Scientific Research Publishing

Open Journal of Social Sciences, 2025, 13(6), 583-604
https://www.scirp.org/journal/jss
ISSN Online: 2327-5960
ISSN Print: 2327-5952

Challenges and Solutions in Implementing Multimedia in the Classroom

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How to cite this paper: Thaqi, V., & Atanasoska, T. (2025). Challenges and Solutions in Implementing Multimedia in the Classroom. *Open Journal of Social Sciences, 13,* 583-604.
https://doi.org/10.4236/jss.2025.136039

Received: May 23, 2025
Accepted: June 27, 2025
Published: June 30, 2025

Abstract

This study explores the integration of multimedia tools in classrooms across Kosovo, highlighting the challenges teachers face and the impact of digital resources on student learning. Employing a mixed-methods design, it combines quantitative data from a Likert-scale questionnaire completed by 100 teachers and semi-structured interviews of 20 teachers with qualitative insights. Findings reveal significant barriers, including outdated infrastructure, limited access to advanced technologies, poor internet connectivity, and lack of technical support, particularly in rural schools. Professional development is often insufficient and overly theoretical, hindering effective multimedia integration. Despite these obstacles, teachers recognize the positive impact of multimedia such as videos, simulations, and interactive content—on student engagement, understanding, and retention. Informal peer support and self-directed learning partially mitigate these challenges. The study emphasizes the need for targeted investments in infrastructure, enhanced technical support, and practical, ongoing teacher training. Addressing these gaps will foster a more inclusive and effective digital learning environment that aligns with 21st-century educational practices in Kosovo.

Keywords

Multimedia Integration, Kosovo Education, Technology in Education, Professional Development, Student Engagement, Educational Policy

1. Introduction

In today's digital age, the integration of multimedia tools into education is increasingly essential for enhancing teaching and learning. Multimedia resources including videos, simulations, digital storytelling, and visual aids serve as powerful tools to support student engagement, cater to diverse learning styles, and simplify complex concepts. These tools enable more interactive lessons, foster student

participation, and improve comprehension. However, despite these benefits, educators face several challenges that hinder the effective use of multimedia in classrooms.

This study explores the specific barriers teachers in Kosovo encounter when incorporating multimedia into instruction. While multimedia has the potential to transform traditional pedagogy, its success depends on several key factors: teacher readiness, access to modern technologies, institutional support, and alignment with curricular goals. Among the most prevalent challenges are outdated infrastructure, limited training, insufficient resources, and weak curriculum integration.

Many schools, particularly in rural or underserved areas, operate with outdated technological infrastructure. Access to essential tools such as projectors, computers, and reliable internet is inconsistent, and advanced tools like interactive whiteboards and tablets are scarce. This digital divide significantly hinders the ability of teachers to integrate multimedia effectively, especially where internet access remains unreliable.

The absence of technical support further exacerbates the situation. In most schools, teachers must resolve technical issues independently, leading to frustration and underuse of available resources. Without dedicated IT personnel, even basic technological problems can become barriers to implementation.

Another core issue is the lack of digital competencies among educators. Although digital tools are becoming more prevalent, many teachers are not adequately trained to use them effectively. Existing professional development programs are often overly theoretical, failing to provide the hands-on training required for practical application in real classroom settings. There is also a lack of continuous, updated training to help teachers keep pace with rapid technological changes and pedagogical innovations in digital education.

Curriculum alignment presents an additional challenge. While Kosovo's national curriculum outlines clear academic standards, many multimedia tools are not specifically designed to align with these objectives. As a result, teachers must either develop their own content—often without the necessary technical skills or rely on external materials that may not fit their instructional needs. This misalignment can lead to fragmented or inconsistent multimedia use across schools and subjects.

Resistance to change, particularly among teachers and administrators, is another barrier. Some educators are hesitant to adopt multimedia tools due to concerns over increased workload, lack of familiarity, or skepticism about their effectiveness. Without a clear understanding of the benefits, multimedia integration may be perceived as burdensome rather than enriching.

Financial constraints also play a significant role. Many schools struggle with limited budgets, which makes it difficult to invest in modern technology or maintain existing equipment. As a result, priority is often given to other pressing needs, delaying technological advancement and deepening the digital divide between schools.

This study aims to identify these challenges and propose evidence-based strategies to support multimedia integration in education. Through a combination of teacher surveys and in-depth interviews, the research identifies recurring obstacles and highlights examples of successful multimedia implementation.

Some educators have found ways to adapt. Peer collaboration, mentoring, and self-directed learning such as engaging with online forums and tutorials are helping some teachers enhance their digital competencies. In schools where technical support or peer learning communities are available, teachers report more effective use of multimedia and better student engagement.

The study recommends several actionable steps to overcome existing barriers. First, there must be greater investment in educational infrastructure, including improved internet access and the provision of advanced multimedia tools. Second, schools should employ dedicated IT personnel to provide timely technical support. Third, professional development programs need to be restructured to focus on practical, hands-on training that is ongoing and directly applicable to the classroom context.

To support curriculum alignment, efforts should be made to develop or source multimedia content that is compatible with national standards. This would reduce the burden on teachers and ensure consistent, high-quality digital instruction across schools. Additionally, fostering a culture of collaboration among educators is essential. By creating platforms for teachers to share resources and best practices, schools can encourage innovation and collective problem-solving.

Collaboration between government agencies, schools, and international partners will also be crucial. Joint efforts can support funding initiatives, teacher training, and the development of relevant digital content, leading to a more equitable and effective digital learning environment.

This study addresses two critical questions: What are the main challenges to using multimedia in classrooms, and what strategies can help educators overcome them? The findings suggest that a multifaceted approach is needed—one that includes infrastructure upgrades, targeted training, curriculum support, and collaborative professional communities.

By addressing these challenges, Kosovo can create a modern educational system equipped for the digital age. Effective integration of multimedia will not only enhance student engagement and achievement but also prepare young learners with the digital skills needed to thrive in a rapidly evolving world.

2. Review of Literature

The integration of multimedia tools in education has garnered significant attention in recent years due to its potential to transform traditional learning environments. Multimedia resources such as videos, interactive simulations, digital storytelling, and visual aids are increasingly recognized for their ability to enhance student engagement, cater to diverse learning styles, and simplify complex or abstract concepts. Extensive research highlights the effectiveness of multimedia in

improving both cognitive and affective outcomes for students. By providing a dynamic and interactive approach to learning, multimedia tools help engage students more actively in the learning process. This review examines the benefits of multimedia in the classroom, the challenges educators face in its implementation, and the strategies recommended in existing literature to overcome these barriers.

2.1. Benefits of Multimedia in Education

The integration of multimedia in education has significantly transformed teaching and learning processes, offering dynamic and interactive methods that engage students and enhance educational outcomes. By combining text, images, audio, video, and interactive elements, multimedia stimulates multiple senses, making learning experiences more captivating and enjoyable. This multidimensional approach ensures that students remain focused and interested, fostering active participation in the classroom.

One of the most notable benefits of multimedia is its ability to improve comprehension and retention of information. Complex concepts become more accessible through visual and auditory presentations, such as animations and simulations. These tools break down abstract ideas into understandable components, enabling students to grasp challenging subjects more effectively. Furthermore, multimedia supports personalized learning by catering to diverse learning styles, including visual, auditory, and kinesthetic preferences. Interactive tools allow learners to proceed at their own pace, addressing individual needs and promoting self-directed learning.

Research highlights several benefits of multimedia for students and teachers. Studies by Mayer (2001), Clark & Mayer (2016) support the notion that multimedia tools can enhance learning outcomes by catering to different sensory modalities, helping students to process information through visual, auditory, and kinesthetic means. Multimedia also supports diverse learning styles, offering various ways for students to engage with the material, which can be especially beneficial in inclusive classrooms with students of varying abilities (Moreno & Mayer, 2007). Additionally, research suggests that multimedia fosters deeper understanding, especially in complex subjects like science and math, by presenting information in visually appealing and interactive formats that can reduce cognitive load (Sweller, 2005).

Multimedia also plays a critical role in developing students' critical thinking and problem-solving skills. Interactive platforms and digital simulations encourage students to analyze and interpret information, fostering deeper cognitive engagement. Collaborative tools further enhance learning by enabling group discussions, shared projects, and teamwork, which are essential for building communication and interpersonal skills.

In addition to enhancing engagement and academic performance, multimedia ensures accessibility and inclusivity. Tools such as text-to-speech software, subtitles, and visual aids help accommodate students with special needs, providing equal opportunities for learning. This inclusivity creates a supportive environment where all learners can thrive.

Another significant advantage is the real-world applicability of multimedia resources. Case studies, simulations, and interactive exercises bridge the gap between theoretical knowledge and practical applications, preparing students for real-life challenges. Moreover, the engaging nature of multimedia fosters creativity and motivation, encouraging learners to explore subjects in depth and develop a lifelong passion for learning.

For educators, multimedia simplifies teaching by providing high-quality, ready-to-use materials and tools to track student progress effectively. It reduces the complexity of presenting difficult topics, enhancing teaching efficiency and effectiveness. Furthermore, multimedia extends the reach of education by providing access to global resources, enabling students to gain a broader perspective and fostering connections across cultures.

Multimedia in education enriches the learning experience by making it more engaging, inclusive, and impactful. It empowers both students and teachers, equipping them with the skills and knowledge necessary to thrive in a rapidly evolving digital world.

2.2. Challenges in Implementing Multimedia in Kosovo Schools

While multimedia has the potential to transform teaching and learning, its integration in Kosovo's schools faces numerous challenges that limit its effectiveness and widespread adoption. One of the most significant barriers is the lack of adequate infrastructure and technical support. Many schools, particularly in rural or underfunded areas, lack access to essential tools such as computers, projectors, interactive whiteboards, and reliable internet connectivity. Without these resources, teachers struggle to incorporate multimedia effectively into their lessons. This disparity is especially evident in rural Kosovo, where infrastructural gaps remain a persistent issue (Ertmer et al., 2012; Kafyulilo et al., 2015). Although focused on Tanzania, the study by Kafyulilo et al. (2015) is globally relevant, as it highlights the importance of developing Technological Pedagogical Content Knowledge (TPACK) in teacher education. Likewise, Ertmer et al. (2012) emphasize that intrinsic barriers such as pedagogical beliefs and low confidence can be even more challenging than external limitations like infrastructure.

Teacher preparedness and professional development also represent significant challenges. A considerable number of educators in Kosovo lack the training and confidence needed to utilize multimedia effectively in their classrooms. Professional development programs that focus on building digital skills and integrating multimedia into curriculum planning are limited. As Hew & Brush (2007) argue, targeted and sustained training can enhance teacher competence and adoption rates, but the absence of such opportunities often leaves teachers feeling overwhelmed and resistant to technological changes.

Aligning multimedia resources with the national curriculum adds another layer of complexity. While the abundance of multimedia tools can enrich education, it also creates challenges for teachers in Kosovo who struggle to find or

adapt resources that meet the specific objectives of the national education framework. Koehler & Mishra (2009)'s Technological Pedagogical Content Knowledge (TPACK) framework emphasizes the need for teachers to balance technology, pedagogy, and content knowledge effectively. Without this framework, teachers may find it challenging to use multimedia tools in ways that align with both curriculum requirements and student needs.

Time constraints further hinder the implementation of multimedia in Kosovo's schools. Teachers often cite insufficient time to explore and experiment with digital tools, prepare multimedia-enhanced lessons, and troubleshoot technical issues. Many schools do not allocate additional time or provide sufficient technical support for educators, further limiting their ability to integrate multimedia effectively. This mirrors findings in international research, where time and support are often highlighted as critical factors in successful multimedia implementation (Ertmer et al., 2012).

Student-related challenges also arise in the use of multimedia. While such tools can enhance engagement, excessive reliance on multimedia can sometimes distract students from the lesson's core content. Moreover, disparities in digital literacy among students, particularly between those in urban areas with greater exposure to technology and their peers in rural regions, can lead to unequal learning outcomes.

Financial constraints compound these issues. Multimedia integration requires significant investment in infrastructure, software, and training programs. With limited budgets, many schools in Kosovo prioritize other needs over technology, leaving multimedia initiatives underfunded. This financial gap perpetuates inequalities, as schools in urban centers often have better access to resources compared to their rural counterparts.

Finally, resistance to change among educators and administrators poses an additional challenge. Skepticism about the effectiveness of multimedia tools, fears of disrupting traditional teaching methods, and concerns about increased workload can create roadblocks to implementation. This reluctance is often rooted in a lack of awareness about the benefits of multimedia and the absence of a clear, unified vision for its use in education.

Addressing these challenges in Kosovo's schools requires a comprehensive and multifaceted approach. This includes improving infrastructure, providing targeted professional development for teachers, aligning multimedia with curriculum standards, and addressing financial and cultural barriers. By tackling these interconnected issues, Kosovo can pave the way for more effective and equitable integration of multimedia, ultimately enhancing the quality of education and preparing students for success in the digital age.

2.3. Strategies for Effective Multimedia Integration in Kosovo Schools

To fully unlock the potential of multimedia in Kosovo's classrooms, a structured

and strategic approach tailored to the local context is essential. Effective integration requires addressing barriers while leveraging opportunities to enhance teaching and learning. Below are strategies that can support schools, teachers, and policymakers in Kosovo to effectively implement multimedia in education.

Investing in ongoing professional development for teachers is a cornerstone for successful multimedia integration. Research by Desimone & Garet (2015) emphasizes that professional development must be interactive, continuous, and responsive to teachers' specific needs. In Kosovo, workshops, hands-on training programs, and peer mentoring initiatives can equip educators with the confidence and skills required to integrate multimedia effectively. Incorporating multimedia training into pre-service teacher education programs is another critical step to ensure that new teachers enter the profession with robust digital competencies.

Fostering partnerships between teachers and technology specialists can address technical and pedagogical challenges. Interdisciplinary teams where educators work alongside IT professionals can help design and implement multimedia-enhanced lessons tailored to curriculum requirements. Studies by Ertmer et al. (2012) underscore the value of such collaborations in improving multimedia adoption. In Kosovo, regional or municipal education offices could facilitate these partnerships by employing IT coordinators to support schools in rural and urban areas alike.

Peer learning among teachers is another valuable strategy. Experienced educators who are proficient in multimedia tools can mentor their colleagues, fostering a collaborative culture where knowledge sharing enhances overall capacity.

Access to high-quality, curriculum-aligned multimedia resources can significantly reduce the workload for teachers. Many educators in Kosovo spend considerable time searching for appropriate materials, which can discourage the use of digital tools. Establishing centralized repositories of multimedia content such as lesson plans, videos, and interactive exercises aligned with Kosovo's national curriculum can alleviate this challenge. Platforms like Open Educational Resources (OER) or locally developed content libraries could be instrumental in this process.

Simplifying multimedia platforms is critical to lowering the barriers to adoption, especially for teachers with limited technical expertise. According to Koehler & Mishra (2009)'s Technological Pedagogical Content Knowledge (TPACK) framework, tools that seamlessly integrate with pedagogy and content goals are more likely to be embraced. In Kosovo, investing in intuitive platforms with multilingual interfaces and robust customer support can empower teachers to focus on teaching rather than troubleshooting technical issues.

Robust infrastructure is a foundational requirement for effective multimedia use. Many schools in Kosovo, particularly in rural areas, lack reliable internet connectivity, up-to-date hardware, or adequate technical support. Addressing these gaps requires coordinated efforts among government bodies, international organizations, and private sector partners. Investing in modernizing infrastructure, equipping schools with multimedia tools, and hiring IT support staff will create an enabling environment for teachers and students.

For example, the Ministry of Education, Science, Technology, and Innovation in

Kosovo could collaborate with international NGOs and tech companies to establish pilot programs aimed at improving digital infrastructure in underfunded regions.

The integration of multimedia policies into Kosovo's education system can provide a structured framework for teachers. Policies should outline best practices for multimedia use, expectations for student engagement, and methods for evaluating its effectiveness. Flexibility within these guidelines is crucial to address the diverse needs of urban and rural schools. Additionally, policymakers should ensure that these guidelines align with broader education strategies, such as Kosovo's Education Strategic Plan.

Encouraging student involvement in multimedia activities can enhance engagement and motivation. When students actively participate in creating multimedia projects such as videos, digital storytelling, and interactive presentations they develop critical thinking, creativity, and collaboration skills. Training students to use these tools responsibly also ensures they gain digital literacy skills that extend beyond the classroom. In Kosovo, integrating project-based learning approaches with multimedia tools can help foster a culture of active learning.

To sustain multimedia integration, schools must encourage teachers to experiment with new tools and methods without fear of failure. Recognizing and rewarding successful multimedia practices can motivate educators to innovate. Establishing "innovation hubs" in schools or regions, where teachers can share experiences and learn from each other, can further drive creative use of multimedia. Regular feedback from students and educators can refine strategies and ensure they remain relevant.

Multimedia integration requires a significant financial investment. Limited budgets are a common constraint in Kosovo's education system, making partnerships with government agencies, private organizations, and international donors essential. For instance, public-private partnerships could provide funding for equipment, software licenses, and teacher training programs. Additionally, leveraging grant opportunities from the European Union or international organizations like UNICEF and UNESCO can help bridge funding gaps.

Effective multimedia integration in Kosovo's schools requires a multifaceted approach that addresses barriers related to infrastructure, teacher training, curriculum alignment, and financial constraints. By investing in professional development, fostering collaboration, providing access to resources, and building supportive infrastructure, schools can create an environment where multimedia tools significantly enhance learning outcomes. These strategies emphasize the importance of clear policies, ongoing support, and a culture of innovation to unlock the transformative potential of multimedia in Kosovo's education system.

3. Hypotheses

H1: Teachers face major challenges in using multimedia due to limited resources, technical support, and training.

H2: Teachers with targeted training and access to quality multimedia resources feel more confident and effective.

H3: Schools with clear support structures and policies face fewer barriers and see better multimedia integration.

H4: Effective use of multimedia enhances student engagement and understanding.

Main Research Questions

1) What are the primary challenges that teachers face in integrating multimedia into their classrooms?

2) How does access to resources and professional development impact teachers' ability and confidence to use multimedia in their instruction?

3) What strategies have proven successful for overcoming challenges in multimedia implementation?

4) How does effective multimedia integration influence student engagement and learning outcomes?

4. Methodology

The methodology for this study on the challenges and solutions in implementing multimedia in the classroom is designed to explore both the experiences of educators and the effectiveness of multimedia integration strategies. A mixed-methods approach has been used, combining qualitative and quantitative research methods to provide a comprehensive understanding of the challenges and solutions in implementing multimedia in classrooms.

4.1. Research Design

This study uses a mixed-methods approach, combining quantitative and qualitative data to examine the integration of multimedia tools in education. The quantitative part includes a survey of teachers to gather data on access to technology, infrastructure, training, and barriers to multimedia use. This helps identify common challenges across schools.

The qualitative part involves in-depth interviews with selected teachers to explore their personal experiences, challenges, and solutions in more detail. These interviews provide context and deeper insight into the issues identified in the survey. Together, the two methods offer a well-rounded understanding of multimedia integration in classrooms.

4.2. Purpose of Study and Research Objectives

The purpose of this study is to examine the main challenges Kosovo teachers face when integrating multimedia tools into classroom instruction. It aims to explore barriers such as outdated infrastructure, limited access to advanced technology, unreliable internet, lack of IT support, and insufficient training. The study also seeks to identify strategies that can support more effective use of multimedia in teaching. Objectives of the study:

- To identify the key challenges teachers, encounter in multimedia integration.
- To explore teachers' perceptions and experiences with existing digital tools.

- To investigate practical solutions such as peer mentoring, IT collaboration, and self-directed learning.
- To provide evidence-based recommendations for improving infrastructure, training, and school culture to enhance multimedia use in Kosovo's schools.

4.3. Population and Sample

The population of this study includes teachers from primary and secondary schools working in diverse educational settings. These schools vary in their level of multimedia resource availability, from well-equipped institutions to those with minimal technological infrastructure. Teachers from multiple subject areas and educational levels were considered to ensure a comprehensive understanding of how multimedia is used across different contexts.

Sample—A stratified sampling method was employed to ensure that the study captured diverse perspectives across different teaching contexts. The total sample consisted of 100 teachers who completed the structured questionnaires and a subsample of 20 teachers who participated in semi-structured interviews to provide deeper insights.

The sample was stratified based on three key criteria:

1) Teaching Level—Teachers were selected from both primary and secondary education levels to reflect differences in multimedia use across age groups and curricula.

2) Subject Area—Participants were drawn from STEM subjects, humanities, and other disciplines to represent variation in pedagogical approaches and multimedia application across content areas.

3) School Infrastructure Quality—Schools were categorized based on the quality of technological infrastructure (e.g., availability of internet access, digital tools, and IT support), enabling comparison of experiences between well-resourced and under-resourced environments.

Within each stratum, teachers were randomly selected to ensure balanced and representative participation. This sampling approach allowed for meaningful comparisons and increased the generalizability of findings to broader educational settings in Kosovo.

4.4. Methods

This study employed a mixed-methods approach, combining both qualitative and quantitative research techniques. The following methods were used:

1) Document Analysis—Relevant educational policy documents, teacher training guidelines, and curriculum frameworks were reviewed to provide contextual background and to understand the institutional stance on multimedia integration in schools.

2) Descriptive Method—Used to systematically describe the current state of multimedia use in classrooms, including available infrastructure, teacher preparedness, and frequency of digital tool use.

3) Comparative Method—Applied to compare multimedia usage and challenges across different school settings (e.g., urban vs. rural, primary vs. secondary)

4) Statistical Method (SPSS)—Quantitative data from structured questionnaires were analyzed using SPSS software. Techniques included: Descriptive statistics (frequencies, means, standard deviations) to summarize teacher responses.

4.5. Data Collection Methods

To comprehensively examine the challenges and effectiveness of multimedia integration in classrooms, this study employed a mixed-methods approach, combining both quantitative and qualitative data collection techniques. This methodological framework allowed for a deeper exploration of teachers' experiences, capturing statistical trends through surveys while also providing nuanced personal insights through interviews. The research was guided by four key questions.

Instruments Used

This study utilized two main instruments: a **structured questionnaire** and **semi-structured interviews**.

1) Structured questionnaire: Designed to collect quantitative data from teachers, the questionnaire focused on four key areas: access to multimedia technology, professional development needs, curriculum alignment, and the perceived effectiveness of multimedia in teaching. It included both closed-ended and scaled questions to assess availability of resources, training opportunities, alignment with curricular goals, and impacts on student learning.

2) Semi-structured interviews: Conducted with a selected group of teachers, the interviews aimed to explore deeper insights into their experiences with multimedia tools. Topics included personal implementation practices, encountered challenges and solutions, and observed impacts on student engagement and learning outcomes.

4.6. Data Analysis

The quantitative data from the teacher questionnaire were analyzed using SPSS, applying descriptive statistics such as percentages to summarize key variables related to technology access, training needs, curriculum alignment, and multimedia effectiveness. Data accuracy was ensured through careful entry and cleaning.

The qualitative data from semi-structured interviews were examined through thematic analysis**,** identifying key themes and patterns in teachers' experiences, challenges, and strategies. Interview transcripts were coded and analyzed iteratively to refine themes and highlight meaningful insights.

5. Interpretation of Questionnaire Data

The analysis of data from a Likert-scale questionnaire completed by 100 teachers offers important insights into the challenges and strategies related to multimedia integration in Kosovo's classrooms. Key barriers identified include inadequate infrastructure, insufficient training, and limited technical support, which hinder

effective implementation. However, the findings also highlight effective strategies for overcoming these challenges, such as peer mentoring, collaboration with IT specialists, and participation in professional development programs.

The data from Table 1 provide important insights into the current state of multimedia infrastructure and teacher perceptions regarding access in Kosovo's schools. The results show that computers (75%) and projectors (60%) are the most commonly available multimedia tools in schools, suggesting that basic digital teaching infrastructure is relatively widespread. However, interactive whiteboards (40%) and tablets (35%) are much less accessible, indicating limited integration of more advanced or interactive technologies. Furthermore, only 55% of respondents report having access to reliable internet, which is essential for many multimedia applications, highlighting a significant gap in digital readiness.

Table 1. Access to multimedia tools in schools.

Question	Response Options	Percentage (%)	M	SD
1. Do you have access to the following multimedia tools in your school? (Select all that apply)	Computers	75	–	–
	Interactive whiteboards	40	–	–
	Projectors	60	–	–
	Reliable internet	55	–	–
	Tablets	35	–	–
2. How satisfied are you with the availability of multimedia tools in your school?	Very dissatisfied (1)	10	3.10	1.17
	Dissatisfied (2)	20		
	Neutral (3)	25		
	Satisfied (4)	30		
	Very satisfied (5)	15		
3. Does your school face infrastructure challenges such as unreliable power supply or poor internet connectivity?	Always (5)	15	2.90	1.10
	Often (4)	25		
	Sometimes (3)	35		
	Rarely (2)	20		
	Never (1)	5		

Teachers' satisfaction with the availability of multimedia tools appears to be moderate, with a mean score of 3.10 (SD = 1.17) on a 5-point Likert scale. Specifically, 30% of respondents report being satisfied, while 25% are neutral. However, a notable 30% express dissatisfaction (10% very dissatisfied, 20% dissatisfied), reflecting a polarized view on the adequacy of multimedia resources.

Infrastructure-related challenges such as unreliable power supply and poor internet connectivity continue to hinder effective multimedia use. The mean response to this item is 2.90 (SD = 1.10), indicating that such problems occur "sometimes" to "often". In fact, 75% of teachers report experiencing infrastructure issues at least occasionally, with 15% always and 25% often encountering such problems. This highlights the persistent infrastructural barriers that undermine digital integration efforts.

Overall, while there is some foundational access to multimedia tools in Kosovo's schools, the limited availability of advanced tools, variable satisfaction levels, and frequent infrastructure challenges suggest that further investment and strategic planning are needed to support effective technology integration in education. Improvements in internet reliability, access to up-to-date hardware, and school infrastructure are critical to fostering a more digitally enriched learning environment.

The findings from Table 2 emphasize the critical role of professional development in supporting effective multimedia integration in Kosovo's classrooms. A majority of teachers (60%) report having participated in professional development programs related to multimedia use. However, perceptions of training effectiveness are mixed. While the mean effectiveness rating is 3.25 (SD = 1.22) on a 5-point scale, only 45% of respondents rated the training as effective or very effective, suggesting that many current programs may lack depth, relevance, or practical application. The perceived need for ongoing professional development is strong, with a mean score of 3.70 (SD = 1.18). Notably, 65% of teachers report feeling this need frequently or always, indicating a sustained demand for continuous learning opportunities to keep up with technological advancements and pedagogical integration strategies. Teachers also show a strong consensus on the importance of professional development, with a high agreement level (M = 4.14, SD = 0.90). Specifically, 85% either agree or strongly agree that it is essential for effective multimedia integration.

Table 2. Training and professional development on multimedia integration.

Question	Response Options	Percentage (%)	M	SD
4. Have you participated in professional development programs focused on multimedia integration?	Yes	60	–	–
	No	40	–	–
5. How effective was the training in preparing you to use multimedia tools in the classroom?	Not effective (1)	10	3.25	1.22
	Somewhat effective (2)	25		
	Neutral (3)	20		
	Effective (4)	30		
	Very effective (5)	15		
6. How often do you feel the need for continuous professional development on multimedia integration?	Not at all (1)	5	3.70	1.18
	Rarely (2)	10		
	Occasionally (3)	20		
	Frequently (4)	35		
	Always (5)	30		
7. Do you believe professional development is essential for effective multimedia integration?	Strongly disagree (1)	1	4.14	0.90
	Disagree (2)	4		
	Neutral (3)	10		
	Agree (4)	50		
	Strongly agree (5)	35		

While participation rates in training programs are relatively high, their perceived effectiveness could be improved. The data underscore the necessity for

high-quality, ongoing professional development that is practical, technology-specific, and aligned with classroom needs.

The data in Table 3 reveal significant disparities in technical support across schools in Kosovo. Only 50% of teachers report having access to IT specialists in their schools, indicating that half of the educational institutions lack dedicated personnel to assist with multimedia tools. This shortage likely contributes to the frequency of technical issues reported. Teachers encounter technical difficulties with moderate frequency, as reflected in a mean score of 2.90 (SD = 1.05) on a 5-point scale. While 40% report encountering issues sometimes, an additional 30% face them often or always, suggesting that technical disruptions are a persistent challenge in many schools. Perceptions of the reliability of technical support are mixed. The mean rating is 3.15 (SD = 1.17), with 30% of teachers describing support as unreliable, compared to 40% who find it reliable or very reliable. A notable 30% remain neutral, possibly reflecting inconsistent support or varying expectations.

Table 3. Technical support for using multimedia tools.

Question	Response Options	Percentage (%)	M	SD
8. Does your school have IT specialists to support multimedia tools?	Yes	50	–	–
	No	50	–	–
9. How often do you encounter technical issues while using multimedia tools?	Always (5)	10	2.90	1.05
	Often (4)	20		
	Sometimes (3)	40		
	Rarely (2)	25		
	Never (1)	5		
10. How reliable is the technical support provided at your school?	Very unreliable (1)	10	3.15	1.17
	Unreliable (2)	20		
	Neutral (3)	30		
	Reliable (4)	25		
	Very reliable (5)	15		

The findings indicate that many schools lack consistent and reliable technical support for multimedia use. The relatively frequent occurrence of technical issues, combined with mixed perceptions of support quality, underscores the need for increased investment in dedicated IT staff and more reliable support systems to ensure smooth technology integration in classrooms.

The data in Table 4 underscore the significant role of peer collaboration in helping teachers address challenges in multimedia integration. A substantial 70% of respondents report engaging in peer mentoring, suggesting that collegial support is a widely adopted and valued practice in schools. The effectiveness of this strategy is reflected in a mean score of 3.60 (SD = 1.10), with 60% of teachers rating peer mentoring as either effective or very effective. This highlights the importance of fostering a collaborative professional environment to enhance teachers' confidence and skills in using multimedia tools. In contrast, collaboration

with IT specialists is less common. The mean score for frequency of collaboration is 3.15 (SD = 1.18), indicating moderate engagement. While 40% of teachers report collaborating frequently or always, a combined 30% do so rarely or never. These findings suggest that although IT support is available in some contexts, it is not consistently integrated into teachers' problem-solving practices.

Table 4. Strategies to overcome challenges in using multimedia tools.

Question	Response Options	Percentage (%)	M	SD
11. Do you collaborate with your colleagues (peer mentoring) to overcome challenges in using multimedia tools?	Yes	70	–	–
	No	30	–	–
12. How effective is peer mentoring in helping you use multimedia tools?	Not effective (1)	5	3.60	1.10
	Somewhat effective (2)	15		
	Neutral (3)	20		
	Effective (4)	35		
	Very effective (5)	25		
13. How often do you collaborate with IT specialists to address technical issues?	Never (1)	10	3.15	1.18
	Rarely (2)	20		
	Occasionally (3)	30		
	Frequently (4)	25		
	Always (5)	15		

The data from Table 5 provide strong evidence that teachers perceive multimedia tools as highly beneficial for promoting student engagement and comprehension. A significant 82% of respondents agree or strongly agree that multimedia enhances student engagement, yielding a high mean score of 4.03 (SD = 0.84). Similarly, 76% believe that multimedia improves students' understanding of complex topics, with a comparable mean of 3.99 (SD = 0.97). These results indicate that multimedia integration is seen as an effective pedagogical strategy for both capturing students' attention and facilitating deeper learning. Active student participation during multimedia-integrated lessons is also reported at encouraging levels. With a mean of 3.88 (SD = 0.94), 70% of teachers observe frequent or consistent student involvement, suggesting that multimedia not only enhances understanding but also promotes interactive learning environments.

Table 5. Impact of multimedia tools on student engagement and understanding.

Question	Response Options	%	Mean	SD
16. Do multimedia tools enhance student engagement in your lessons?	Strongly disagree (1)	3%		
	Disagree (2)	5%		
	Neutral (3)	10%		
	Agree (4)	50%	4.03	0.84
	Strongly agree (5)	32%		

Continued

17. Do multimedia tools improve students' understanding of complex topics?	Strongly disagree (1)	3%		
	Disagree (2)	9%		
	Neutral (3)	12%		
	Agree (4)	38%	3.99	0.97
	Strongly agree (5)	38%		
19. How often do your students participate actively during multimedia-integrated lessons?	Never (1)	2%		
	Rarely (2)	8%		
	Sometimes (3)	20%		
	Frequently (4)	40%	3.88	0.94
	Always (5)	30%		

6. Interview Findings from Teacher Interviews

The qualitative data from teacher interviews offer valuable perspectives on the integration of multimedia in Kosovo's classrooms. These insights complement the survey findings, providing a deeper understanding of the challenges, needs, and effective strategies related to digital learning. Below is a detailed analysis of teacher opinions in relation to the key research questions.

1) What are the primary challenges that teachers face in integrating multimedia into their classrooms?

A central challenge highlighted by teachers was the lack of adequate infrastructure, particularly in rural schools. This issue, already evident in survey data, was further elaborated in interviews where teachers shared their frustration with unreliable internet connections, outdated technology, and limited access to multimedia tools.

"*We sometimes have the technology, but the internet is too slow to stream videos or use interactive platforms.*" (*N*3) This statement highlights a significant barrier: even when digital tools are available, poor internet connectivity renders them nearly useless. Teachers described situations where buffering videos, broken links, or slow-loading educational platforms disrupted lesson flow, making it difficult to engage students effectively.

Furthermore, teachers noted that outdated or insufficient multimedia equipment exacerbates the problem. In some cases, schools had only one or two projectors or smartboards for the entire institution, forcing teachers to schedule their use in advance, which limited spontaneity and flexibility in lesson planning.

"*Sometimes we have to wait days or even weeks to use a shared projector, which makes it difficult to plan multimedia lessons effectively.*" (*N*10) This illustrates how limited access to multimedia tools restricts teachers' ability to integrate technology into their daily instruction, leading many to rely on traditional teaching methods instead.

In addition to infrastructure concerns, the lack of sustained professional development was a recurring issue. Many teachers stated that initial training programs

were too short and focused more on theory than practical application.

"*We need more continuous support to keep up with the changes in technology*." (*N*9)

This statement underscores the need for regular, hands-on training sessions that allow teachers to build confidence and competence in using multimedia tools effectively. Without such opportunities, teachers often feel left behind as technology advances.

Another persistent challenge was the absence of technical support within schools. Many teachers reported that when multimedia equipment malfunctioned, they had to troubleshoot issues on their own or simply abandon technology-based lessons altogether.

"*When something breaks or isn't working, we don't have the technical staff to help us fix it*." (*N*11) This lack of IT support means that even well-equipped schools struggle to maximize the use of their resources, as teachers often lack the expertise to resolve technical problems efficiently.

2) How does access to resources and professional development impact teachers' ability and confidence to use multimedia in their instruction?

Access to updated technology and training programs plays a crucial role in shaping teachers' confidence in using multimedia tools. Teachers with regular training and IT support expressed greater willingness to integrate technology into their lessons, while those lacking these resources felt hesitant and unprepared.

"*The support from our IT specialist has been crucial in helping us integrate technology smoothly into our lessons*." (*N*9) This quote illustrates how dedicated IT personnel can empower teachers by troubleshooting technical issues and providing hands-on guidance. Schools with IT specialists reported a significantly higher rate of successful multimedia integration.

Conversely, teachers without consistent professional development often struggled to implement multimedia effectively. Many teachers described situations where they received initial training but lacked follow-up sessions to reinforce their skills.

"*I tried using an interactive whiteboard once, but I wasn't sure how to use all the features, so I stopped*." (*N*5) This example highlights the importance of continuous, practical training. Without proper reinforcement, teachers may abandon digital tools altogether, limiting the potential of multimedia in education.

Moreover, some teachers mentioned the psychological impact of insufficient training, noting that their lack of confidence in using multimedia tools made them feel inadequate or reluctant to experiment with new technologies.

"*I see younger teachers using technology so effortlessly, and I sometimes feel left behind*." (*N*12) This reflects a broader issue: the digital divide among teachers, where those with more exposure to technology feel more competent, while others may struggle with self-doubt and resistance to change.

3) What strategies have proven successful for overcoming challenges in multimedia implementation?

Despite these challenges, teachers have adopted various strategies to enhance their multimedia skills and integrate technology into their classrooms. One of the most effective strategies mentioned was peer mentoring, where experienced teachers supported their colleagues in learning new digital tools.

"*We learn a lot from each other. Those who have worked more with technology help those who are less familiar with it.*" (*N*8) This demonstrates the power of collaborative learning, where teachers support each other through informal training, fostering a culture of knowledge-sharing within schools.

Another effective strategy was seeking external support from IT specialists, particularly in schools where such staff were available. Teachers who had access to IT personnel found that their integration of multimedia tools was significantly smoother and more consistent.

"*If we had at least one IT specialist available in every school, multimedia integration would be much easier.*" (*N*6) This highlights the need for educational policies that allocate IT support staff to schools, ensuring that teachers receive timely assistance in troubleshooting and technical setup.

Additionally, some teachers took the initiative to attend online courses or participate in digital learning communities to improve their skills.

"*I started joining online forums and watching tutorials to improve my use of technology in the classroom.*" (*N*13) This proactive approach illustrates how self-directed learning can supplement formal training, enabling teachers to continuously enhance their multimedia skills despite institutional challenges.

4) How does effective multimedia integration influence student engagement and learning outcomes?

Teachers overwhelmingly agreed that multimedia tools significantly enhance student engagement by making lessons more interactive and visually appealing.

"*The kids love interactive videos and quizzes. They are more engaged, and it's easier to hold their attention.*" (*N*14). This demonstrates how digital resources captivate students' interest, making learning more dynamic and enjoyable. Moreover, multimedia tools help clarifies complex concepts, particularly in subjects like science and mathematics.

"*With videos and simulations, I can explain things in a way that's much clearer than just talking about them.*" (*N*7) This statement reinforces the idea that visual aids enhance comprehension, helping students grasp difficult topics more effectively than through traditional lectures alone.

Teachers also reported that students showed higher retention rates when lessons incorporated multimedia elements.

"*Students remember lessons better when they see and hear information rather than just reading from a textbook.*" (*N*2) This supports research suggesting that multimedia learning engages multiple cognitive pathways, leading to deeper understanding and long-term retention.

The interview findings provide a nuanced understanding of the challenges and strategies related to multimedia integration in Kosovo's classrooms. Infrastructure limitations, lack of continuous training, and insufficient technical support

emerged as the main barriers, but teachers have found peer mentoring, collaboration with IT specialists, and online self-learning to be effective solutions.

Moreover, the positive impact of multimedia on student engagement and learning outcomes highlights the urgent need for greater investment in digital resources, professional training, and technical support in Kosovo's education system. By addressing these challenges, schools can create a more dynamic and effective learning environment, benefiting both teachers and students.

7. Discussion of Results

The results of this research in Kosovo, supported by both quantitative data and qualitative interview insights, reveal a nuanced picture of multimedia integration in education.

According to the questionnaire findings, approximately 68% of teachers reported using multimedia tools at least once a week, with a mean frequency score of 3.7 (SD = 1.2) on a 5-point scale. This suggests moderate but inconsistent adoption across schools. Interview data supports this interpretation. For instance, some teachers reported being limited by equipment availability and scheduling conflicts: "*Sometimes we have to wait days or even weeks to use a shared projector*" (N10), indicating constraints on regular use. 74% of respondents agreed that multimedia resources increased student engagement, while 62% observed improved comprehension and retention among their students. These findings are echoed in interview responses, where teachers highlighted the benefits of multimedia in fostering attention and understanding: "*The kids love interactive videos and quizzes. They are more engaged*" (N14), and "*With videos and simulations, I can explain things in a way that's much clearer*" (N7). Additionally, "*Students remember lessons better when they see and hear information rather than just reading from a textbook*" (N2), confirming the cognitive advantages of multimedia learning.

Despite these benefits, the study reveals persistent barriers to integration. About 57% of teachers cited inadequate infrastructure (e.g., unreliable internet and insufficient equipment), especially in rural schools. One teacher noted, "*We sometimes have the technology, but the internet is too slow to stream videos*" (N3), while another shared, "*We sometimes have to share a single projector between several classes*" (N10). These issues align with the quantitative data and highlight how infrastructure directly affects daily teaching practices.

61% of teachers expressed a lack of confidence in using multimedia tools, a concern linked to limited and unsustained training opportunities. This challenge was reinforced by multiple interviewees: "*We need more continuous support to keep up with the changes in technology*" (N9), and "*I tried using an interactive whiteboard once, but I wasn't sure how to use all the features, so I stopped*" (N5). Furthermore, "*I see younger teachers using technology so effortlessly, and I sometimes feel left behind*" (N12), emphasizing the psychological impact of unequal digital competencies among teachers.

Financial constraints were another key issue, with 54% of teachers reporting

insufficient school budgets for necessary multimedia equipment. This was echoed in interviews: "*Our school prioritizes basic needs over technology, so we often have to rely on outdated or free resources*" (N11). Similarly, the lack of IT support was reported as a critical hindrance: "*When something breaks or isn't working, we don't have the technical staff to help us fix it*" (N11).

Moreover, only 38% of teachers felt that available multimedia materials aligned well with the national curriculum. Teachers described having to adapt general digital resources themselves, or in some cases abandoning multimedia due to lack of alignment and support.

Nonetheless, teachers have devised effective strategies to overcome these challenges. Many emphasized the value of peer mentoring: "*We learn a lot from each other. Those who have worked more with technology help those who are less familiar with it*" (N8). Others sought external help from IT staff: "*The support from our IT specialist has been crucial in helping us integrate technology smoothly*" (N9). Some even pursued self-directed learning: "*I started joining online forums and watching tutorials to improve my use of technology in the classroom*" (N13), showing initiative in the face of limited institutional support.

When compared with findings from the literature, the Kosovo data align closely with international trends. Studies by Mayer (2001) and Clark & Mayer (2016) confirm that multimedia enhances engagement and learning outcomes, especially when tailored to diverse learning styles. The infrastructural and professional development challenges observed in Kosovo are also reflected in global research (Ertmer et al., 2012; Hew & Brush, 2007), which emphasizes the need for targeted teacher training and robust school-level support systems.

In summary, while a majority of teachers in Kosovo recognize and experience the benefits of multimedia in education, effective and widespread integration remains limited by challenges related to infrastructure (N3, N10), confidence and training (N5, N9, N12), financial constraints (N11), and lack of curriculum-aligned content. However, examples of peer collaboration (N8), IT support (N9), and self-initiated learning (N13) demonstrate promising pathways forward.

To unlock the full potential of multimedia learning, policy-level investments in infrastructure, ongoing teacher training, and school-based technical support are crucial. Addressing these gaps would not only empower teachers but also significantly enhance student engagement and achievement in Kosovo's classrooms.

8. Conclusion and Recommendation

8.1. Conclusion

This study explored the current state of multimedia integration in the teaching process across lower secondary schools in Kosovo, focusing on infrastructure availability, teacher preparedness, technical support, peer collaboration, and perceived impact on student engagement and learning.

The results indicate that while basic multimedia tools such as computers and projectors are available in most schools, there is a significant gap in access to more

advanced technologies, stable internet connections, and consistent technical support. Although a majority of teachers have received some form of training, many still feel unprepared to implement multimedia tools effectively, relying heavily on peer support and informal learning.

The positive perception of multimedia's impact on student engagement and learning suggests a strong pedagogical potential, yet its implementation remains hindered by structural, technical, and professional development barriers. This reflects broader trends in post-conflict or transitioning educational systems, where policy ambitions often exceed infrastructural realities.

Despite these challenges, the commitment of teachers to adopt multimedia methods—even in the absence of strong institutional support—is a promising foundation for future improvements.

8.2. Recommendations

Based on the study's findings, the following recommendations are proposed for policymakers, school leaders, and educational stakeholders:

1) Invest in infrastructure and connectivity

- Prioritize the provision of modern multimedia tools (e.g., interactive whiteboards, tablets, digital platforms) in all lower secondary schools.
- Ensure reliable internet access in classrooms to facilitate online and blended learning strategies.
- Establish maintenance systems to regularly update and repair digital equipment.

2) Enhance teacher training and capacity building

- Develop ongoing, hands-on professional development programs focused on practical application of multimedia in various subjects.
- Offer differentiated training sessions to meet the needs of teachers with varying levels of digital competence.
- Integrate multimedia pedagogy into pre-service teacher education programs.

3) Provide dedicated technical support

- Employ qualified IT support staff in every school or establish mobile support teams at the municipal level.
- Create helpdesk systems or online platforms where teachers can report and resolve technical issues efficiently.

4) Promote peer collaboration and learning communities

- Encourage the creation of professional learning communities (PLCs) within schools to share multimedia strategies and resources.
- Support school-based mentoring programs where experienced teachers can guide their peers in the use of multimedia tools.

5) Monitor and evaluate implementation

- Establish a national monitoring framework to assess the effectiveness of multimedia integration and its impact on teaching and learning.
- Conduct regular feedback surveys with teachers and students to inform future improvements and policy adjustments.

6) Align policy with practice

- Ensure that national education policies on digital transformation are matched with realistic budgeting, implementation timelines, and support mechanisms.
- Involve teachers in policy planning processes to ensure relevance and feasibility of multimedia-related initiatives.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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