures), and tactile and visual feedback.

Control Group Application

In the control group, the traditional teaching method was applied. The same Kazakh folk tales were narrated by the teacher using sign language, and printed picture cards and story posters were shown. Activities included question-and-answer sessions related to the tale, coloring pages, flag drawing, making character models, role-playing (silent theatre), cut-and-paste poster work, and making a handmade storybook. No artificial intelligence tools, computers, tablets, or interactive digital materials on smart boards were used in the control group. Each session was also planned to last 40 minutes, the same as in the experimental group. The activities carried out in the control group are summarized in Table 2:

Table 2. Control Group (Traditional Teaching – Same Tales)

Session	Thema	Traditional Teaching Activity
1	What is homeland?	The teacher tells simple stories using sign language, with picture cards.
2	Heroism and the Flag	Paper painting, flag drawing, hero model
3	Independence and Freedom	Reading the fairy tale text (simple), question-and-answer (sign language or written)
4	Cooperation and Unity	Role-playing (storytelling through silent theatre)
5	Symbols of Patriotism	Poster design, cut and paste, classic wall newspaper.
6	Project Day	Handmade storybook, illustrated storytelling (in sign language)

Pre-test and Post-test Administration

One week before the start of the experimental intervention, both the experimental and control groups were administered the Patriotism Concept Achievement Test and the Patriotism Attitude Scale as pre-tests. The tests were administered individually in a classroom setting with the assistance of a sign language interpreter. One week after the completion of the six-week experimental intervention, the same measurement tools were administered again to both groups as post-tests under the same conditions. The pre-test and post-test administrations were carried out by the researcher, with the groups independent of each other.

Data Collection Tools

Two measurement tools were developed or adapted to collect quantitative data in the research.

Patriotism Concept Achievement Test

This test, developed by the researcher, aims to measure the level of knowledge that hearing-impaired 3-4th-grade students have about fundamental concepts of patriotism (homeland, flag, nation, independence, heroism, unity, symbols). The test consists of a total of 20 items: visually supported multiple-choice (15 questions) and true-false (5 questions). Each question includes at least one visual (picture, symbol, photograph), and the questions are read aloud with the assistance of a sign language interpreter. For content validity, the opinions of 3 field experts (special education, Kazakh Literature, measurement and evaluation) were obtained, and the content validity ratio (CVR) was calculated to be above 0.85. In a pilot study conducted with 30 hearing-impaired students for reliability analysis, the KR-20 internal consistency coefficient was found to be 0.89.

Patriotism Attitude Scale

Adapted for hearing-impaired children, this scale measures students' feelings and thoughts about patriotism. The scale consists of 10 items using a Likert-type scale with emojis and facial expressions (very happy – happy – undecided – unhappy – very unhappy). Each item includes a visual expression (e.g., what do you feel when you look at the flag?) and three to five facial expressions/emojis. Students respond by selecting the most appropriate emoji. The scale was reviewed by two special education specialists and one psychological counselor; in the pilot study (n=30), the Cronbach Alpha reliability coefficient was found to be 0.86.

Data Analysis

The obtained data were analyzed using the SPSS (Statistical Package for Social Sciences) program. First, the Shapiro-Wilk test was used to examine whether the data showed a normal distribution. In addition, the homogeneity of variances of the groups was tested with the Levene test. Since the assumptions of normal distribution and homogeneity of variances were not met ($p < 0.05$), non-parametric tests were used for intergroup comparisons. In this context, the Mann Whitney U test was performed to determine whether there was a significant difference between the pre-test scores of the experimental and control groups. To test the effect of the experimental treatment, intergroup comparisons were made using post-test scores, and the Mann Whitney U test was also used in this stage. The significance level was accepted as $p < 0.05$ in all statistical tests.

Findings

Table 3 shows that the mean score on the patriotism concept achievement test was $\bar{X}=5.06$ ($Sd=3.02$) for the experimental group students before the intervention, while the mean score was $\bar{X}=5.53$ ($Sd=2.61$) for the control group. These findings indicate that the experimental and control groups were quite close in terms of achievement levels before the study. Furthermore, the standard deviation values reveal that the score distributions of both groups were at a similar level.

Table 4 presents the results of the Mann Whitney U test conducted to determine the significance of the difference between the pre-test scores of the experimental and control groups. The analysis revealed a mean rank of 14.72

for the experimental group and 17.37 for the control group. The analysis showed no statistically significant difference between the groups ($U=99.50$; $U=99.50$; $p>0.05$). This result indicates that the experimental and control groups were comparable in terms of achievement levels before the study.

Table 3. Descriptive Analyses of Pre-Test Data on Scores Obtained by Experimental and Control Groups on the Patriotism Concept Achievement Test

Pre Test	Group	N	Mean	Std. Deviation
Achievement	Experimental	16	5.06	3.02
	Control	15	5.53	2.61

Table 4. Mann Whitney U Analyses of Pre-Test Data on Patriotism Concept Achievement Test Scores of Experimental and Control Groups

Pre Test	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	p
Achievement	Experimental	16	14.72	235.50	99.50	-0.82	0.41
	Control	15	17.37	260.50			

According to Table 5, the mean score on the attitude scale for the experimental group before the intervention was $\bar{X}=3.63$ ($Sd=0.53$), and the mean score for the control group was $\bar{X}=3.70$ ($Sd=0.64$). The fact that the means of both groups were quite close indicates that the students' attitudes towards the course were at a similar level before the intervention.

Table 5. Descriptive Analyses of Pre-Test Data on Attitude Scale Scores of Experimental and Control Groups.

Pre Test	Group	N	Mean	Std. Deviation
Attitude	Experimental	16	3.63	0.53
	Control	15	3.70	0.64

Table 6 shows the significance of the difference between the pre-test scores of the experimental and control groups on the attitude scale, examined using the Mann Whitney U test.

Table 6. Mann Whitney U Analyses of Pre-Test Data on Attitude Scale Scores of Experimental and Control Groups

Pre Test	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	p
Attitude	Experimental	16	15.59	249.50	113.50	-0.26	0.79
	Control	15	16.43	246.50			

The analysis revealed that the rank mean of the experimental group was 15.59, and the rank mean of the control group was 16.43. The difference between the groups was found to be statistically insignificant ($U=113.50$; $p>0.05$). This finding indicates that the students' attitudes towards the course were similar before the intervention,

and that the groups initially exhibited comparable characteristics.

Table 7 shows that after the intervention, the mean achievement test score of the experimental group was $\bar{X}=12.63$ ($Sd=4.08$), while that of the control group was $\bar{X}=9.00$ ($Sd=3.09$). The fact that the mean score of the experimental group is higher than that of the control group suggests that the AI-supported patriotic education based on Kazakh folk tales had a positive effect on the students' academic achievement.

Table 7. Descriptive Analyses of Post-Test Data on Scores Obtained by Experimental and Control Groups on the Patriotism Concept Achievement Test

Post Test	Group	N	Mean	Std. Deviation
Achievement	Experimental	16	12.63	4.08
	Control	15	9.00	3.09

Table 8 shows the significance of the difference between the post-test scores of the experimental and control groups on the achievement test, examined using the Mann Whitney U test. The analysis revealed a rank mean of 20.03 for the experimental group and 11.70 for the control group. The analysis showed a statistically significant difference in favor of the experimental group ($U=55.50$; $p<0.05$). This result indicates that AI-assisted patriotism education is more effective than traditional teaching methods in improving the academic success of hearing-impaired students.

Table 8. Mann Whitney U Analyses of the Post-Test Data of the Attitude Scale Scores of the Experimental and Control Groups

Post Test	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
Achievement	Experimental	16	20.03	320.50	55.50	-2.57	0.01
	Control	15	11.70	175.50			

According to Table 9, the mean attitude score of the experimental group after the intervention was determined to be $\bar{X}=4.44$ ($Sd=0.47$), while the mean score of the control group was $\bar{X}=3.85$ ($Sd=0.85$). The higher mean score of the experimental group indicates that the AI-assisted instruction process positively affected students' attitudes towards the course.

Table 9. Descriptive Analyses of Post-Test Data on Attitude Scale Scores of Experimental and Control Groups.

Post Test	Group	N	Mean	Std. Deviation
Attitude	Experimental	16	4.44	0.47
	Control	15	3.85	0.85

Table 10 shows the significance of the difference between the experimental and control groups' attitude scale post-test scores using the Mann Whitney U test. The analysis revealed a mean rank of 19.22 for the experimental group and 12.57 for the control group. The analysis showed a statistically significant difference in favor of the

experimental group ($U=55.50$; $p<0.05$). This finding indicates that AI-supported patriotic education based on Kazakh folk tales positively improved students' attitudes towards the lesson.

Table 10. Mann Whitney U Analyses of Pre-Test Data on Attitude Scale Scores of Experimental and Control Groups

Post Test	Group	N	Mean	Sum of	Mann-Whitney U	Z	p
			Rank	Ranks			
Attitude	Experimental	16	19.22	307.50	55.50	-2.18	0.032
	Control	15	12.57	188.50			

Overall, the findings show that the experimental and control groups were comparable in terms of both academic achievement and attitudes towards the lesson before the intervention. After the intervention, a significant increase was observed in both the achievement test and attitude scale scores of the experimental group. These results demonstrate that AI-supported patriotic education based on Kazakh folk tales is an effective method for improving both the academic achievement and positive attitudes towards the lesson of hearing-impaired primary school students.

Discussion

Comments Regarding the First Research Question

The first question of the study sought to answer the question, "Does AI-assisted patriotic education based on Kazakh folk tales significantly improve the academic achievement of hearing-impaired students compared to traditional methods?" The research findings showed that the experimental and control groups were equivalent in terms of achievement levels before the application. The lack of a significant difference between the groups in the pre-test results allowed for a more robust evaluation of the effect of the experimental intervention. However, it was determined that the achievement scores of the experimental group were significantly higher than those of the control group after the application. This indicates that AI-assisted and culturally-oriented teaching applications are effective in improving the academic achievement of hearing-impaired students.

The research findings are consistent with the literature regarding the fact that AI-assisted learning environments increase student achievement (Raji, et al., 2024; Salawa et al., 2024). In particular, personalized learning processes, instant feedback mechanisms, and multisensory learning supports can positively affect the learning performance of students with special needs. Holmes and Tuomi (2022) state that AI-assisted educational applications make the learning process more accessible by taking into account individual learning differences. Considering the importance of visually supported and interactive content in the learning process for hearing-impaired students, the research findings support this approach.

Similarly, Mayer's (2009) Multimedia Learning Theory reveals that the combined use of visual and verbal elements enhances learning. Storytelling, visualization, and interactive content used in AI-assisted instruction may have contributed to hearing-impaired students learning abstract concepts more meaningfully. In particular, the

concretization of value-based and abstract concepts such as patriotism through folk tales seems to have increased learning retention.

The research results are also consistent with studies showing that the use of cultural elements in educational processes contributes to learning success. According to Vygotsky's sociocultural learning approach, individuals learn through cultural tools and social interaction. Connecting Kazakh folk tales with students' cultural identity may have made the learning process more meaningful. Furthermore, various studies indicate that the use of folk narratives in value education processes supports students' cognitive and affective development.

From the perspective of hearing-impaired students, traditional teaching methods often rely on verbal communication, leading to limitations in the learning process. AI-supported applications, however, can be said to increase accessibility due to their visual richness, individualization, and repetition capabilities. In this context, the research findings indicate the need to expand the use of digital and AI-based applications in special education. In terms of application, developing culturally relevant digital materials in teaching processes is crucial. Specifically, AI applications supporting sign language, animation-supported storytelling systems, and adaptive learning platforms can be developed for hearing-impaired students. Furthermore, supporting teachers with in-service training on AI literacy can contribute to the more effective use of such applications in educational settings.

Comments on the Second Research Question

The second research question addressed the question, "How does AI-assisted patriotic education based on Kazakh folk tales affect students' attitudes towards the course compared to traditional teaching?" The research findings show that the experimental and control groups were similar in terms of attitude levels before the intervention. However, after the intervention, the attitude scores of the experimental group increased significantly. This result indicates that AI-assisted instruction increases students' interest in the course and their positive attitudes.

The literature frequently emphasizes the positive effects of technology-supported learning environments on student motivation and attitudes towards the course (Mwangi, 2024; Olatunji & Olatunji-Olawepo). According to Keller's ARCS Motivation Model, engaging, interesting, and student-needs-appropriate learning environments increase motivation (Parveen et al., 2026). The interactive nature of AI-assisted applications, the provision of individual feedback, and the encouragement of active student participation may have contributed to students developing positive attitudes towards the course.

Furthermore, many studies indicate that digital storytelling-based applications increase students' interest in learning. Integrating cultural narratives, such as folk tales, with technology can strengthen both students' sense of cultural belonging and their affective commitment to learning. In this context, research findings show that a teaching approach that supports not only the cognitive but also the affective dimensions of values education is effective.

When evaluated within the context of special education, the motivation and participation levels of hearing-

impaired students are of great importance in their learning processes. It is believed that artificial intelligence applications supported by visual and interactive materials increase students' active participation in the lesson. This may have contributed to students feeling more competent in the learning process and developing a positive attitude towards the lesson.

The research findings are consistent with studies indicating that technology-supported values education contributes to students' socio-emotional development. The fact that AI-supported systems provide content tailored to students' individual learning paces and enable them to experience success may have helped create positive learning experiences. In this context, students developing positive attitudes towards the lesson can be considered an important factor supporting increased learning success. From an application perspective, it is recommended that digital content supporting students' cultural identities be used in teaching processes. Especially in special education settings, the use of interactive storytelling, gamified learning environments, and AI-supported visual materials can increase students' interest in the lesson. In addition, it is important to support teachers not only in their technology usage skills but also in cultural pedagogical approaches.

Conclusion and Recommendations

This study investigated the effect of AI-assisted patriotic education based on Kazakh folk tales on the academic achievement and attitudes towards the lesson of hearing-impaired 3-4th-grade primary school students. The research findings revealed that both the experimental and control groups showed similar characteristics in terms of both achievement and attitude before the intervention. After the intervention, the experimental group's achievement test and attitude scale scores were found to be significantly higher than the control group's. The results indicate that AI-assisted teaching applications support the learning processes of hearing-impaired students and yield more effective results compared to traditional teaching methods. In particular, the combined use of cultural content, folk tales, and digital learning tools improved both the cognitive achievement and positive attitudes towards the lesson for the students. This highlights the importance of culturally based and technology-supported teaching approaches in the field of special education. The research results also show that values education should not be limited solely to the transfer of information; it is more effective when supported by interactive and student-centered learning environments that increase students' affective participation. In this context, AI-powered applications offer significant opportunities for accessibility, individualization, and motivation in the learning processes of individuals with special needs. Based on the results of this research, the following recommendations can be made:

- The use of AI-supported and visually-oriented teaching materials should be increased in the educational processes of hearing-impaired students.
- Folk tales, cultural narratives, and local literary products should be integrated with digital technologies and used in teaching processes within the scope of values education.
- In-service training should be provided to special education teachers on AI-supported teaching applications to improve their digital pedagogical competencies.
- AI applications with sign language support, interactive storytelling systems, and adaptive learning platforms should be developed for hearing-impaired students.

- Similar research should be conducted in different age groups, different types of disabilities, and different cultural contexts to increase the generalizability of the results.
- Future research should examine not only academic achievement and attitudes but also students' motivation, cultural belonging, social-emotional development, and levels of lasting learning.
- Repeating the research with larger sample groups and long-term applications will contribute to revealing the long-term effects of AI-supported values education.

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