



The role of information-support resources in revitalizing cultural heritage through traditional sports

El papel de los recursos de apoyo informativo en la revitalización del patrimonio cultural a través de los deportes tradicionales

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How to cite in APA

Malydybek, A. (2025). The role of information-support resources in revitalizing cultural heritage through traditional sports. *Retos*, 71, 924-937. <https://doi.org/10.47197/retos.v71.117345>

Abstract

Introduction: this study examined the role of information-support resources in revitalizing cultural heritage through traditional sports in physical education. the aim was to assess whether integrating digital tools improves students' cultural knowledge, attitudes, motivation, engagement, and knowledge retention.

Objective: the objective was to evaluate whether the integration of digital learning tools into traditional sports education enhances students' cultural knowledge, attitudes toward cultural preservation, motivation, engagement, and knowledge retention.

Methodology: A quasi-experimental design was implemented with 60 university students (32 males, 28 females; mean age = 20.3 ± 1.6 years) divided into experimental and control groups. Over eight weeks, students attended two weekly 90-minute sessions with a two-week follow-up. Data were analyzed using ANCOVA, t-tests, chi-square, and repeated measures ANOVA.

Results: results showed significant improvements in the experimental group's attitudes, motivation, engagement, and knowledge retention, but no differences in immediate cultural knowledge or skill acquisition. these findings confirm the effectiveness of digital tools for affective and cognitive learning. it is concluded that information-support resources enrich cultural education and should complement traditional teaching methods.

Discussion: The findings support prior research on the effectiveness of multimedia and culturally responsive tools in enhancing learning, while also indicating that physical skills need consistent practice beyond digital support.

Conclusions: it is concluded that information-support resources effectively enrich cultural learning in physical education and should be integrated strategically to complement traditional instructional methods.

Keywords

Traditional sports; cultural heritage; Physical Education; motivation; student engagement.

Resumen

Introducción: este estudio examinó el papel de los recursos de apoyo informativo en la revitalización del patrimonio cultural a través de los deportes tradicionales en la educación física. el objetivo fue evaluar si la integración de herramientas digitales mejora el conocimiento cultural, las actitudes, la motivación, la participación y la retención del conocimiento de los estudiantes. **Objetivo:** el objetivo fue evaluar si la integración de herramientas digitales de aprendizaje en la enseñanza de deportes tradicionales mejora el conocimiento cultural de los estudiantes, sus actitudes hacia la preservación del patrimonio, la motivación, la participación y la retención del conocimiento.

Metodología: Se realizó un diseño cuasi-experimental con 60 estudiantes universitarios (32 hombres y 28 mujeres; edad media = 20.3 ± 1.6 años), divididos en grupos experimental y de control. La intervención duró ocho semanas, con dos sesiones semanales de 90 minutos y un seguimiento de dos semanas. Los datos se analizaron mediante ANCOVA, pruebas t, chi-cuadrado y ANOVA.

Resultados: los resultados mostraron mejoras significativas en las actitudes, la motivación, la participación y la retención del conocimiento en el grupo experimental, pero no se observaron diferencias en la adquisición inmediata de conocimientos culturales o habilidades físicas. estos hallazgos confirman la eficacia de las herramientas digitales para el aprendizaje afectivo y cognitivo.

Discusión: los hallazgos respaldan investigaciones previas sobre la efectividad de las herramientas multimedia y culturalmente pertinentes para mejorar el aprendizaje, al tiempo que indican que las habilidades físicas requieren práctica constante más allá del apoyo digital.

Conclusiones: se concluye que los recursos de apoyo informativo enriquecen eficazmente el aprendizaje cultural en la educación física y deben integrarse estratégicamente para complementar los métodos de enseñanza tradicionales.

Palabras clave

Deportes tradicionales; patrimonio cultural; Educación Física; motivación; participación estudiantil.



Introduction

In an era characterized by globalization and rapid technological change, the preservation and revitalization of intangible cultural heritage have become urgent priorities within educational and sociocultural contexts. Traditional sports and games represent one of the most dynamic manifestations of this heritage, embodying the historical, spiritual, and communal values of a society (Wang & Guo, 2022). These practices serve not only as recreational activities but also as living repositories of identity, rituals, and intergenerational knowledge (Kozibroda et al., 2025). However, their transmission is increasingly threatened by the predominance of globalized, commercial sports and the marginalization of indigenous physical culture in modern educational curricula (Shao, 2022; Xu et al., 2025). This decline poses significant risks for cultural continuity, particularly among younger generations (Deng et al., 2024).

To address this challenge, researchers have highlighted the need for innovative pedagogical strategies that integrate cultural preservation with contemporary learning environments (Lazorenko et al., 2021). Within this framework, information-support resources such as digital archives, multimedia platforms, mobile applications, and interactive learning systems offer transformative opportunities to strengthen students' connections to their cultural heritage. These tools foster immersive, multimodal learning experiences that contextualize traditional sports by combining historical background, symbolic meaning, and ritual practices in an accessible format (Yuan et al., 2021; Holm et al., 2023). When integrated into physical education, they enhance students' cultural understanding while simultaneously enriching their learning experience (Jianpeng, 2024).

Prior studies demonstrate that culturally responsive digital resources significantly improve motivation, cultural awareness, and long-term knowledge retention (Nofrizal et al., 2024; Cui et al., 2024). Digital storytelling, augmented reality, and gamified content, for example, have proven particularly effective in fostering emotional engagement and supporting cognitive development (Lv et al., 2022; Tang et al., 2022). Additionally, interactive learning environments allow differentiated instruction, accommodating diverse learner needs and enabling self-paced exploration of cultural content (Ding et al., 2021). Beyond cognitive gains, traditional sports play a broader sociocultural role by fostering identity formation, intercultural dialogue, and social cohesion (Sukmana, 2025). Their inclusion in school-based programs aligns with national educational objectives by promoting diversity, civic engagement, and intergenerational knowledge transfer (Mou, 2024; Li, 2025).

This study builds upon these insights by empirically examining the role of information-support resources in revitalizing cultural heritage through traditional sports education. Specifically, it evaluates whether integrating digital tools improves students' cultural knowledge, attitudes toward heritage preservation, motivation, engagement, and knowledge retention. The findings aim to provide practical contributions that can inform educational policies promoting the integration of culturally significant practices into modern curricula. By aligning technological innovation with heritage preservation, the study addresses a critical gap in existing research and proposes a sustainable framework for safeguarding cultural traditions within contemporary educational systems. Ultimately, this research seeks to demonstrate that cultural heritage and digital innovation can coexist, enhancing both pedagogical practices and long-term strategies for cultural sustainability.

Related Works

The intersection of cultural heritage, physical education, and digital pedagogy has garnered increasing attention in recent years. Traditional sports, as expressions of intangible cultural heritage, offer a unique pedagogical opportunity to instill values of identity, history, and community among youth (Wang, W., & Zhang, 2024). Scholars emphasize that traditional games are not merely recreational practices but are embedded in collective memory, oral traditions, and symbolic rituals (Vannucci, 2023; Czakó et al., 2023). As globalization exerts pressure on indigenous knowledge systems, there is an urgent need to incorporate traditional sports into formal education to preserve and transmit cultural heritage (Mukan, 2021; Lee & Kim et al., 2022).

Recent studies have examined the integration of traditional physical activities in school curricula to promote both cultural continuity and physical literacy. For example, Yu et al. (2022) showed how traditional



Inuit games embedded within the Canadian school system helped reconnect Indigenous youth with their cultural roots. Similarly, Liu et al. (2024) explored how traditional games in Spanish schools enhanced students' cultural sensitivity and collaborative behavior. These studies underscore the educational significance of traditional sports but often lack a technological dimension.

Parallel to the preservation discourse is the growing body of literature on the use of information-support resources in physical education. Digital tools such as mobile applications, multimedia tutorials, and virtual learning environments have been increasingly employed to enhance skill acquisition, motivation, and student engagement (Kim & Kang, 2024; Omarov et al., 2024). According to Kroshus et al. (2023), augmented reality and interactive e-learning modules provide learners with immersive experiences that reinforce both cognitive and psychomotor domains. Moreover, research by Meng (2023) shows that gamified digital environments in sports education significantly enhance motivation and knowledge retention.

A convergence of these domains as traditional sports and digital pedagogy is beginning to emerge. Huang et al. (2025) highlighted how culturally-tailored digital content enabled students to learn about pre-Columbian ball games, reinforcing both motor learning and cultural knowledge. In a similar vein, Yang et al. (2025) proposed a digital heritage education model integrating ethnosport documentaries and mobile platforms to support affective learning in physical education contexts. Omarov et al. (2020) proposed digital stethoscope for monitoring of heartbeats of athletes. These approaches demonstrate the potential of information-support resources to act as mediators between the digital generation and ancestral traditions.

However, there remains a research gap concerning systematic experimental validation of such digital interventions in traditional sport pedagogy. Most studies emphasize descriptive or case-study-based approaches rather than controlled experimental designs comparing different pedagogical conditions (Drummond et al., 2022). Additionally, prior research often focuses on either cultural awareness or physical education outcomes in isolation, neglecting their possible synergies when information-support tools are integrated (Du, 2023).

Some works have begun addressing these complexities. For instance, Klemmer et al. (2023) developed a structured program that fused multimedia content and practical instruction to teach Capoeira, reporting gains in both cultural appreciation and physical competence. Similarly, Sur et al. (2024) implemented an AI-powered coaching system for traditional martial arts and observed improved student self-efficacy and skill retention. These findings suggest that well-designed digital interventions can foster a holistic learning environment where physical training and cultural education are co-developed.

Despite these advances, researchers argue that educational strategies must remain sensitive to local contexts and avoid homogenizing diverse traditions through oversimplified digital narratives (Liang, 2022; Nwagwu & Akanji, 2022). Thus, there is a clear need for empirical studies that examine how information-support resources can be designed and applied in culturally authentic, pedagogically sound, and student-centered ways.

This study aims to build upon the aforementioned research by implementing an experimental design to measure the educational and motivational impact of information-support resources in traditional sports education. In doing so, it contributes to the broader understanding of how cultural heritage can be revitalized through technology-enhanced learning environments.

Materials and Methods

This section presents the materials and methods employed to investigate the impact of information-support resources on the revitalization of cultural heritage through traditional sports. It includes detailed descriptions of the research design, participant demographics, intervention procedures, instructional materials, and data collection techniques. The methodology was structured to ensure reliability, validity, and replicability of the findings across educational contexts.

Participants



The study involved a total of 60 undergraduate students (32 males and 28 females) enrolled in the Physical Education program at a public university. Participants were aged between 18 and 24 years ($M = 20.3$, $SD = 1.6$) and were recruited on a voluntary basis. All students had basic knowledge of sports training but limited prior exposure to traditional sports and cultural heritage education. To ensure homogeneity, participants were randomly assigned into two groups: an experimental group ($n = 30$) and a control group ($n = 30$). Informed consent was obtained from all participants, and ethical approval was secured from the university's Institutional Review Board. The grouping ensured a balanced distribution by gender and academic year to minimize potential confounding variables. Participant demographics and group assignments are detailed in Table 1.

Table 1. Participant demographics and group assignment

Variable	Experimental Group ($n = 30$)	Control Group ($n = 30$)	Total ($N = 60$)
Gender			
- Male	16	16	32
- Female	14	14	28
Mean Age (Years)	20.4 ± 1.5	20.2 ± 1.7	20.3 ± 1.6
Academic Year			
- First Year	10	11	21
- Second Year	9	8	17
- Third Year	6	7	13
- Fourth Year	5	4	9

Intervention

The intervention spanned eight weeks and was designed to integrate information-support resources into traditional sports instruction for the experimental group, while the control group received standard physical education sessions focused on the same traditional sports without digital enhancement. Participants in the experimental group engaged with a variety of multimedia tools, including instructional videos, digital storytelling modules, interactive quizzes, and mobile applications, all centered on the cultural significance, historical context, and rules of selected traditional sports such as togyz kumalak and Kazakh kuresi.

Figure 1. Sample of Students Engaging in the Traditional Intellectual Game Togyz Kumalak During the Intervention.



Sessions were conducted twice weekly, with each lasting 90 minutes and consisting of a balanced combination of theoretical learning and practical performance. The information-support resources were accessed via tablets provided during class and were aligned with each session's learning objectives. In contrast, the control group received instructor-led training through conventional methods such as verbal explanations, physical demonstrations, and printed materials. Both groups were taught by the same

instructors to maintain consistency in pedagogical delivery and content coverage. Figure 1 demonstrates a sample scene of students engaging in the traditional intellectual game togyz kumalak during the intervention phase.

Figure 2 illustrates a dynamic moment from a session of Kazakh kuresi, a traditional form of Kazakh wrestling that emphasizes balance, technique, and cultural symbolism. As part of the intervention, students practiced this indigenous sport under guided instruction, applying both physical skills and knowledge acquired through information-support resources. This integration helped deepen their understanding of the sport's rules, values, and historical significance, reinforcing cultural heritage through embodied learning experiences.

Figure 2. Demonstration of a Wrestling Technique in a Kazakh Kuresi Training Session.



Information-Support Resources

The information-support resources used in the intervention were specifically designed to enhance students' understanding of traditional sports through culturally immersive and pedagogically structured content. These resources included interactive modules and videos that explained the rules, tactics, and historical background of traditional games such as togyz kumalak and Kazakh kuresi. Additionally, infographics were utilized to visually convey elements of traditional clothing, rituals, and competition structures, providing students with accessible cultural context. Augmented and virtual reality (AR/VR) components further enriched the learning experience by offering simulated exposure to traditional sports festivals and ceremonial events. These tools were accessible via tablets during class sessions and were integrated with practical training to create a holistic educational experience that combined cognitive, affective, and physical learning dimensions.

Data Collection

Data collection was conducted at three stages: pre-intervention, post-intervention, and follow-up (two weeks after completion) to assess both immediate and retained effects of the instructional approach. A mixed-methods strategy was employed to gather both quantitative and qualitative data. Quantitative data were obtained through standardized tests measuring cultural knowledge, motivation scales adapted for physical education contexts, and performance-based assessments specific to togyz kumalak and Kazakh kuresi. These instruments were validated by subject matter experts prior to administration. Observational checklists and instructor logs were also maintained during each session to monitor engagement, participation, and skill progression. Additionally, semi-structured interviews were conducted with selected participants from both groups at the end of the intervention to gain deeper insights into their experiences, perceptions, and attitudes toward traditional sports and cultural heritage. All data

collection procedures were carried out under consistent conditions, and confidentiality was ensured through anonymized coding of responses.

Measured Outcomes

The study focused on four primary outcome variables to evaluate the effectiveness of the intervention: cultural knowledge, attitudinal change, motivation and engagement, and physical skill acquisition. Cultural knowledge was assessed using a researcher-developed test comprising multiple-choice and short-answer questions focused on the history, symbolism, rules, and cultural context of togyz kumalak and Kazakh kuresi. Attitudinal change toward cultural preservation and traditional sports was measured using a 5-point Likert scale questionnaire administered before and after the intervention. Motivation and engagement levels were evaluated using a modified version of the Sport Motivation Scale (SMS-II), along with attendance records and observational checklists tracking participation and enthusiasm during sessions. Lastly, physical skill acquisition was measured through performance-based evaluations, where trained instructors rated participants on technique, rule compliance, and tactical application during structured games and matches. These outcome measures allowed for a comprehensive analysis of cognitive, affective, and psychomotor domains, supporting a holistic assessment of the impact of information-support resources in traditional sports education. The instruments and methods used to assess each outcome variable are summarized in Table 2.

Table 2. Summary of Measured Outcomes and Assessment Tools

Outcome Variable	Definition	Measurement Tool	Data Type
Cultural Knowledge	Understanding of historical, symbolic, and rule-based aspects of traditional sports	Researcher-developed knowledge test (multiple choice + short answers)	Quantitative
Attitudinal Change	Shift in perceptions and values toward cultural heritage and preservation	5-point Likert scale questionnaire (pre- and post-intervention)	Quantitative
Motivation and Engagement	Level of interest, enthusiasm, and participation in traditional sport sessions	Sport Motivation Scale (SMS-II), attendance logs, observations	Quantitative + Qualitative
Physical Skill Acquisition	Demonstrated competency in performing sport-specific techniques and tactics	Instructor performance evaluation rubric	Quantitative + Qualitative

Hypotheses Formulation

To evaluate the effectiveness of integrating information-support resources into traditional sports education, the study was guided by five research hypotheses targeting cognitive, affective, and psychomotor learning domains. These hypotheses were formulated to assess differences between the experimental and control groups across cultural knowledge, attitudes, motivation, skill development, and retention. The null and alternative hypotheses for each outcome are presented below:

Hypothesis 1: Cultural Knowledge Gain

H₀ (Null Hypothesis): There is no significant difference in the gain of cultural knowledge between students who use information-support resources and those who do not.

H₁ (Alternative Hypothesis): Students in the experimental group will show significantly higher cultural knowledge scores compared to the control group.

Hypothesis 2: Attitudinal Shift

H₀ (Null Hypothesis): Information-support resources do not influence students' attitudes toward preserving cultural heritage.

H₁ (Alternative Hypothesis): Students using information-support resources will develop more positive attitudes toward cultural preservation through traditional sports.

Hypothesis 3: Motivation and Engagement

H₀ (Null Hypothesis): There is no significant difference in motivation or engagement between both groups.



H_1 (Alternative Hypothesis): The integration of information-support tools enhances student motivation and engagement in traditional sports sessions.

Hypothesis 4: Skill Development

H_0 (Null Hypothesis): Information-support resources do not affect physical skill acquisition in traditional sports.

H_1 (Alternative Hypothesis): Students with access to such resources show higher improvement in performance and skill acquisition.

Hypothesis 5: Knowledge Retention

H_0 (Null Hypothesis): Students in both groups retain cultural information at similar levels after one month.

H_1 (Alternative Hypothesis): Students in the experimental group retain cultural and historical knowledge longer due to multimedia reinforcement.

Results

This section presents the empirical findings derived from the analysis of data collected throughout the intervention. It includes statistical comparisons between the experimental and control groups across multiple outcome variables, such as cultural knowledge, attitudes, motivation, engagement, and skill acquisition. The findings are organized according to the study's hypotheses and are supported by tables and visual representations for clarity.

Table 3. ANCOVA Results for Cultural Knowledge Post-Test Scores (Pre-Test as Covariate)

Source	SS	df	MS	F	p-value	Partial η^2
Pre-Test (Covariate)	42.178	1	42.178	9.216	0.004	0.139
Group (Treatment)	3.865	1	3.865	0.845	0.362	0.015
Error	261.537	57	4.589			
Total	307.580	59				

As shown in Table 3, the ANCOVA analysis revealed no statistically significant difference in post-test cultural knowledge scores between the experimental and control groups after controlling for pre-test scores. While the covariate (pre-test performance) had a significant effect on post-test outcomes, indicating that initial knowledge levels influenced final scores, the treatment effect of using information-support resources was not significant. This suggests that the intervention did not result in a measurable improvement in cultural knowledge compared to traditional instruction methods. Therefore, the results support the null hypothesis (H_0) for Hypothesis 1, indicating that the integration of digital learning tools did not significantly enhance knowledge acquisition regarding traditional sports.

Table 4. Chi-Square Test of Motivation and Engagement Levels by Group

Group	M	SD	n	t	df	p-value
Experimental Group	4.38	0.41	30			
Control Group	3.92	0.47	30	3.80	58	0.0004

As presented in Table 4, the independent samples t-test revealed a statistically significant difference in post-intervention attitudinal scores between the experimental and control groups. Students who engaged with information-support resources demonstrated more positive attitudes toward cultural heritage preservation compared to those who received traditional instruction. The observed effect size was large, indicating not only statistical significance but also practical relevance in terms of the intervention's impact on learners' values and perceptions. These results support the alternative hypothesis (H_1) for Hypothesis 2, confirming that digital enrichment tools can effectively enhance students' attitudinal orientation toward preserving traditional cultural practices through sport.

Table 5. Chi-Square Test of Motivation and Engagement Levels by Group

Motivation & Engagement Level	Experimental Group	Control Group	Total
High	18	9	27
Moderate	10	13	23
Low	2	8	10
Total	30	30	60
Statistic	Value		
χ^2 (df = 2)	8.56		
p-value	0.013		
Cramér's V	0.38		

As shown in Table 5, the chi-square analysis revealed a statistically significant association between group membership and levels of motivation and engagement, indicating that students in the experimental group were more likely to exhibit higher levels of motivation compared to those in the control group. The moderate effect size further suggests that the observed relationship is meaningful in practical terms. These findings support the alternative hypothesis (H_1) for Hypothesis 3, demonstrating that the integration of information-support resources positively influenced student enthusiasm, participation, and sustained interest in traditional sports activities.

Table 6. Independent Samples t-Test Results for Physical Skill Performance Scores

Group	M	SD	n	t	df	p-value
Experimental Group	82.3	6.8	30			
Control Group	80.7	7.2	30	0.88	58	0.384

As presented in Table 6, the independent samples t-test revealed no statistically significant difference in physical skill performance between the experimental and control groups. Although the experimental group exhibited a slightly higher mean score, the difference was not large enough to reach statistical significance, and the effect size was minimal. These findings indicate that the integration of information-support resources did not have a measurable impact on students' practical skill acquisition in traditional sports when compared to conventional instructional methods. Consequently, the results support the null hypothesis (H_0) for Hypothesis 4, suggesting that both instructional approaches were equally effective in developing physical competencies.

Table 7. Repeated Measures ANOVA Results for Cultural Knowledge Retention

Source	SS	df	MS	F	p-value	Partial η^2
Time	189.342	2	94.671	24.83	<0.001	0.301
Group	36.127	1	36.127	6.48	0.014	0.102
Time $\times$ Group	57.812	2	28.906	7.58	0.001	0.208
Error (within)	434.985	116	3.750			

As shown in Table 7, the repeated measures ANOVA revealed a statistically significant interaction between time and group, indicating that the pattern of change in cultural knowledge scores over time differed between the experimental and control groups. While both groups demonstrated improvement from pre-test to post-test, only the experimental group maintained a significantly higher level of knowledge at the follow-up stage, suggesting stronger retention. The main effect of time and group were also significant, confirming overall gains and group differences. These results support the alternative hypothesis (H_1) for Hypothesis 5, providing evidence that the use of information-support resources contributed to more durable learning and long-term retention of cultural knowledge related to traditional sports.

Figure 3. Sample of Students Engaging in the Traditional Intellectual Game Togyz Kumalak During the Intervention.



The results support the effectiveness of information-support resources in enhancing students' motivation, engagement, and retention of cultural knowledge within traditional sports education. As illustrated in Figure 3, the summary visualization of all five hypotheses clearly highlights the domains where the intervention produced meaningful differences, particularly in attitudinal outcomes and sustained learning effects. While no significant gains were observed in immediate skill acquisition or cultural knowledge post-tests, the experimental group consistently outperformed the control group in affective and long-term cognitive measures. These findings affirm the pedagogical value of integrating digital tools to revitalize cultural heritage through experiential and enriched learning.

In addition to quantitative results, qualitative data were collected through semi-structured interviews conducted with ten randomly selected participants from both the experimental and control groups to gain deeper insights into their experiences during the intervention. Thematic analysis revealed three main themes: cultural awareness, motivation and engagement, and perceived learning benefits.

Participants from the experimental group frequently expressed heightened cultural awareness, noting that multimedia resources and virtual experiences allowed them to better understand the symbolism, history, and traditions behind games such as Togyz Kumalak and Kazakh Kuresi. Several students highlighted that "interactive videos and infographics made learning about traditional sports more meaningful and connected to our heritage."

Regarding motivation and engagement, students in the experimental group described feeling more excited and involved in sessions that incorporated digital tools. One participant stated that "using AR and interactive modules made the training more enjoyable and encouraged me to participate actively." In contrast, students in the control group indicated that while they valued practical training, they found the sessions less stimulating without supplementary digital content.

Finally, under the theme of perceived learning benefits, students from the experimental group emphasized that the integration of information-support resources helped them retain cultural knowledge more effectively. They reported that "having access to virtual content after sessions made it easier to revisit and understand concepts," which aligns with the quantitative results on knowledge retention.

These qualitative insights complement the statistical findings, providing richer evidence that integrating information-support resources enhances students' cultural engagement, motivation, and long-term learning outcomes.

Discussion

This study examined the impact of integrating information-support resources into traditional sports education as a means to revitalize cultural heritage among university students. The findings provide partial support for the hypothesized benefits of digital interventions, particularly in enhancing students' attitudes toward cultural preservation, motivation and engagement levels, and long-term knowledge retention. These results contribute to the growing body of literature advocating for the application of digital technologies in culturally responsive pedagogies (Zhang & Zhang, 2025; Omarov et al., 2024).

One of the most notable findings was the significant improvement in students' attitudes toward preserving cultural heritage through traditional sports in the experimental group. This result aligns with previous studies indicating that multimedia content and digital storytelling can effectively evoke emotional engagement and foster appreciation for cultural narratives (Le et al., 2025; Retzepis et al., 2024). The attitudinal shift suggests that when learners are immersed in culturally enriched environments via interactive digital tools, they are more likely to internalize the value of indigenous practices and traditions. Such affective outcomes are particularly relevant for educational institutions aiming to preserve intangible heritage in increasingly globalized contexts (Backhouse, 2023).

The results also indicated that motivation and engagement levels were significantly higher in the experimental group, reinforcing earlier research that emphasizes the motivational benefits of technology-enhanced learning environments (Karataş & Aydos, 2023; Yang et al., 2021). As shown in Figure 2, students actively participating in traditional sports like Kazakh kuresi displayed not only physical commitment but also cultural immersion, which was likely amplified by access to infographics, AR/VR experiences, and gamified learning modules. This multidimensional engagement aligns with the principles of constructivist learning, where learners construct knowledge more effectively when they are active participants in meaningful, culturally situated tasks (Li & Shi, 2022).

Contrary to expectations, no significant differences were observed between the experimental and control groups in terms of immediate cultural knowledge gain and physical skill acquisition. These findings mirror those of Pan et al. (2024), who argued that while digital resources can enhance understanding and motivation, they do not automatically translate into superior performance outcomes in physically embodied activities. One explanation could be that skill development in traditional sports requires prolonged and repetitive physical practice, which may not be significantly influenced by digital augmentation alone over a short intervention period. Likewise, knowledge acquisition might be contingent on factors such as instructional time, cognitive load, or assessment alignment, which warrant further investigation.

However, the experimental group demonstrated significantly better knowledge retention during the follow-up phase, supporting the hypothesis that multimedia reinforcement facilitates long-term memory consolidation. These results corroborate prior findings in educational psychology that multimodal content delivery can enhance cognitive processing and reduce forgetting (Pereira et al., 2022). The sustained retention also underscores the utility of digital archives, mobile learning applications, and interactive storytelling in fostering deeper, more lasting engagement with cultural content.

Taken together, these outcomes suggest that information-support resources hold considerable potential for enhancing the cultural and motivational dimensions of traditional sports education. They offer an effective supplement to conventional instruction, particularly in cultivating affective and cognitive engagement. However, the limited impact on immediate performance outcomes also signals the need for integrative strategies that balance digital enrichment with sustained physical practice. Moreover, future studies should consider longer interventions, larger sample sizes, and the inclusion of qualitative reflections to capture nuanced learner experiences.

In conclusion, this study affirms that revitalizing cultural heritage through traditional sports can be significantly supported by the strategic integration of information-support resources. Such an approach not only modernizes cultural education but also bridges the gap between tradition and technology in a way that resonates with today's learners.

Although the study presents promising findings regarding the role of information-support resources in revitalizing cultural heritage through traditional sports, certain limitations should be considered when interpreting the results. First, the relatively small sample size and single-institution context limit the



generalizability of the findings to broader populations. Second, the duration of the intervention and follow-up period may not have been sufficient to capture long-term impacts on skill acquisition or cultural integration. Third, while qualitative insights from semi-structured interviews enriched the interpretation of results, future studies should incorporate more extensive qualitative data to explore learners' perceptions in greater depth. Lastly, the study focused on short-term educational outcomes and did not examine potential implications for educational policies, which could inform systemic integration of traditional sports into curricula. Future research should address these aspects by employing larger, multi-institutional samples, extended follow-up periods, and mixed-method designs for a more comprehensive understanding.

Conclusions

This study explored the role of information-support resources in revitalizing cultural heritage through traditional sports education, employing a controlled experimental design to assess cognitive, affective, and behavioral outcomes among university students. The findings demonstrate that the integration of digital tools such as interactive modules, infographics, and AR/VR experiences significantly enhances student motivation, engagement, attitudinal orientation toward cultural preservation, and knowledge retention. These results highlight the value of technology-enhanced pedagogies in fostering deeper cultural understanding and sustained interest in indigenous practices. However, the study also revealed that such resources do not necessarily translate into immediate improvements in physical skill acquisition or cultural knowledge gain when compared to traditional instruction alone. This suggests that while digital content can reinforce cultural learning, embodied competencies still require hands-on, repetitive practice. The study's outcomes point to the importance of blending conventional and digital instructional strategies to maximize educational impact in physical education settings. As traditional sports continue to face marginalization in modern curricula, incorporating culturally meaningful digital resources may serve as a viable path to preservation and renewal. Future research should examine long-term effects, diverse learner populations, and hybrid instructional models to further validate and expand on these findings within broader educational and cultural contexts.

Acknowledgements

This research was funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan with the grant "Study of the information potential of religious tourism facilities in the Turkestan region: development of a multimedia interactive atlas in 4 languages." (Grant No. AP23490104).

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