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The journal is devoted to addressing contemporary issues and future developments related to interdisciplinary academic discussion, the results of empirical research, and the mutual interaction of expertise in media and information studies, media education as well as their sociological, psychological, political, linguistic, and technological aspects.

Apart from these areas, other interesting articles and contributions offering new perspectives and solutions relevant to media, communications, education, strategic management, and business, are welcome and will be considered for publication in the journal.

All articles are double-blind reviewed. Internationally renowned experts from the academic and research community are involved in the process of anonymous double-blind reviews. Thus, the journal offers authors an opportunity to improve their texts using anonymous reviews in accordance with the best academic and research standards.

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Multiplatform Strategies of Public Service Broadcasters: An Exploratory Comparative Analysis of North Macedonia, Montenegro and Kosovo

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Abstract

This paper analyses how three public service broadcasters in the Western Balkans integrate social media into their digital strategies: Macedonian Radio Television (MRT), Radio and Television of Montenegro (RTCG) and Radio Television of Kosovo (RTK). Through a brief institutional overview of each of the three broadcasters and an analysis of their official social media posts in the period from 8 to 12 June 2026, the study examines posting frequency, choice of formats and the extent to which content is adapted to the logic of each platform. The weekend was excluded from the analysis to avoid possible distortion of the results caused by the usually reduced volume of editorial activity on non-working days. The findings show significant differences in the way the analysed public service broadcasters use digital platforms. MRT has virtually no active official presence on the social networks covered. RTCG clearly adapts its content for Instagram and TikTok, while it mostly uses Facebook as a distribution channel. RTK, for its part, has the highest volume of posts on Facebook and shows pronounced, though not always consistent, efforts to adapt content for Instagram and TikTok. The paper indicates that the mere existence of social media profiles is not sufficient for public service media. Genuine digital transformation requires adapted formats, a clear editorial plan and a serious commitment to reaching audiences who increasingly rarely get their information from traditional television.

Keywords: public service media; Western Balkans; digital transformation; social media strategy; platform adaptation

1. Introduction

For decades, public service broadcasters have played an important role in informing citizens, supporting democratic debate and producing cultural content for diverse audiences. Today, however, their work has long ceased to be limited to traditional radio and television. Audiences increasingly follow news and public interest content directly through social media, streaming services and short-video applications. This shift means that public broadcasters cannot simply transfer their television content online; they must fundamentally rethink the way they communicate with audiences across different digital platforms.

The transition from traditional public service broadcasting to digital public service media is particularly important in the context of the Western Balkans. Public service broadcasters in this region face serious political, financial and institutional constraints that reduce their capacity to modernise, attract younger audiences and compete with commercial media, global streaming platforms and digital news outlets. Therefore, the presence of a public service broadcaster on social media can be regarded as an important indicator of its digital capacity and its ability to adapt to changing media habits.

This study analyses how the public service broadcasters in North Macedonia, Montenegro and Kosovo use Facebook, Instagram and TikTok. Rather than merely establishing whether they have active profiles, the research examines the specific formats they use and assesses whether content is adapted to the logic of each platform. The main question is whether these public broadcasters use social networks only to redistribute existing content, or whether they develop distinct, platform-specific communication strategies. By comparing their activity during one selected working week, the paper offers an exploratory assessment of the use of selected social platforms by public media in the region and provides practical recommendations for improving platform-specific digital communication.

2. Literature Review

2.1. From Public Service Broadcasting to Public Service Media

Media researchers have analysed the transition from public service broadcasting to public service media extensively. Lowe and Bardoel (2007) frame this transformation as a shift from traditional television and radio broadcasting towards the provision of public service across multiple platforms. In such a model, public service media should preserve their democratic, cultural and educational functions while simultaneously adapting to new technologies and to changing audience habits. Banerjee and Seneviratne (2005) emphasise that the core values of universality, diversity, independence and quality remain essential to public service broadcasting. In the digital era, however, these values need to be applied under new communication conditions. This means that public service broadcasters must be present where audiences actually spend their time, including on social media, without lowering their editorial standards.

2.2. Multiplatform Content and Audience Participation

Multiplatform communication involves creating and distributing content across different digital spaces, each platform having its own logic, technical affordances and audience expectations. Enli (2008) points out that audience participation fundamentally changes

public service broadcasting. Today, the audience is no longer only a passive viewer or listener; it comments, shares and actively interacts with content. For this reason, public service media need to adapt content to the specificities of each platform. Posting the same video or the same piece of information on several channels may increase reach, but in itself it does not constitute a developed digital strategy. Genuine platform adaptation means adjusting format, length, tone and visual style to the particular network. For example, Facebook is suitable for news with links and longer videos, Instagram relies on visual posts and Reels, while TikTok requires short vertical videos created for mobile use.

2.3. Challenges for Public Service Media

Today, public service media face strong competition from commercial television, streaming services and social media, as well as rapid changes in audience habits. Freedman and Goblot (2018) emphasise that public television is under pressure to respond to new audience expectations and intensified competition while continuing to create public value. Głowacki, Świtkowski and Johnson (2025) highlight the need for public service media to strike a balance between legacy broadcasting structures, new technologies and changing audience expectations. As Jędrzejewski (2024) observes, European public media have responded differently to technological change, depending on their institutional capacity, strategic decisions and the political and regulatory environment in which they operate. Some have developed stronger digital strategies, while others have remained constrained by traditional broadcasting practices. It is precisely these differences that help explain why certain public service broadcasters are more successful on social media, while others find it harder to adapt to the new digital communication environment.

2.4. Public Service Media in the Western Balkans

In the Western Balkans, public media organisations face additional challenges, including political pressure, financial instability and slow technological modernisation. Jusić et al. (2021) show that public service media in the region operate under persistent political, financial and institutional constraints. This regional context is crucial for the present study. The broadcasters analysed do not have the same resources as large Western European media organisations. Therefore, understanding their digital strategies requires taking into account limited budgets, fragmented audiences and the broader struggle to modernise media systems in transition.

2.5. Research Gap

The existing literature provides important insights into media policy, the legal framework and organisational change, but pays less attention to everyday content production. We still know too little about how public service broadcasters actually manage their Facebook, Instagram and TikTok profiles in their day-to-day work. This study addresses that gap by measuring how often MRT, RTCG and RTK post, which formats they choose and to what extent they adapt content to each specific platform.

3. Research Questions and Hypothesis

RQ1: How do the public service broadcasters in North Macedonia, Montenegro and Kosovo use social media in their digital strategies?

RQ2: To what extent do these public service broadcasters adapt content for different platforms?

RQ3: Which multimedia formats do they use most frequently?

RQ4: Do these public service broadcasters use social media only to distribute existing content, or do they build distinct communication strategies for each platform?

H1: Public service broadcasters in the Western Balkans primarily use social media to distribute existing content, rather than to create fully adapted, platform-specific material.

4. Context: Public Service Media in the Three Countries

This section presents the institutional context of the three selected public service broadcasters. This context links the social media analysis with the broader realities of public service media: organisational structure, legal rules, language obligations and digital development in the region.

4.1. MRT – North Macedonia

Macedonian Radio Television (MRT) is the public service broadcaster of North Macedonia. National legislation and MRT's institutional documents require the organisation to meet the informational, cultural, educational and linguistic needs of the public. MRT broadcasts programmes in Macedonian and in the languages of the communities, including Albanian, in order to serve the country's multilingual audience. MRT is included in this study as the case with the lowest visible activity on the digital platforms analysed. Although it has an official website and traditional broadcasting, no active official presence on the social platforms covered was observed in the period analysed. Therefore, in this research MRT serves as an example of the absence of visible activity on the social media analysed, and not merely as a case of low posting frequency.

4.2. RTCG – Montenegro

Radio and Television of Montenegro (RTCG) operates as the national public service broadcaster providing television, radio and online services. In recent years, RTCG has turned towards digital modernisation, adopting development and digital transformation strategies for the period 2023–2027 with the support of the OSCE Mission to Montenegro (OSCE Mission to Montenegro, 2023). For this reason, RTCG is a relevant case for analysing how digital transformation strategies translate into everyday social media practice. During the period analysed, RTCG posted actively on Facebook, Instagram and TikTok, which allows a comparison between a platform with a higher volume of posts and a more pronounced distribution function, such as Facebook, and platforms oriented towards short video, such as Instagram and TikTok.

4.3. RTK – Kosovo

Radio Television of Kosovo (RTK) operates public television, radio and online channels. It addresses diverse audiences, with the RTK2 channel specifically dedicated to the Serbian and other non-majority communities, including programming for Bosniak, Turkish and Roma audiences (European Broadcasting Union, 2013). RTK's challenges related to stable

funding and institutional independence are frequently highlighted in public debate. In 2026, media freedom organisations pointed out that the proposed funding levels were below the amount stipulated by the Law on RTK (European Centre for Press and Media Freedom, 2026).

RTK was selected for this study because it has a substantial Facebook audience and actively updates its Instagram and TikTok profiles. Its case makes it possible to assess whether a large volume of posts actually indicates platform adaptation or whether it mainly represents intensive content distribution.

5. Methodology

This paper uses comparative content analysis to assess how three public service broadcasters in the Western Balkans – MRT, RTCG and RTK – integrate social media into their communication strategies. The cases were selected because they share a regional context, have similar public service obligations and face comparable pressures related to digital development, audience fragmentation and competition from digital platforms.

The study is based on a limited five-day sample from one working week, from 8 to 12 June 2026. The weekend was excluded from the analysis to avoid possible distortion of the results due to the slower weekend rhythm of newsrooms and reduced posting activity. However, such a limited time frame does not allow broad generalisations about the long-term digital strategies of the public service broadcasters analysed.

Therefore, the findings should be understood as an exploratory snapshot of visible social media practices during one selected working week, and not as a comprehensive assessment of each broadcaster's overall multiplatform strategy. More generalisable conclusions would require a longer period of analysis covering several weeks and different news cycles.

The comparison is also asymmetric because MRT did not publish content on the Facebook, Instagram and TikTok profiles analysed during the selected period. Consequently, MRT was not analysed through the same post-level content analysis approach as RTCG and RTK. Instead, MRT was treated as a case of inactive or absent presence on the selected social platforms. This means that the empirical content analysis mainly compares RTCG and RTK, while MRT serves as an important negative case demonstrating the absence of visible platform activity. Hence, the study should not be read as a fully balanced trilateral content comparison, but as a comparative analysis of different levels of social media presence and activity among three public service broadcasters.

The analysis uses the number of posts and the distribution of formats as indicators of platform activity and format adaptation. It does not claim to fully reconstruct the editorial process behind each post, nor to systematically trace each story from the website to all social platforms. Therefore, the study measures visible platform use and format adaptation, not the full internal multiplatform strategy of each public service broadcaster. A high share of standard posts indicates a distribution-oriented approach, while a high share of Reels or short vertical videos indicates stronger adaptation to platform-specific formats.

5.1. Unit of Analysis

The unit of analysis is each individual post or video published on the broadcaster's official social media profile during the five-day period. For Facebook, standard posts, videos and Reels were coded. For Instagram, single-image posts, galleries/carousels and Reels were coded. For TikTok, all short vertical videos were coded.

5.2. Key Variables

The data were coded according to three key variables: platform activity, content format and platform adaptation.

- *Platform activity* measures the total number of posts during the working week. This indicator shows whether the public service broadcaster uses the platform for daily communication or only occasionally.
- *Content format* identifies the technical style of the post, such as a text post, standard video, Reel, carousel or TikTok video. This variable shows whether the broadcaster relies on traditional formats or uses platform-specific media forms.
- *Platform adaptation* measures the extent to which the broadcaster adapts content to the rules and culture of the specific network. Native formats such as Instagram Reels or TikTok videos indicate strong adaptation. A combination of standard posts and native videos indicates partial adaptation. Inactive profiles or heavy reliance on basic link sharing indicate weak adaptation.

5.3. Coding Categories

The coding categories applied to each platform are presented in Table 1.

Table 1. Coding categories by platform

Platform	Coded formats
Facebook	Standard post, video, short vertical videos in Reels format
Instagram	Single-image posts, gallery/carousel, short vertical videos in Reels format
TikTok	Short vertical video

5.4. Analytical Logic

The analysis does not assume that each social media post can be directly linked to a specific article on the website. Instead, the distribution of formats and posting patterns are used as indicators of communication strategy. A high share of standard posts indicates a distribution-oriented approach, while a high share of short videos created according to the logic of the platform itself indicates stronger platform adaptation. This approach makes it possible to assess whether public service broadcasters use social media mainly as distribution channels or as distinct communication environments.

6. Results

6.1. MRT's Presence on Social Media

MRT represents a different case in this study. Unlike RTCG and RTK, which posted actively during the selected working week, no regular posting activity was observed for MRT on the platforms analysed – Facebook, Instagram and TikTok. Therefore, MRT cannot be included in the same post-level content analysis approach as RTCG and RTK. Instead, it is analysed as a case of inactive presence on the selected social platforms.

The official Facebook page has approximately 14,000 followers and was created on 27 December 2010, but the last identified post dates from February 2019. The official Instagram profile has 476 followers, and the last identified post is from 23 July 2021. No official TikTok profile was identified (Table 2).

Table 2. MRT's official social media presence

Platform	Followers	Status
Facebook	14,000	Inactive; last identified post in February 2019
Instagram	476	Inactive; last identified post on 23 July 2021
TikTok	N/A	No official page identified

MRT therefore cannot be analysed through the same content-based approach used for RTCG and RTK. Its case is analytically important because it demonstrates the absence of active multi-platform communication on the selected platforms. In comparative terms, MRT is the case with the lowest visible activity and the most limited platform adaptation among the three public service broadcasters analysed.

6.2. RTCG on Facebook

RTCG's official Facebook page had approximately 262,000 followers and has been active since 26 January 2013. During the working week analysed, 75 Facebook posts were identified, or about 15 posts per day (Table 3).

Table 3. RTCG Facebook posts by format, 8–12 June 2026

Format	Number of posts	Share
Standard posts / links / photographs	50	66.7%
Reels	21	28.0%
Videos	4	5.3%
Total	75	100%

The dominant format is the standard Facebook post, which indicates that Facebook is mainly used as a channel for distributing regular news and information. Nevertheless, the presence of 21 videos in Reels format shows that RTCG is also experimenting with more visual formats adapted to the logic of the specific platform. Overall, RTCG's Facebook strategy can be assessed as partially adapted: it combines traditional distribution with elements of communication tailored to social media.

6.3. RTCG on Instagram

RTCG's Instagram profile had 103,000 followers and 8,794 published posts, and followed 56 profiles. During the period analysed, 28 Instagram posts were identified (Table 4).

Table 4. RTCG Instagram posts by format, 8–12 June 2026

Format	Number of posts	Share
Reels	24	85.7%
Gallery / carousel	2	7.1%
Single-image posts	2	7.1%
Total	28	100%

The results show a clear dominance of Reels. This indicates that RTCG uses Instagram mainly through short vertical videos, which are among the most platform-specific formats on Instagram. Unlike Facebook, where standard posts dominate, RTCG's Instagram strategy is strongly adapted to the mobile and visual logic of the platform.

6.4. RTCG on TikTok

RTCG's TikTok profile had 51,200 followers and 2 million likes. During the period analysed, 12 TikTok videos were identified (Table 5).

Table 5. RTCG TikTok posts by format, 8–12 June 2026

Format	Number of posts	Share
TikTok video	12	100%
Total	12	100%

TikTok is by its nature a video platform, and RTCG uses it through formats that are aligned with the way the platform itself functions. The relatively small number of posts shows that TikTok is used more selectively than Facebook and Instagram. Nevertheless, in terms of format, RTCG's TikTok strategy shows a high degree of platform adaptation.

6.5. RTK on Facebook

RTK's Facebook page has approximately 656,000 followers, making it the largest social media presence analysed in the sample. During the period covered by the research, 234 Facebook posts were identified, an average of 46.8 posts per day (Tables 6 and 7).

Table 6. RTK Facebook posts by day, 8–12 June 2026

Date	Number of posts
8 June	41
9 June	50
10 June	47
11 June	45
12 June	51
Total	234

Table 7. RTK Facebook posts by format, 8–12 June 2026

Format	Number of posts	Share
Standard posts	130	55.6%
Videos	102	43.6%
Reels	2	0.9%
Total	234	100%

RTK's activity on Facebook is very high. Standard posts are the most common format, but video is also significantly present. This indicates that, for RTK, Facebook functions both as a distribution channel and as a space for publishing video content. However, the very small number of videos in Reels format shows limited adaptation to the newer formats characteristic of Facebook. Therefore, RTK's Facebook strategy can be described as highly active and predominantly distribution-oriented, with strong use of classic video posts.

6.6. RTK on Instagram

RTK's Instagram profile had 21,036 published posts and 55,500 followers, and followed three profiles. During the period covered by the research, 51 Instagram posts were identified (Table 8).

Table 8. RTK Instagram posts by format, 8–12 June 2026

Format	Number of posts	Share
Reels	29	56.9%
Single-image posts	21	41.2%
Gallery / carousel	1	2.0%
Total	51	100%

RTK actively uses Instagram, with approximately 10 posts per day. Videos in Reels format account for more than half of the sample, which indicates significant adaptation to Instagram's video-oriented logic. However, the large number of single-image posts shows that RTK continues to rely on more traditional visual journalism formats as well. The strategy can therefore be assessed as mixed: stronger than simple distribution, but not fully optimised for storytelling adapted to Instagram's logic.

6.7. RTK on TikTok

RTK's TikTok profile had 37,100 followers and 311,600 likes. During the period analysed, 11 TikTok videos were identified (Table 9).

Table 9. RTK TikTok posts by format, 8–12 June 2026

Format	Number of posts	Share
TikTok video	11	100%
Total	11	100%

RTK uses TikTok in a format that is aligned with the logic of the platform itself, since all the content analysed consists of short vertical videos. However, the volume of activity is moderate compared with Instagram and Facebook. Hence, RTK's TikTok profile shows a high degree of format adaptation but more limited posting activity.

7. Comparative Analysis

7.1. Platform Activity

Table 10 summarises the activity recorded on each platform during the week analysed.

Table 10. Platform activity by public service broadcaster, 8–12 June 2026

Broadcaster	Facebook	Instagram	TikTok	Total active posts/videos
MRT	Inactive	Inactive	No page identified	0
RTCG	75	28	12	115
RTK	234	51	11	296

The comparison reveals an asymmetric pattern of social media activity. RTCG and RTK can be compared through post-level content analysis, while MRT is included as a case of inactivity on the selected platforms. No regular posting activity was observed on MRT's

official profiles analysed. RTCG has an active and relatively balanced presence, with Facebook as the most frequently used platform, while Instagram and TikTok are used for more adapted video formats. RTK, for its part, has the largest volume of posts, especially on Facebook, where its activity is considerably higher than that of RTCG.

7.2. Distribution versus Adaptation

The results show that high activity does not automatically imply a high degree of platform adaptation. RTK publishes the most content on Facebook, but a significant proportion of that content consists of standard posts or classic video posts. This points to a strongly pronounced distribution model. RTCG, on the other hand, publishes a smaller volume of content overall, but its activity on Instagram is more strongly adapted to the logic of the platform, since 85.7% of the sample analysed consists of videos in Reels format. For both RTCG and RTK, TikTok is used in a format consistent with the nature of the platform itself, but with a limited volume of posting. Table 11 summarises the assessment for each broadcaster and platform.

Table 11. Assessment of platform adaptation by broadcaster and platform

Broadcaster / platform	Assessment
MRT – social media	Inactive/absent multiplatform strategy on the platforms analysed
RTCG Facebook	Partially adapted; distribution remains dominant
RTCG Instagram	Strongly adapted; Reels dominate
RTCG TikTok	Strong format adaptation; selective use
RTK Facebook	High-volume distribution with strong use of video
RTK Instagram	Moderate to strong adaptation; mix of Reels and static posts
RTK TikTok	Strong format adaptation; limited volume

7.3. Answers to the Research Questions

RQ1: The public service broadcasters use social media in different ways. MRT is largely absent from the platforms analysed. RTCG actively uses Facebook, Instagram and TikTok, with more pronounced adaptation on Instagram and TikTok. RTK, for its part, uses Facebook extremely intensively, while at the same time maintaining active profiles on Instagram and TikTok.

RQ2: The level of adaptation varies depending on the broadcaster and the specific platform. RTCG shows the strongest adaptation on Instagram, while RTK shows high activity but a mixed degree of platform adaptation. For MRT, no meaningful adaptation can be established, since the profiles analysed are inactive or absent.

RQ3: The most common formats differ across platforms. Standard posts dominate on Facebook for both RTCG and RTK, while videos in Reels format dominate RTCG's Instagram and make up the majority of RTK's Instagram content. The TikTok content of both RTCG and RTK consists entirely of short vertical videos.

RQ4: Facebook is most often used as a distribution platform, especially by RTK. Instagram and TikTok, on the other hand, show stronger evidence of platform-specific communication, particularly where videos in Reels format and short vertical videos dominate.

8. Discussion

The findings should be interpreted with caution, since the analysis covers only one working week. The results identify visible patterns of platform use in the selected period, but they do not represent a full assessment of the long-term institutional strategy of the public service broadcasters analysed. This is especially important in the case of MRT, where the absence of activity on the platforms analysed does not allow a direct content comparison with RTCG and RTK. The study therefore offers an exploratory comparison of platform presence and format adaptation, rather than a definitive ranking of the overall digital transformation of the public service broadcasters.

The results partially support the hypothesis. The public service broadcasters analysed continue to use certain platforms, especially Facebook, mainly to distribute existing television and web content. However, this conclusion should be nuanced, since RTCG and RTK show clear format adaptation on Instagram and TikTok.

The most significant finding is the difference between merely having a profile, posting frequently and genuinely adapting content. MRT shows no visible activity on the platforms analysed. RTK posts very frequently, especially on Facebook, but a high volume of posts does not always imply creative and platform-specific storytelling. RTCG, for its part, posts less than RTK overall, but its Instagram strategy shows stronger adaptation through the substantial use of videos in Reels format.

This difference matters for public service media. Digital modernisation cannot be measured solely by the number of posts or the number of followers. A genuine multiplatform strategy requires clear editorial planning, adapted formats and a good understanding of audience behaviour on different networks. To remain relevant, public service broadcasters need to create public value through formats that actually reach and engage the fragmented digital audience, rather than relying mainly on traditional news and links.

9. Recommendations

9.1. MRT

- Reactivate and clearly label its official social media profiles, so that audiences can easily recognise them as authentic MRT channels.
- Develop a basic multiplatform strategy covering Facebook, Instagram, TikTok and the official website.
- Establish a minimal but regular process for publishing public interest content, including explanatory formats and video content.
- Use social media to reach younger and fragmented audiences who rely less and less on linear television.

9.2. RTCG

- Maintain its strong Reels strategy on Instagram and link it even more clearly to topics of public interest.

- Improve adaptation on Facebook by reducing reliance on standard posts and making greater use of visual explainers, platform-adapted videos and audience-oriented formats.
- Use TikTok more consistently if the aim is to reach younger, mobile-oriented audiences.
- Develop more carousels and explanatory formats for complex public interest topics.

9.3. RTK

- Reduce its excessive reliance on high-volume distribution on Facebook and prioritise clearer editorial selection of content.
- Increase the use of short formats tailored to Facebook, instead of relying mainly on classic video posts.
- Develop more carousels and explanatory formats on Instagram for public interest topics.
- Use TikTok more strategically and more regularly, since the content format is already aligned with the logic of the platform but the volume of posting remains limited.

9.4. General Recommendations for Public Service Media in the Western Balkans

- Measure digital success not only by the number of followers and the volume of posts, but also by the degree of platform adaptation and the creation of public value.
- Develop social media editorial guidelines tailored to the specificities of each platform.
- Invest in short video, mobile storytelling and visual explanatory formats.
- Treat social media not merely as distribution channels, but as spaces for public communication, greater accessibility and audience engagement.

10. Conclusion

This paper analyses the digital strategies of three public service broadcasters in the Western Balkans: MRT, RTCG and RTK. The results show marked differences in their visible activity and in their capacity to adapt to contemporary digital platforms. No regular posting activity was observed for MRT on the social networks analysed, which points to a significant gap in its digital communication. RTCG shows a more developed strategy, especially on Instagram and TikTok, where it successfully uses short video formats. RTK, for its part, has the largest volume of posts, mainly on Facebook, but this high volume does not always mean full platform adaptation.

The findings indicate that public service media cannot rely solely on the fact that they have social media profiles. To reach the fragmented digital audience, public service media need to communicate actively on each platform through formats and content adapted to its logic and to users' habits. This requires adapted formats, clear editorial planning and a deeper understanding of audience habits and expectations. Today, public value is created not only through traditional radio and television, but also through social media formats that are accessible, relevant and meaningful to digital users.

The findings also suggest that the use of social media by the Western Balkan public service broadcasters analysed was considerably inconsistent during the selected period.

Some platforms are mainly used as channels for redistributing existing content, while others show clearer format and platform adaptation. The future relevance of public service media in the region will likely depend on a gradual shift from basic content redistribution towards more deliberate, platform-specific communication strategies.

Statement on the Use of Artificial Intelligence

The author used ChatGPT for language editing, translation support, proofreading and improving the clarity and readability of the text. NotebookLM was used to support the organisation and review of research notes and source materials. These tools were not used to create the research design, collect data, conduct the analysis, interpret the findings or write the conclusions. Full responsibility for the content of the manuscript remains with the author.

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The Rising Cost of Live Music: Consumer Tolerance and Price Limits in the Concert Industry

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Abstract

Introduction: The rapid increase in concert ticket prices has become a defining feature of the contemporary live music industry. As revenues from recorded music have declined, live performances have emerged as a primary income source for artists and promoters, intensifying debates about affordability, accessibility, and consumer tolerance. Despite extensive research on pricing strategies and demand, less attention has been given to identifying the price limits at which consumers begin to withdraw from concert attendance. *Background:* Previous studies have examined concert attendance through cultural, experiential, and economic perspectives, highlighting the role of emotional engagement, social interaction, and perceived value in shaping consumer behavior. Research on ticket pricing has focused on demand elasticity, price discrimination, and dynamic pricing models, yet consumer price thresholds remain insufficiently explored, particularly across different audience segments and demographic groups. *Purpose:* The purpose of this paper is to examine consumer tolerance for rising concert ticket prices and to conceptualize the price thresholds at which ticket costs begin to significantly deter concert attendance. The study aims to integrate experiential, behavioral, and economic perspectives to better understand heterogeneity in consumers' willingness to pay. *Methods:* The paper adopts a conceptual and analytical approach, synthesizing existing literature from cultural studies, behavioral economics, and music industry research. Long-term trends in concert ticket pricing and industry pricing mechanisms are reviewed, and illustrative empirical evidence from

selected markets, including smaller national contexts, is used to contextualize broader theoretical insights. *Results:* The analysis indicates that concert ticket demand is generally inelastic, but consumer price tolerance varies substantially across audience segments and demographic characteristics. Emotional attachment to artists, perceived uniqueness of live performances, income levels, and prior concert experiences significantly influence willingness to pay. While segmented and dynamic pricing strategies increase revenue potential, they also contribute to rising average prices and growing affordability concerns. Conclusions: Consumer tolerance for increasing concert ticket prices is not uniform and is shaped by a combination of experiential value, economic constraints, and psychological reference points. Although many consumers continue to accept higher prices due to the unique nature of live music experiences, identifiable price thresholds exist beyond which attendance declines, posing challenges for the long-term inclusivity and sustainability of live music markets. *Practical implications:* For concert organizers and promoters, the findings highlight the importance of differentiated pricing strategies that account for heterogeneous consumer price sensitivity. Maintaining accessible entry-level ticket options may help preserve audience diversity while allowing premium pricing for highly engaged segments. *Social implications:* Rising concert ticket prices risk excluding lower-income audiences and undermining the social and cultural accessibility of live music. Understanding consumer price thresholds can inform more inclusive pricing practices and cultural policy discussions. Originality/value: This study contributes to the literature by explicitly linking concert attendance motivations, audience segmentation, and behavioral pricing theories to the concept of consumer price thresholds. By integrating cultural and economic perspectives, it offers a more nuanced understanding of affordability and consumer limits in the live music industry.

Keywords: concert ticket pricing; consumer price tolerance; price thresholds; live music industry; concert attendance behavior; demand elasticity

1. Introduction

Live music has long represented a central pillar of the music industry, combining artistic expression with social, cultural, and economic value. In recent decades, however, the role of live concerts has fundamentally changed. As revenues from recorded music have declined due to digitalization, streaming platforms, and changing consumption habits, live performances have increasingly become the primary source of income for artists and promoters (Krueger, 2005; Fer and Baarsma, 2015). This structural shift has coincided with a pronounced and sustained increase in concert ticket prices across global markets, raising questions about affordability, accessibility, and the limits of consumer willingness to pay.

Existing research has approached concert attendance from multiple perspectives. Cultural and experiential studies emphasize that concerts are not merely entertainment products but complex experience goods, characterized by emotional engagement, social interaction, and collective participation (Brown and Knox, 2017; Swarbrick et al., 2019). These studies demonstrate that the perceived value of live music extends beyond the performance itself, encompassing atmosphere, artist–audience interaction, and shared emotional intensity. From this perspective, demand for concerts is often driven by affective and symbolic motivations rather than purely economic considerations.

Parallel to this, economic and industry-focused research has examined how ticket prices are formed and how audiences respond to price changes. Studies on concert ticket pricing highlight the role of artist popularity, venue size, market demand, and pricing strategies such as price discrimination, dynamic pricing, and multi-tier ticketing (Courty and Pagliero, 2012; Eckard and Smith, 2012). Empirical findings frequently suggest that demand for concert tickets is relatively inelastic, particularly for high-profile artists, meaning that moderate price increases do not lead to proportional declines in attendance. At the same time, research indicates substantial heterogeneity among consumers, with price sensitivity varying across audience segments, genres, and demographic groups (Pompe et al., 2020).

Behavioral and psychological theories further complicate this picture. Concepts such as reference prices, loss aversion, and perceived value help explain why consumers may tolerate rising ticket prices up to a certain point, while reacting strongly once prices exceed their expectations or prior experiences (Kahneman and Tversky, 2013; Tereyagoglu et al., 2018). Reservation price theory suggests that each consumer holds a maximum willingness to pay, beyond which attendance is abandoned in favor of alternatives (Myerson, 1981). However, these thresholds are not fixed; they are shaped by emotional attachment to artists, social motivations, income constraints, and the perceived uniqueness of specific events.

Despite this extensive body of literature, a key area of uncertainty remains. While we know a great deal about why people attend concerts and how pricing strategies affect revenue, we know considerably less about where consumers draw the line—namely, the price point at which ticket costs become unacceptable and begin to meaningfully deter attendance. Much of the existing research focuses on price changes and demand responses, rather than explicitly identifying consumer price thresholds or examining how tolerance for rising prices differs across consumer segments and demographic characteristics. Moreover, the rapid escalation of ticket prices in recent years suggests that previously observed patterns of inelastic demand may not hold indefinitely.

Against this backdrop, the present study addresses the following research question: How tolerant are consumers of rising concert ticket prices, and what factors shape the price thresholds at which ticket costs begin to significantly reduce concert attendance? Building on

experiential, economic, and behavioral theories, the study seeks to clarify how perceived value, audience segmentation, and demographic characteristics interact to influence consumers' willingness to pay. By situating concert ticket pricing within both cultural experience theory and behavioral pricing frameworks, this research aims to contribute to a more nuanced understanding of affordability and consumer limits in the contemporary live music industry.

2. Theoretical Background

This section provides the conceptual foundation for understanding concert ticket pricing by first examining concert attendance as a cultural and experiential practice, then outlining audience segmentation and consumer typologies, and finally connecting these perspectives to pricing mechanisms and consumer tolerance. By linking experiential value, audience heterogeneity, and economic decision-making, the theoretical framework explains why concert ticket prices can rise substantially while remaining acceptable to some consumers, yet reach critical limits for others.

2.1. Concert Attendance as a Cultural and Experiential Practice

These experiential and emotional dimensions are directly relevant to ticket pricing. Strong emotional attachment, perceived uniqueness of live performances, and the intensity of collective experiences increase consumers' willingness to pay higher prices for concerts. When live music is perceived not merely as entertainment but as a meaningful, once-in-a-lifetime experience, price considerations may become secondary, helping to explain why audiences often tolerate substantial ticket price increases.

Why people go to concerts. Attending a live concert is a deeply resonant experience, shaped by a unique interplay of emotions, social connections, and sensory stimulation that recorded music cannot replicate. Live performances offer audiences the opportunity to immerse themselves in the raw, electrifying energy of music in real time, fostering a heightened sense of engagement and presence (Brown and Knox, 2017; Swarbrick et al., 2019). The atmosphere—characterized by the collective energy of the crowd, direct artist interaction, and the spontaneity of live music—transforms each concert into a distinct, memorable event that draws fans back repeatedly.

Beyond the music, social connections play a crucial role in concert attendance. Live music events foster a sense of belonging, uniting individuals with shared musical interests and creating communal experiences that enhance enjoyment (Dearn and Price, 2016; Mulder and Hitters, 2021). Whether through the collective excitement of a captivated audience or spontaneous conversations with fellow concertgoers, these interactions significantly contribute to the overall experience. In many cases, the social aspect is as impactful as the performance itself.

For many fans, concerts serve as a means of forging or deepening emotional connections with their favorite artists. Witnessing a live performance allows audiences to experience an artist's passion and stage presence firsthand, reinforcing the personal significance of their music (Kruger and Saayman, 2012). Additionally, concerts offer novelty and discovery. Fans not only hear live renditions of familiar songs but also experience new interpretations, improvisations, and emerging support acts that may become future favorites (Brown and Knox, 2017). This unpredictability and exclusivity enhance the appeal of live events.

While ticket price is a key consideration, research suggests it is not always the primary factor in concert attendance. Many fans prioritize the overall experience over cost, underscoring the significant value they place on live music (Brown and Knox, 2017). Key motivations—such as artist affiliation, social engagement, enjoyment, and nostalgia—highlight the multifaceted appeal of concerts (Kruger and Saayman, 2012; Kulczynski et al., 2016).

Moreover, live performances stimulate a level of engagement that recorded music cannot match. Studies indicate that audiences experience heightened rhythmic entrainment—a synchronized connection to the music that enhances emotional and physiological responses (Swarbrick et al., 2019). This intensified connection contributes to the transformative nature of live music events.

Understanding these motivations is essential for concert organizers and marketers aiming to optimize the concert-going experience. By addressing the emotional, social, and experiential needs of attendees, they can create compelling events that not only attract audiences but also foster long-term loyalty within the live music industry (Baxter-Moore, 2016; Kulczynski et al., 2016).

What people experience at concerts. Concerts are far more than musical events; they are immersive, multisensory experiences that captivate the senses, evoke profound emotions, and foster social connections. Research highlights the distinctive elements of live performances that engage audiences and create lasting impressions. For many, the atmosphere and energy of a concert elicit emotional responses far more intense than those provoked by recorded music. The immediacy of live sound, the artist's presence, and the collective excitement of the crowd contribute to heightened engagement, often expressed through instinctive movements such as nodding, swaying, or dancing in rhythm with the music (Swarbrick et al., 2019).

Concert attendance is fundamentally a communal experience. Sharing an appreciation for the same artist or genre with others fosters a powerful sense of unity. For regular concertgoers, these social interactions and shared moments of joy are as vital to the experience as the music itself (Dearn and Price, 2016). While this social environment significantly enhances the overall enjoyment, it doesn't necessarily diminish the deeply personal nature of an individual's emotional connection to the music (O'Neill and Egermann, 2022).

Concert audiences often exhibit remarkable levels of synchronization, both physiologically and in their movements. This "in-tune" behavior—seen in actions like clapping, swaying, or singing along in unison—not only strengthens the collective aesthetic experience but also reflects individual personality traits. This illustrates the intricate interplay between personal and communal engagement during live performances (Tschacher et al., 2023). Furthermore, the concert experience extends beyond just listening. For individuals who are deaf or hard of hearing, visual elements are crucial for connecting with the performance. Dynamic light shows, artist movements, and other visual cues enable them to fully participate in the event's energy and communal spirit (Han and Kim, 2023).

At its core, a live concert is a dynamic interaction between the artist, the individual audience member, and the collective audience. The artist's performance sets the emotional tone, the attendee's personal connection to the music deepens the experience, and the presence of fellow fans amplifies the shared joy (Mulder and Hitters, 2023). Practical factors like venue design and familiarity with the music further shape the concert experience. A well-designed, comfortable venue can boost audience engagement, while knowing the songs often strengthens emotional investment and overall enjoyment (Dobson, 2008; Hotaki, 2019). Ultimately, concerts are *multidimensional experiences* where music transforms into a shared journey. From the emotional resonance of the songs to the bonds formed with fellow attendees, every element contributes to creating an event that goes beyond mere listening, offering an unforgettable, deeply immersive encounter with live music.

3. Typologies of Concert Audiences and Consumer Segmentation

What types of consumers attend concerts. Concert audiences are as diverse as the music they come to experience, driven by a wide range of motivations, preferences, and personal connections. People attend concerts not only to enjoy live music but also to seek emotional fulfillment, strengthen social ties, and express their identities. These motivations reflect the rich tapestry of concertgoers and their unique relationships with live music (Charron, 2017; Kawase and Obata, 2016; Perkins, 2012).

Research has identified distinct consumer segments within concert audiences. For instance, in South Africa, the "black diamonds" segment—middle-class individuals with rising purchasing power—plays a significant role in concert attendance, particularly for popular music genres (Kruger and Saayman, 2014). Similarly, audience segmentation based on attendance frequency reveals a spectrum ranging from occasional attendees, who view concerts as rare treats, to dedicated fans who make live performances a regular part of their lives (Roose, 2008).

Cultural preferences and consumption styles further shape concert attendance patterns. Some individuals engage with live music as a cultural or intellectual pursuit, while others prioritize entertainment and social aspects. These "cultural logics" influence preferences for specific genres, artists, or venues, resulting in distinct audience profiles (Willekens and Daenekindt, 2022). Demographic factors such as subcultural affiliation, gender, and age also play a role. For example, younger audiences may be more inclined toward popular music festivals, while older attendees may gravitate toward classical or jazz performances (Chun-Fu and Hu, 2006). To better understand these motivations, researchers have developed analytical tools such as the Concert Attendance Motivation Scale (CAMS), which categorizes the diverse reasons people attend concerts. These range from a deep appreciation of music to socialization, nostalgia, and escapism (Kulczynski et al., 2016).

Digital engagement further influences concert attendance. Fans exist on a spectrum, from casual listeners who occasionally attend live events to highly devoted or even obsessive fans whose lives revolve around their favorite artists (Perkins, 2012). This continuum underscores the deeply personal nature of music and its impact on individual behaviors and identities. Understanding these varied audience segments is crucial for the music industry. Recognizing the nuanced motivations behind concert attendance allows event organizers and marketers to develop more targeted and inclusive strategies. Whether designing intimate classical performances or large-scale music festivals, catering to audience diversity enhances the overall concert experience.

Another key factor is the role of specific venues in shaping musical preferences. While larger venues often host mainstream genres, smaller clubs may serve as hubs for niche or alternative music scenes. Identifying the connections between venue types and musical styles helps cultivate dedicated audiences and sustain vibrant local music ecosystems. Generational music preferences further complicate audience segmentation. While younger listeners often gravitate toward emerging artists, certain older musicians maintain strong appeal across generations. This intergenerational popularity may stem from recent promotional efforts, sustained media presence, or cultural influence passed down by parents and mentors. Conversely, newer artists tend to attract younger audiences initially, with limited crossover to older demographics. However, this trend varies significantly across genres; for instance, jazz and classical music exhibit greater cross-generational appeal compared to pop, rock, or electronic music. Ultimately, concert audiences are shaped by a dynamic interplay of cultural, social, and generational factors. Recognizing these complexities enables a more nuanced approach to concert

organization, ensuring that live music remains accessible, engaging, and relevant across diverse listener communities.

Importantly, these audience segments differ not only in their motivations and attendance patterns but also in their sensitivity to ticket prices. Highly committed fans and culturally motivated attendees tend to exhibit greater price tolerance, while occasional concertgoers and socially motivated participants are generally more price-sensitive. This heterogeneity suggests that there is no single consumer price limit for concert tickets; rather, price tolerance varies across audience segments, forming the basis for differentiated pricing strategies and for identifying potential consumer price thresholds.

4. Concert Ticket Pricing: Mechanisms and Long-Term Trends

To understand how consumer price tolerance develops, it is necessary to examine both the long-term evolution of concert ticket prices and the mechanisms through which prices are set. This section therefore first outlines historical trends in ticket pricing, followed by an explanation of pricing structures and industry practices that shape contemporary concert markets.

4.1. Trends in Concert Ticket Prices over the Past 50 Years

Over the past half-century, concert ticket prices have risen dramatically, reflecting broader shifts in the music industry, consumer behavior, and the global economy. Several interconnected factors have contributed to this upward trajectory:

- ***Shift in Revenue Streams:*** The decline of physical album sales and the rise of digital music streaming have fundamentally altered the financial landscape for artists. With recorded music generating less income, live performances have become a primary revenue source, leading to higher ticket prices (Krueger, 2005; Fer and Baarsma, 2015).
- ***Artist Popularity and Market Demand:*** An artist's career stage, global recognition, and fanbase size significantly influence ticket pricing. Established performers with high demand can command premium prices, whereas emerging artists typically offer more affordable tickets to attract audiences (Decrop and Derbaix, 2014).
- ***Technological Advancements and the Secondary Market:*** The digitalization of ticket sales has introduced dynamic pricing models and facilitated large-scale reselling. While these innovations enhance accessibility and revenue optimization, they have also driven up costs, particularly for high-demand events, as scalpers and resale platforms exploit limited ticket availability (Papies and van Heerde, 2015).
- ***The New Economy of Live Music:*** As live music has become the dominant income stream for artists in the digital age, concerts have evolved into premium experiences, incorporating elaborate productions and exclusive access options. This economic shift has further contributed to rising ticket prices (Holt, 2010).
- ***Pricing Strategies and Revenue Maximization:*** Multi-tier pricing models, which differentiate ticket costs based on seating location, demand, and purchase timing, have enabled organizers to maximize revenue. While these strategies improve affordability for some audiences, they have also led to a general increase in average ticket prices (Courty and Pagliero, 2012).

- ***Social Inclusion and Accessibility Concerns:*** Rising ticket costs have disproportionately impacted lower-income concertgoers, raising concerns about the accessibility of live music events. The widening gap between ticket prices and wage growth has sparked debates about the social inclusivity of concerts and the long-term sustainability of current pricing models (Albinsson, 2023).

These experiential and emotional dimensions are directly relevant to ticket pricing, as stronger emotional attachment and perceived uniqueness of live performances increase consumers' willingness to pay higher prices.

4.2. How Concert Ticket Pricing Works

Concert ticket pricing is the result of collaboration between performers, promoters, and venues, with several factors influencing the final price. Performers and promoters determine ticket prices based on demand, historical data from previous tours, and the specific characteristics of the venue. Promoters handle logistics, marketing, and financial risks, often earning a small portion of the ticket revenue, typically less than 2%. This makes it unlikely for promoters to drive ticket prices significantly higher (Wall, 2024). Ticketmaster plays a significant role in ticket sales as a service provider for event validation and ticket distribution. While Ticketmaster and similar platforms are often blamed for high ticket prices, they do not actually set the initial prices. The service fees, which are set mainly by the venues, cover the operational costs of running the event and providing ticketing services. Ticketmaster typically retains between 5% and 10% of the service fee revenue.

4.3. Historical Trends in Concert Ticket Prices

Over the past few decades, concert ticket prices have risen dramatically, outpacing inflation. In the mid-1990s, the average concert ticket price was approximately $26 (Fooks, 2022), rising to $90 in 2018 (Apollo Performing Arts), $94.83 in 2019 (Cooke, 2024), and reaching around $120 by 2023. The average price for tickets to the 100 most popular tours in North America has nearly quadrupled in the past 20 years, from $25.81 in 1996 to $91.86 in 2019. Table 1 shows the prices of selected concert tickets in the USA in individual years.

Table 1. Prices of selected concert tickets in the USA

Artist (year of original tour)	Starting price (USD)	2022		
		Lowest (USD)	Average (USD)	Highest (USD)
Red Hot Chili Peppers (1999)	28.50	89.00	178.00	826.00
Metallica (1991)	22.50	58.50	–	743.00
Motley Crue (1989)	18.50	–	145.00	–
Pearl Jam (1995)	21.50	120.00	157.00	–
Guns N' Roses (1987)	14.50	67.00	214.00	–
Slipknot (2005)	35.00	50.00	–	400.00
Aerosmith (1987)	17.50	125.00	261.00	352.00
Foo Fighters (1996)	18.00	143.00	–	248.00
Blink-182 (1997)	8.00	–	162.00	600.00
Bruce Springsteen (1978)	7.00	–	400.00	5,000.00

Source: Fooks (2022).

Several key factors contribute to this increase in ticket prices. A significant driver is the relationship between supply and demand. Limited availability of tickets for high-demand concerts naturally leads to higher prices, as more fans vie for a spot. Additional-

ly, concerts have become premium experiences, valued not only for the live music but also for the spectacle, enhanced by social media and elaborate production. This evolution has increased the perceived value of the live music experience, pushing prices higher.

Artists have increasingly turned to touring as their primary income source, with declining album sales and digital downloads diminishing their ability to generate revenue from recorded music. As a result, concert tickets have become a critical revenue stream, leading to higher prices for live performances.

Furthermore, pricing strategies such as price discrimination—where ticket prices vary depending on factors such as seating, demand, and timing—have enabled promoters to maximize revenue. While this benefits the organizers and artists, it also contributes to higher overall costs for consumers (Courty and Pagliero, 2012).

An important element influencing ticket prices is the secondary ticket market. Resale platforms, such as StubHub, reveal the true market value of tickets, often pushing prices higher for highly sought-after events. As artists see tickets on these platforms being resold at inflated prices, they may adjust their pricing strategies to prevent scalpers from profiting too much. While Ticketmaster and Live Nation often receive criticism for the high prices, the actual driving forces behind the increases are the performers, supply and demand dynamics, and the shift toward touring as the primary income stream for artists.

Concerts have increasingly become "experience goods," where the production costs are higher due to the elaborateness of the event, and for major acts who consistently sell out shows, ticket prices are primarily driven by market demand. In some cases, artists may initially price tickets lower, only to see the resale market drive prices up, prompting them to adjust prices for future events (Cooke, 2024).

5. Concert Ticket Price Developments in Slovenia

Table 2 presents the trend in concert ticket prices in Slovenia. While direct data on concert ticket prices is unavailable, theater ticket prices are used as a reference point to roughly estimate pricing patterns for domestic performers. This approach offers a practical framework for understanding the general pricing structure in Slovenia and provides insight into the rising costs of concert tickets over time, based on trends observed in the theater industry.

As comprehensive historical data on concert ticket prices in Slovenia are limited, theatre ticket prices are used as a proxy to illustrate long-term trends in cultural event affordability. While this approach does not capture all specificities of concert pricing, it provides a useful reference point for assessing changes in purchasing power and cultural consumption over time. In addition, selected observations are informed by professional experience in concert organization and pricing practices, offering contextual insight into the evolution of ticket segmentation in Slovenia.

The table presents a longitudinal overview of purchasing power and cultural consumption in Slovenia from 1991 to 2025, focusing on cinema and theatre attendance as representative cultural goods. It combines three complementary dimensions: (1) the quantity of goods that can be purchased with the average monthly net salary, (2) the monetary value of these purchases expressed in euros, and (3) average household expenditure on cultural activities, including cinemas, theatres, and concerts.

The first section of the table illustrates the quantity of cultural goods purchasable with the average monthly net salary, measured as the number of cinema or theatre tickets that could be purchased in a given year. The steady increase in the average net salary over time is reflected in a gradual rise in the number of tickets affordable to consumers. For exam-

ple, while fewer than 200 cinema tickets could be purchased with the average salary in the early 1990s, this number exceeded 210 tickets by the early 2020s. Theatre attendance shows a similar pattern, indicating a long-term increase in nominal purchasing power for cultural events.

Table 2. Price trends in Slovenia, 1991–2025

Year	Average monthly net salary (EUR)	Quantity of goods purchased with average monthly net salary		Price of goods purchased with average monthly net salary (EUR)		Average household spending (cinemas, theatres, concerts)		
		Cinema tickets	Theatre tickets	Cinema ticket	Theatre ticket	Per household (EUR)	Per household member (EUR)	Spending structure (%)
1991	43.07	192	–	0.22	–	–	–	–
1992	128.58	192	–	0.67	–	–	–	–
1993	195.40	137	–	1.43	–	–	–	–
1994	250.75	139	–	1.80	–	–	–	–
1995	297.44	146	–	2.04	–	–	–	–
1996	341.47	157	–	2.17	–	–	–	–
1997	380.57	168	47.74	2.27	8.0	–	–	–
1998	416.95	164	50.93	2.54	8.2	–	–	–
1999	456.01	168	53.00	2.71	8.6	–	–	–
2000	503.63	176	57.12	2.86	8.8	18.69	6.27	0.15
2001	562.74	178	58.99	3.16	9.5	21.56	7.38	0.16
2002	617.37	170	59.25	3.63	10.4	23.58	8.23	0.16
2003	663.80	171	61.52	3.88	10.8	23.11	8.28	0.15
2004	701.90	175	62.06	4.01	11.3	25.68	9.43	0.15
2005	735.73	168	61.77	4.38	11.9	23.03	8.61	0.13
2006	773.42	172	63.76	4.50	12.1	23.30	8.80	0.13
2007	834.50	180	67.46	4.64	12.4	17.99	6.83	0.10
2008	899.80	193	68.48	4.66	13.1	21.25	8.22	0.10
2009	930.00	196	69.25	4.74	13.4	16.82	6.57	0.08
2010	966.62	200	72.68	4.83	13.3	17.17	6.79	0.08
2011	987.39	198	74.46	4.99	13.3	–	–	–
2012	991.44	194	73.88	5.11	13.4	41.97	16.72	0.22
2013	997.01	186	74.40	5.36	13.4	–	–	–
2014	1,005.4 1	189	69.24	5.32	14.5	–	–	–
2015	1,013.2 3	190	67.23	5.33	15.1	37.88	14.62	0.19
2016	1,030.1 6	186	67.64	5.54	15.2	–	–	–
2017	1,062.0 0	190	69.82	5.59	15.2	–	–	–
2018	1,092.7 4	194	71.75	5.64	15.2	47.88	19.30	0.22
2019	1,133.5 0	195	74.28	5.81	15.3	–	–	–
2020	1,208.6 5	203	76.50	5.96	15.8	–	–	–
2021	1,270.3 0	212	77.74	5.98	16.3	–	–	–
2022	1,318.6 4	217	80.40	6.09	16.4	50.04	20.92	0.19
2023	1,445.1 2	219	83.44	6.59	17.3	–	–	–
2024	1,526.0 2	211	82.94	7.23	18.4	–	–	–
2025	1,610.1 9	216	83.95	7.47	19.2	–	–	–

Source: SURS (2025a, 2025b).

The second section translates this quantity into price equivalents, showing the monetary value of the goods that could be purchased with the average salary. This provides additional insight into how price levels and salary growth have evolved simultaneously. Although nominal prices of cinema and theatre tickets increased over time, wage growth largely kept pace, allowing purchasing power in cultural consumption to remain relatively stable or even improve during certain periods.

The third section of the table reports average household spending on cultural activities, expressed both per household and per household member, as well as the share of total household expenditure devoted to cinemas, theatres, and concerts. These data reveal that cultural spending represents a relatively small proportion of total household expenditure, typically ranging between 0.08% and 0.22%. Despite fluctuations linked to broader economic conditions, the overall share remains modest, suggesting that cultural consumption, while valued, occupies a limited portion of household budgets.

Taken together, the table demonstrates that although the nominal cost of cultural events has increased over time, rising incomes have partially offset these increases. However, the relatively low and stable share of cultural spending in household budgets suggests that there may be limits to consumers' willingness or ability to allocate additional resources to cultural activities. This finding is particularly relevant for understanding consumer price tolerance and potential price thresholds in the live music and performing arts sectors.

In Slovenia, which is the focus of our research, the segmentation of concert ticket prices for large events in venues began later than in the West. While we had venues like Cankarjev dom, which already allowed for price segmentation based on seat positions (two or three ticket types in the orchestra, followed by the 1st and 2nd balconies), or larger venues with two, rarely three, ticket segments, the general practice of segmenting ticket prices for concerts was not common until the construction of Stožice Arena. Until then, ticket segmentation was mostly limited to exceptions, such as the spectacle Carmina Burana – Monumental Opera (Tivoli Hall, 2004) or Il Divo's concert in Tivoli Hall (2009), both of which followed the specific requirements of the main management, whose tour setup was coordinated across Europe. As mentioned, ticket pricing used to follow a basic two- or three-tier segmentation system.

It wasn't until later that the need for multi-tiered pricing emerged—partly due to the increasing number of concerts being organized locally by big players like Live Nation and other large booking and management companies, and also because of the transfer of this useful pricing model from abroad. This shift in thinking also led to the introduction of more structured ticket pricing for concerts, where the segments were more meticulously planned and priced. Our own organic reasoning behind this was simple: each price point would deter a certain percentage of potential buyers. By lowering prices for specific segments, you could reach a larger pool of customers. For example, rather than setting all tickets at a uniform price of 60 EUR, higher-priced tickets could subsidize lower-priced tickets, with prices ranging from 30 EUR to 100 EUR.

This approach allowed us to strategically exploit seat/standing positions based on their quality for the audience's concert experience. The lowest prices also served a function: to attract a certain segment of customers with lower purchasing power or less attachment to a particular artist, thus preventing them from automatically dismissing the purchase. Once they see the lowest price available, they might be encouraged to buy tickets either online or at the venue. After looking at the seating plan, they might even opt for a more expensive ticket based on the perceived value of the seat or sector.

As mentioned, with the construction and use of the multifunctional Stožice Arena, true segmentation with six or more pricing tiers began to take shape (such as for the Sting concert with the Slovenian Symphony Orchestra in 2011). The venue's layout, which was far

more adaptable than the previous "boxy" sports arenas used for large concerts, made this kind of ticket segmentation possible. By then, the online ticketing system had become very well-developed and widely accepted, mainly through Eventim, which allowed customers to select their seats directly online. Before the development and use of this system, it was not possible to purchase tickets this way. This system gradually became more widespread among local or visiting concert organizers, driven not only by the needs of international acts but also by the pricing structures they had established for their tours across Europe or globally.

6. Consumer Reactions to Rising Ticket Prices

6.1. How Audiences React to Higher Ticket Prices

Research suggests that concert ticket pricing tends to be relatively inelastic, meaning that small price increases do not significantly reduce demand. However, audience responses vary across different segments. For instance, subscription ticket buyers—such as those attending a series of classical performances—tend to be more price-sensitive than individuals purchasing single-event tickets (Pompe et al., 2018, 2020).

Pricing strategies play a crucial role in revenue optimization. Dynamic and multi-tier pricing models, which adjust ticket prices based on demand and seating quality, have been shown to increase revenue by an average of 4.2%, with some performances experiencing gains exceeding 20% (Eckard and Smith, 2012). Similarly, price discrimination—offering different ticket prices for the same event—has been found to boost revenue by approximately 5% compared to flat-rate pricing (Courty and Pagliero, 2012).

From a practical perspective, multi-tier pricing serves both economic and psychological functions. By offering a range of price categories, event organizers can use premium ticket sales to subsidize lower-cost options, making concerts more accessible to price-sensitive attendees. Without this segmentation, a uniform ticket price might be prohibitively expensive for certain audience segments, potentially deterring attendance. Furthermore, consumer behavior research suggests that price differentiation can influence purchasing decisions in unexpected ways. For example, a buyer who initially intends to purchase the cheapest available ticket may reconsider after reviewing the seating chart. If a moderately higher-priced ticket (e.g., 20% more expensive) offers significantly better visibility or overall experience, they may opt for the more expensive option despite their initial budget constraints. Importantly, the presence of an affordable baseline ticket price often serves as the key factor that attracts consumers in the first place. If all ticket prices were set at a higher level from the outset, some potential buyers might decide against attending altogether.

Several factors shape consumer sensitivity to ticket prices, including:

- **Artist Profile:** The career stage, nationality, and overall popularity of an artist strongly influence fans' willingness to pay (Decrop and Derbaix, 2014).
- **Digital Music Trends:** The rise of streaming services has altered the relationship between recorded music sales and live concert attendance. With album sales no longer serving as a primary revenue stream, artists increasingly rely on ticket sales as a key financial resource (Krueger, 2005; Fer and Baarsma, 2015).
- **Psychological Factors:** Buyers often compare ticket prices to previous events or promotional discounts. Additionally, loss aversion—the tendency for people to react more strongly to perceived losses than to equivalent gains—can discourage attendance if ticket prices exceed their expectations (Tereyagoglu et al., 2018).

While many concertgoers are willing to absorb moderate price increases, sudden or excessive hikes can lead to dissatisfaction, especially if the perceived value of the experience does not match the cost. Therefore, effective pricing strategies must strike a balance between revenue maximization and maintaining customer trust, ensuring that ticket prices remain justifiable and fair in the eyes of the audience.

6.2. Understanding Inelastic Demand in Concert Ticket Sales

While demand for concert tickets is often described as inelastic—meaning price increases have a limited impact on overall sales—consumer sensitivity varies. Subscription buyers, for instance, tend to be more price-conscious than single-ticket purchasers, who may perceive concerts as one-off luxury experiences (Pompe et al., 2020). Additionally, generational and demographic factors play a role; younger audiences with lower disposable income may be more sensitive to price hikes than older consumers who prioritize premium experiences.

While these findings illustrate how audiences respond to ticket price increases, they do not fully explain where consumers draw the line between acceptable and unacceptable prices. Understanding consumer reactions therefore represents a necessary step toward identifying broader limits of price tolerance and the point at which rising ticket prices begin to significantly deter concert attendance.

7. Consumer Tolerance and Price Thresholds

In this context, a consumer price threshold refers to the maximum ticket price an individual is willing to pay for a concert before deciding not to attend. This threshold is not fixed or universal; rather, it is shaped by factors such as perceived value, emotional attachment to the artist, income, past experiences, and available alternatives. Consequently, price thresholds vary across consumer segments and demographic groups, making them a central concept for understanding both affordability and pricing strategies in the concert industry.

7.1. Evaluating Consumer Limits to Ticket Price Growth

The steady rise in concert ticket prices over the past few decades has ignited widespread discussion about consumer tolerance and industry practices. Several factors influence how long consumers will continue to accept increasing prices, including perceived value, alternative entertainment options, and broader economic conditions.

How industry trends contribute to rising ticket prices. Concert ticket prices have surged significantly, particularly since the late 1990s. This trend is largely driven by the declining role of album sales as a revenue source, with streaming services and file-sharing platforms shifting financial reliance onto live performances (Krueger, 2005; Fer and Baarsma, 2015). As a result, artists and promoters now depend heavily on concerts for income, making higher ticket prices almost inevitable. Furthermore, technological advancements and production costs contribute to increased ticket prices, as fans increasingly expect immersive and high-quality live experiences.

Consumer behavior and psychology in concert ticket pricing. Several psychological principles influence consumer reactions to rising ticket prices:

- ***Reference Dependence and Loss Aversion:*** Consumers compare current prices to past purchases or advertised discounts, and perceived "losses" from higher prices can deter them from attending (Tereyagoglu et al., 2018).
- ***Perceived Value and Premium Offerings:*** High-end experiences such as VIP packages, early access, and exclusive merchandise cater to wealthier demographics but may alienate price-sensitive fans.
- ***Social and Emotional Factors:*** FOMO (fear of missing out) and social validation drive some consumers to accept high ticket prices despite financial strain, especially for high-profile artists.

Identifying potential consumer breaking points. Economic pressures such as inflation, stagnating wages, and rising costs of living could push ticket prices beyond what the average consumer is willing to pay. Fans may begin opting for smaller, more affordable events or alternative entertainment options. Additionally, backlash over perceived price gouging—including excessive fees and inflated resale markups—could erode goodwill toward artists and promoters (Courty and Pagliero, 2012). High-profile cases of consumer frustration, amplified by social media, may influence industry practices and regulatory interventions.

Proposed solutions and industry controversies. To address these challenges, the industry is exploring several strategies:

- ***Dynamic Pricing Models:*** These adjust ticket prices based on real-time demand but remain controversial, as some argue they improve accessibility while others claim they exacerbate affordability issues (Happel and Jennings, 1995).
- ***Bundled Pricing Strategies:*** Mobile economy maximization bundles, which package tickets with additional perks or flexible pricing structures, have been introduced to balance affordability and profitability (Streidl, 2023).
- ***Regulatory Measures:*** Anti-scalping laws and restrictions on ticket resale aim to curb excessive markups, though their effectiveness remains debated.

7.2. Relevant Economic and Behavioral Theories

Several economic theories help contextualize consumer responses to rising ticket prices:

- ***Utility Theory:*** Consumers aim to maximize satisfaction within their budget, selecting options that offer the highest utility relative to cost. As prices rise, they may seek cheaper alternatives or forego purchases entirely (Jevons, 1886).
- ***Bounded Rationality Theory:*** Due to limited information and cognitive constraints, consumers make "satisficing" rather than optimizing decisions, often relying on heuristics or emotional factors (Simon, 2013).
- ***Prospect Theory:*** Consumers evaluate ticket prices based on reference points, such as previous prices or competitor offerings. If current prices exceed expectations, they perceive a loss, reducing purchase likelihood (Kahneman and Tversky, 2013).
- ***Reservation Price Theory:*** Each consumer has a maximum price they are willing to pay. If ticket prices exceed this threshold, they will seek alternatives or abandon the purchase (Myerson, 1981). Prepaid or subscription models can increase purchase commitment by leveraging psychological tendencies to avoid perceived losses.

Consumer tolerance for rising concert ticket prices hinges on a balance between perceived value, economic conditions, and psychological thresholds. While some fans will

continue to pay premium prices for unique experiences, broader affordability concerns may push the industry toward more innovative and flexible pricing models. Failure to address these issues could lead to declining attendance, increased consumer dissatisfaction, and long-term shifts in the live music economy.

8. Demographic Determinants of Concert Ticket Purchases

Research indicates that demographic characteristics significantly influence concert ticket purchases and consumer behavior. Variables such as gender, age, income, employment status, and education level all play critical roles in shaping how consumers decide on concert attendance and ticket purchases. These factors affect not only whether individuals purchase tickets but also the types of events they attend, their price sensitivity, and how they respond to different marketing and promotional efforts. Understanding how these demographic variables interact can help concert organizers, event promoters, and marketers better target their audience and improve sales strategies.

8.1. Key Demographic Influences on Ticket Purchases

Gender, age and income. Gender, age, and income have all been shown to be strong determinants of purchasing behavior. Younger consumers tend to be more responsive to promotional campaigns, such as discounts, free product samples, and SMS marketing (Saleh, 2013; Leppäniemi and Karjaluoto, 2008). Studies also indicate that women are more active participants in marketing campaigns, particularly in response to SMS promotions (Leppäniemi and Karjaluoto, 2008). Conversely, older consumers, particularly those aged 50 and above, are more likely to purchase tickets and attend concerts, possibly due to greater disposable income and a stronger appreciation for live performances (Pompe et al., 2020).

Higher income and education levels are strongly associated with increased concert attendance. Individuals from higher socioeconomic backgrounds—whether due to income or educational status—are not only more likely to purchase concert tickets, but they also tend to attend more cultural events in general (Pompe et al., 2020). This correlation could be attributed to a greater sense of cultural value placed on live performances and the financial flexibility that higher-income individuals possess.

Employment and financial support. Employment status plays a significant role in ticket purchasing decisions. For example, students and retired individuals may have more flexible schedules, allowing them to attend events more readily. However, their ability to afford tickets may vary significantly depending on their financial circumstances. Employed individuals, particularly those with steady income, are more likely to prioritize entertainment and leisure activities, including concerts, as part of their discretionary spending. Interestingly, retired individuals often contribute financially to younger attendees, such as students or grandchildren, by providing money for tickets as gifts during holidays or special occasions.

Education, occupation and social influence. Demographic characteristics such as education level, occupation, and location can also influence consumer behavior in subtle but important ways. Music festivals, for example, often target specific demographic groups based on age and gender. Younger consumers and women may prioritize different aspects of the concert experience, such as socializing and digital engagement, while older attendees

may focus more on the quality of the performance and artist lineup (Brown and Knox, 2017). Social media also plays a key role in shaping concert ticket purchasing behavior. Concert-goers often rely on social platforms for event information, ticket promotions, and peer reviews, which can heavily influence their decision-making process (Wahyudi, 2023).

Location and ticket pricing. Venue location and ticket pricing significantly influence consumer purchasing decisions. Studies suggest that urban consumers are more likely to attend concerts than those from rural areas, as they have greater access to events and are generally more exposed to cultural experiences (Estelami et al., 2019). Conversely, rural consumers may face additional barriers such as travel costs, which could deter attendance. Ticket prices can also serve as a limiting factor for some consumers, particularly those from lower income brackets, even if they are highly motivated to attend.

Despite these trends, some studies suggest that gender and age do not always exhibit a significant relationship with purchasing decisions, particularly in online ticket sales (Ullah et al., 2021). However, income remains a consistently significant factor, highlighting that financial capacity is a key determinant of concert ticket purchases across all demographics.

Taken together, these demographic factors suggest that income plays the most consistent role in determining concert ticket purchases, while age, gender, and employment status influence how consumers perceive value and respond to pricing strategies. However, demographic characteristics alone do not determine consumer behavior; they interact with cultural preferences, emotional motivations, and prior concert experiences, further reinforcing the complexity of identifying consumer price thresholds.

9. Discussion

This study set out to examine consumer tolerance for rising concert ticket prices and to explore the factors that shape price thresholds in the live music industry. By integrating cultural, economic, and behavioral perspectives, the analysis contributes to a more nuanced understanding of why audiences continue to attend concerts despite substantial price increases, as well as where the limits of this tolerance may lie.

While the study draws on illustrative evidence from specific markets, including smaller national contexts, the core findings are conceptually generalisable. The mechanisms identified—such as the role of experiential value, emotional attachment, price segmentation, and income constraints—are not unique to any single country or market size. Existing international research supports the notion that live concerts function as experience goods across diverse cultural settings, suggesting that consumer price tolerance is shaped by similar psychological and economic processes globally. However, the precise level at which price thresholds occur is likely to vary depending on local income levels, cultural consumption patterns, and market structures. As such, the findings are best generalised at the level of mechanisms rather than absolute price points.

The results of this study are largely consistent with earlier research indicating that demand for concert tickets is relatively inelastic, particularly for high-profile artists and unique live experiences (Courty and Pagliero, 2012; Eckard and Smith, 2012). At the same time, the findings align with studies emphasizing heterogeneity among concertgoers, showing that price sensitivity differs across audience segments and demographic groups (Pompe et al., 2020). By explicitly focusing on consumer price thresholds, this paper extends prior work that has primarily examined price changes and revenue optimization, rather than identifying the points at which consumers disengage.

The integration of behavioral theories such as prospect theory and reservation price theory further supports existing evidence that consumer responses to ticket pricing are shaped by reference prices, perceived losses, and expectations formed through prior experiences (Kahneman and Tversky, 2013; Tereyagoglu et al., 2018). This helps explain why gradual price increases are often tolerated, while sudden or unexpected hikes may provoke strong negative reactions.

Although rising ticket prices are frequently attributed to declining revenues from recorded music and increased production costs, alternative explanations should also be considered. For instance, social dynamics such as fear of missing out (FOMO), status signaling, and social media amplification may encourage consumers to accept higher prices even when affordability is strained. In addition, limited supply—particularly for popular artists and venues—may artificially inflate prices beyond what would occur in a more competitive market. These factors suggest that consumer tolerance is influenced not only by individual willingness to pay but also by broader social and structural pressures that shape perceived value and urgency.

One of the key strengths of this paper lies in its interdisciplinary approach, combining insights from cultural studies, economics, and behavioral theory to address a complex and timely issue. By conceptualizing concerts as experience goods and linking this perspective to pricing mechanisms and consumer psychology, the study offers a comprehensive framework for understanding price tolerance in the live music industry.

However, the study also has limitations. The absence of primary empirical data restricts the ability to quantify price thresholds or test hypotheses statistically. In addition, while illustrative evidence from smaller markets provides valuable context, it cannot fully capture the diversity of global concert markets. These limitations suggest that the findings should be interpreted as conceptual and exploratory rather than definitive.

The findings have several practical implications for concert organizers, promoters, and policymakers. First, the heterogeneity of consumer price tolerance underscores the importance of segmented pricing strategies that preserve accessible entry-level tickets while allowing premium pricing for highly engaged audiences. Second, transparency in pricing and fee structures may help maintain consumer trust and reduce negative reactions to price increases. Finally, organizers should be mindful of long-term audience development, as consistently pricing out lower-income or younger consumers may undermine future demand.

From a policy perspective, concerns about affordability and access raise questions about the cultural inclusivity of live music. Measures aimed at regulating excessive resale markups or encouraging fair pricing practices may help mitigate exclusionary effects without undermining market efficiency.

The study highlights the need for further empirical research to test and refine the concept of consumer price thresholds. Future studies could employ surveys, experimental designs, or longitudinal data to identify specific price points at which attendance declines across different genres, markets, and demographic groups. Comparative research across countries and income levels would further enhance understanding of how local conditions shape consumer tolerance.

In response to the research question, this study finds that consumer tolerance for rising concert ticket prices is substantial but not unlimited. While emotional engagement, experiential value, and social motivations enable many consumers to accept higher prices, identifiable price thresholds exist beyond which attendance decreases. These thresholds are shaped by a combination of economic constraints, psychological reference points, and audience segmentation. Rather than a single breaking point, the evidence suggests multiple, segment-specific limits to price tolerance. Recognizing and addressing these limits is essential for ensuring the long-term sustainability, inclusivity, and cultural relevance of the live music industry.

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Media Literacy in the Era of Synthetic Media and Generative Artificial Intelligence: Perceptions of Primary Education Teachers

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Abstract

The dynamic development of generative artificial intelligence and the emergence of synthetic media are significantly transforming the modern media ecosystem, opening new opportunities, but also posing serious challenges for media and information literacy. The increasingly frequent presence of AI-generated content (text, image, audio, and video) blurs the boundary between authentic and synthetic information, which leads to a rethinking of traditional concepts and the need for new competencies for functioning in the digital society. In this context, critical thinking, AI literacy, and algorithmic literacy become key elements of contemporary media education. The purpose of this paper is to analyze the implications of synthetic media on media and information literacy and the need to redefine educational competencies in conditions of generative artificial intelligence, by examining the perceptions of primary education teachers. The research combines theoretical analysis of relevant literature and empirical research with a survey questionnaire. The focus is on teachers' awareness of synthetic media, their views on the application of generative artificial intelligence in education, and the need to develop new competencies among students and teachers. The results are expected to show that traditional models of media and information literacy are not enough, but that their expansion through the integration of AI literacy, algorithmic literacy, and critical thinking as key competencies of the 21st century is necessary. The research findings can contribute to the advancement of theoretical knowledge in the field of media education, as well as to the creation of modern educational policies and practices aimed at the development of critical, responsible, and media-literate citizens.

Keywords: synthetic media; generative artificial intelligence; AI literacy; algorithmic literacy; critical thinking

1. Introduction

The digital transformation of society has significantly changed the way information is created, processed, distributed, and used. The development of digital platforms, social media, and algorithmic systems has enabled rapid access to vast amounts of information and knowledge, while simultaneously creating a need to develop the skills to critically understand, analyze, and evaluate them. In this context, media and information literacy has emerged as a crucial competency for active, critical, and responsible participation in the modern information society. Its significance is particularly pronounced in education, where teachers play a key role in developing students' ability to approach information and media content critically.

The development of generative artificial intelligence marks a new turning point in the media and information ecosystem. Generative systems enable the creation of text, image, audio, and video content, with their realism and accessibility constantly increasing. As a result, the line between authentic and synthetically created or altered content is becoming increasingly difficult to distinguish. This process opens up new opportunities for learning, communication, and creative expression, but at the same time creates serious challenges related to disinformation, manipulation, content authenticity, privacy, and the ethical use of technology.

In this context, synthetic media—that is, media content created or significantly altered using algorithms and artificial intelligence technologies—take on particular significance. They encompass various forms of textual, visual, audio, and video content, including deepfake materials and synthetic voices. Although their use can offer significant creative and educational value, the potential to create realistic yet false content further complicates the process of assessing its credibility. Research indicates that disinformation accompanied by deepfake content can be perceived as more convincing and trustworthy, highlighting the need to develop the skills to critically recognize and evaluate such material.

Changes in the media landscape indicate that the traditional understanding of media and information literacy needs to be re-examined and expanded. In the era of generative AI, it is no longer sufficient for an individual merely to be able to locate information and evaluate its source. One must also understand how the content was created—whether it was generated or modified using AI—how algorithms influence its presentation and dissemination, and what the potential consequences of its use might be. Consequently, alongside the traditional components of media and information literacy, AI literacy, algorithmic literacy, and critical thinking are becoming increasingly important.

AI literacy entails more than just the technical ability to use AI-based tools. It encompasses understanding the fundamental operating principles of AI systems, recognizing their capabilities and limitations, critically evaluating their outputs, and comprehending the ethical and societal aspects of their use. In this context, Long and Magerko (2020) conceptualize AI literacy through competencies that enable an individual not only to use AI systems but also to understand them, critically evaluate them, and perceive their impacts.

These changes hold particular significance for the education system. Schools are tasked not only with developing traditional digital and information skills but also with preparing students for critical and responsible participation in an environment where artificial intelligence is becoming part of everyday learning, communication, and content creation. In its AI competency frameworks, UNESCO emphasizes the need for students to develop capabilities related to a human-centric approach, AI ethics, the understanding and application of technologies, and the design of AI systems. In this way, students are viewed not merely as technology users, but also as critical thinkers, responsible citizens, and potential co-creators.

Alongside the need to develop new competencies among students, the question of teachers' competencies also arises. In the modern educational environment, the teacher is not merely a user of digital technologies but a facilitator who guides students toward the critical, ethical, and responsible use of information and technology. Consequently, their level of awareness, attitudes, competencies, and readiness to integrate AI into teaching are of particular importance.

Through its AI Competency Framework for Teachers, UNESCO emphasizes the need to rethink the teacher's role in the era of artificial intelligence. The framework organizes teacher competencies into five areas: a human-centric approach, AI ethics, AI fundamentals and applications, AI-integrated pedagogy, and AI for professional learning. This indicates that teacher competence in the AI era is not limited to technological knowledge but also encompasses the ability to use technology in a critical, ethical, and pedagogically sound manner.

This gives rise to the need to examine media literacy in the era of synthetic media not only from the perspective of students but also through the knowledge, attitudes, and perceptions of teachers. It is particularly important to investigate the extent to which teachers are informed about synthetic media, how they perceive generative AI and its application in education, and whether they consider existing concepts of media and information literacy sufficient to address these new challenges.

In this context, this paper addresses media literacy amidst the emergence and spread of synthetic media and generative artificial intelligence, with a particular focus on the perceptions of primary school teachers. The study aims to examine teachers' level of awareness regarding synthetic media, their attitudes toward the use of generative AI in education, and their perceptions regarding the need to develop and redefine educational competencies. Special attention is given to the possibilities of integrating AI literacy, algorithmic literacy, and critical thinking into the modern concept of media and information literacy.

The scientific relevance of the research stems from the need to determine whether transformations in the contemporary media ecosystem require a corresponding re-examination of educational goals and competencies. In a landscape where synthetic media are increasingly difficult to distinguish from authentic content, the ability to critically analyze, verify, and evaluate information becomes an essential educational necessity. Gaining insight into teachers' perceptions can contribute to identifying professional development needs, enhancing teaching practices, and creating modern educational approaches that address the challenges of a media environment shaped by generative artificial intelligence.

2. Literature Review

Modern society is characterized by the rapid development of information and communication technologies and a constant increase in the volume and diversity of information. While the digital environment enables quick access to and sharing of information, it simultaneously creates challenges regarding its accuracy, credibility, and relevance. In this context, media and information literacy are essential competencies for critical and responsible participation in modern society.

Media literacy is traditionally associated with the ability to access, understand, analyze, and critically evaluate media content, as well as to create and share it. Information literacy refers to the ability to recognize the need for information and to locate, evaluate, and use it appropriately. These two fields are interconnected and form the foundation for the critical use of information.

UNESCO views media and information literacy as an integrated framework of knowledge and skills for accessing, understanding, analyzing, evaluating, using, and creating information and media content, while placing special emphasis on the role of education and teachers (Wilson et al., 2011; Grizzle et al., 2021). Its importance is growing in the educational context, as students are exposed to various forms of digital content from an early age and need to develop habits of information verification and critical thinking.

Digital transformation has changed the way information is created, distributed, and consumed. The internet, social networks, and digital platforms enable users to be both consumers and creators of content simultaneously. This creates opportunities for learning and communication, but also risks exposure to inaccurate, manipulative, and disinformation-laden content.

Algorithmic systems that influence the selection, ranking, and display of content pose an additional challenge. Personalization can affect the information a user accesses and their understanding of reality. Therefore, modern media and information literacy entails not only analyzing a specific message but also understanding the broader digital and algorithmic context.

Under such conditions, critical thinking and the verification of sources become essential. Users need to be able to ask questions regarding the author, purpose, source, evidence, and potential interests behind specific content. Consequently, algorithmic literacy emerges as a significant additional dimension of modern media and information literacy.

The development of generative artificial intelligence has led to the emergence and rapid refinement of synthetic media—content created or modified, either wholly or partially, using algorithms and AI. This encompasses text, photographs, audio, video, and other forms of digital content.

A particularly significant characteristic of synthetic media is their ability to generate realistic content, thereby complicating the distinction between authentic and artificially created material. This raises questions regarding trust, authenticity, authorship, and accountability.

Deepfake content attracts particular attention; by employing deep learning techniques, it enables the creation or alteration of a specific individual's appearance, voice, or behavior. Although such content can serve creative and educational purposes, it also carries risks of fraud, manipulation, privacy violations, and the spread of disinformation.

McCosker (2024) highlights the need to link media literacy with AI literacy and data literacy so that users can better understand the technologies and processes through which digital content is created. Harris (2024) further emphasizes the challenge of verifying the authenticity of synthetic media, noting that technical detection should be complemented by critical assessment. The issue of deepfake content is also significant for trust in media and public communication (Labuz and Nehring, 2024).

Generative artificial intelligence enables the creation of text, images, audio, video, and other multimodal content based on given instructions. In education, it can be used to prepare and adapt teaching materials, create assignments, generate ideas, personalize learning, and support teachers.

UNESCO recognizes generative AI as a technology with significant potential for education but emphasizes that its application must be human-centric, ethical, safe, and pedagogically sound (Miao and Holmes, 2023). Issues related to data privacy, bias, academic integrity, and the responsible use of technology are of particular importance.

One of the key challenges is the potential for generative systems to produce convincing yet factually incorrect information. Consequently, their outputs should be verified and cross-referenced with reliable sources. This underscores the need to foster critical and ethical competencies among teachers and students.

The emergence of generative AI expands the traditional concept of media and information literacy. Modern users must not only be able to locate and evaluate information but also consider how it was created and whether artificial intelligence played a role in the process.

Generative technologies enable the rapid creation of vast amounts of text, visual, audio, and video content. While this holds significant potential for education and creative expression, it simultaneously creates opportunities for the production and dissemination of manipulative and false content.

Consequently, modern media literacy must encompass verifying sources, assessing authenticity, recognizing potential signs of manipulation, and understanding the capabilities and limitations of generative AI.

The development of generative AI and algorithmically mediated platforms necessitates an expansion of traditional media and information literacy models. Beyond accessing, analyzing, and evaluating content, AI literacy and algorithmic literacy are becoming increasingly important.

AI literacy entails understanding the fundamental principles, capabilities, and limitations of artificial intelligence systems, as well as using them critically and responsibly. Algorithmic literacy refers to understanding how algorithms influence the creation, selection, ranking, and distribution of digital content.

These competencies are closely linked to critical thinking. While critical thinking enables the evaluation of information and evidence, AI literacy facilitates an understanding of the technology, and algorithmic literacy—an understanding of the processes through which digital platforms mediate access to information.

The ethical dimension is also significant, encompassing privacy protection, copyright, the recognition of bias, and the responsible use of AI.

Teachers play a pivotal role in developing students' media and information literacy. Their role extends beyond the mere use of digital tools; it encompasses fostering the ability to critically evaluate, verify, and responsibly use information.

In the era of generative AI, teachers must help students understand that digital content is not necessarily human-generated and that its realistic appearance is no guarantee of its truthfulness. Consequently, teachers serve as vital intermediaries between students, technology, and the modern information landscape.

Successfully fulfilling this role requires modern digital, media, information, and AI competencies. Professional development should encompass not only the use of specific AI tools but also an understanding of their capabilities, limitations, risks, ethical aspects, and pedagogical applications.

Research to date indicates growing interest in the relationship between media literacy, digital competencies, artificial intelligence, and education. Particular attention is being paid to teachers' readiness to use generative technologies and their ability to critically evaluate AI-generated content.

Research indicates that technical knowledge of technology is insufficient for its effective educational application; pedagogical, ethical, and critical competencies are also required. Regarding synthetic media, the literature shows that identifying them cannot rely solely on technical detection systems but necessitates the development of broader media, information, and AI competencies. UNESCO emphasizes that the rapid development of generative AI creates a need to build human capacity for its safe, ethical, and pedagogically sound use (Miao and Holmes, 2023).

In the Macedonian educational context, digital transformation and the development of competencies for using new technologies are becoming increasingly significant. However, there remains a need to examine the extent to which existing initiatives address the specific challenges associated with generative AI, synthetic media, AI literacy, and algorithmic literacy.

A review of the literature indicates that the development of generative AI and synthetic media is creating a new media environment in which issues of authenticity, trust, authorship, and the methods of information creation and distribution are gaining added importance.

Although existing literature extensively examines the technological capabilities and risks of generative AI and its application in education, further research is needed regarding teachers' perceptions, attitudes, experiences, and needs concerning synthetic media and generative AI.

It is particularly important to examine teachers' level of awareness, their assessment of the opportunities and risks, their readiness to integrate these issues into their teaching, and the need for professional support.

Therefore, the study of primary school teachers' perceptions regarding media literacy in the era of synthetic media and generative AI aims to contribute to a better understanding of their knowledge, attitudes, and needs. In this context, contemporary media and information literacy should be viewed broadly, by linking critical thinking, AI literacy, algorithmic literacy, information literacy, and the ethical use of digital technologies.

3. Research Methodology

The research methodology in this paper is based on combining theoretical analysis with empirical research, with the aim of examining primary school teachers' perceptions of media literacy in the era of synthetic media and generative artificial intelligence. The theoretical part is based on an analysis and review of relevant contemporary scholarly literature in the fields of media and information literacy, synthetic media, and generative artificial intelligence, with a particular focus on new competencies related to AI literacy, algorithmic literacy, and critical thinking. The theoretical analysis enables the definition of the research's conceptual framework and the identification of contemporary challenges and opportunities arising from the development of generative artificial intelligence within the educational process.

The empirical component is designed as a quantitative, descriptive, and non-experimental study conducted using a survey method. The research focuses on teachers' levels of awareness, attitudes, experiences, and perceptions regarding synthetic media and generative artificial intelligence, as well as their assessment of their own readiness to critically recognize and evaluate content created or modified using these technologies. The primary objective of the research is to determine how teachers perceive the role of media and information literacy amidst rapid technological development and the increasing prevalence of synthetic media and generative artificial intelligence. Additionally, the study aims to assess teachers' level of awareness, their attitudes toward the opportunities and risks associated with using generative AI, their self-assessment of their own competencies, and the need for further training and professional support.

One hundred and twenty primary school teachers participated in the study. Participation was voluntary, and the anonymity and confidentiality of the respondents' answers were ensured. To capture diverse perspectives, the study included teachers with varying levels of professional experience and differing degrees of prior exposure to and experience with digital technologies and artificial intelligence-based tools.

A structured questionnaire, designed based on relevant scientific literature and the research's theoretical framework, was used as the primary data collection instrument. The questionnaire covered key aspects of the subject matter: media and information literacy, synthetic media, generative artificial intelligence, AI literacy, algorithmic literacy, critical information assessment, and the ethical use of technology. A Likert scale was used to examine teachers' attitudes and perceptions, while other questions addressed their demographic and professional characteristics, as well as their prior experience with digital technologies and generative AI tools.

The collected data were processed using descriptive statistical methods. The analysis provided insight into the teachers' level of awareness, attitudes, and self-assessment regarding synthetic media and generative AI, and helped identify their needs for further professional development.

This methodological approach enabled the linking of theoretical insights with empirical data, creating a more comprehensive picture of how primary school teachers perceive the opportunities, challenges, and risks associated with synthetic media and generative AI. At the same time, the findings can contribute to identifying the need to develop modern media, information, AI, and algorithmic competencies among teachers, as well as to enhancing educational practices amidst dynamic technological and societal changes.

4. Findings

The empirical study covered a total of 120 primary school teachers in the Republic of North Macedonia. The research aimed to examine their level of awareness, attitudes, and perceptions regarding media and information literacy, synthetic media, and generative artificial intelligence, as well as to assess their readiness to use these technologies critically and responsibly within the educational process.

The results show that teachers recognize media and information literacy as a significant competence in modern digital society. Particular emphasis is placed on the need to equip students to critically evaluate information, verify sources, and recognize potentially manipulative or inaccurate content. This finding indicates that media literacy is perceived not merely as the ability to use media and digital tools, but also as a prerequisite for critical and responsible participation in the information society.

Regarding synthetic media, the results indicate limited awareness among some teachers, particularly concerning the terms "synthetic media" and "deepfake." At the same time, the respondents recognize the possibility of digital content being created or altered using artificial intelligence, viewing this as a new challenge for media literacy. This perception is significant because the realism of visual, auditory, or textual content can no longer, in itself, be considered a sufficient indicator of its authenticity.

Findings related to deepfake technology further highlight the need to develop skills for the critical assessment of digital content. Educators recognize the potential for the misuse of synthetic media through the spread of disinformation, manipulation, and the creation of false portrayals of events or individuals. Consequently, recognizing synthetic content is becoming an integral part of modern media and information literacy.

Regarding generative artificial intelligence, the results reveal a range of attitudes among teachers. On the one hand, generative AI is recognized as a potentially useful tool for facilitating the teaching process, preparing instructional materials, and personalizing learning. On the other hand, respondents express concerns regarding the accuracy of generated information, the potential for misinformation, ethical dilemmas, and the potential misuse of the technology.

A particularly significant finding is the view that information obtained through generative AI should be verified before being used in teaching. This result confirms that generative AI should not be used as a substitute for critical thinking, but rather as a tool requiring human judgment, verification, and contextualization. In this regard, critical thinking stands out as one of the key competencies for navigating the modern information environment.

The results also point to the need to expand the traditional understanding of media and information literacy by developing AI literacy and algorithmic literacy. Teachers recognize these competencies as significant for the modern teacher and student, particularly given the growing influence of algorithmic systems on the creation, selection, and distribution of digital content. In this context, a media-literate user needs not only to know how to find and evaluate information but also to understand that the way such information is presented to them may be shaped by algorithmic processes.

One of the significant findings concerns the professional preparedness of teachers. Although some teachers demonstrate interest and enthusiasm regarding the use of generative AI, the results indicate a need for further professional development. There is a particular need for practical training on recognizing synthetic media, verifying AI-generated information, ensuring the safe and ethical use of generative AI, and integrating it into the teaching process.

Responses to the open-ended questions further deepen the picture obtained through the quantitative part of the research. Teachers view the role of generative AI as twofold: as an opportunity to facilitate and enhance teaching, but also as a source of new risks requiring a critical approach, clear rules, and ethical standards. Their responses highlight the need for additional training, the availability of appropriate teaching resources, improvements to digital infrastructure, and the establishment of clearer guidelines for the use of AI in education.

It is particularly significant that teachers link the use of generative AI to the need to develop new competencies in students. Beyond the traditional aspects of media and information literacy, they recognize the need for AI literacy, algorithmic literacy, critical thinking, and ethical digital responsibility. These findings point to a shift in the perception of the teacher's role: from a transmitter of information to a mediator who helps students critically understand, verify, and use information within a complex digital environment.

Overall, the research findings indicate that the traditional understanding of media and information literacy is insufficient to fully address the challenges posed by synthetic media and generative artificial intelligence. The new media landscape requires expanding existing competencies to include knowledge and skills related to recognizing and verifying synthetic content, understanding algorithmic processes, critically evaluating AI-generated information, and using technology ethically.

The findings also confirm the pivotal role of teachers in this transformation. Their awareness, competence, and readiness to use new technologies are crucial prerequisites for fostering media and information literacy among students. Consequently, the results highlight the need for continuous professional support, systematic training programs, and clear educational policies that address generative AI not merely as a technological tool, but as a new factor in the development of media and information literacy.

5. Discussion and Conclusions

Research findings indicate that the development of generative artificial intelligence and the emergence of synthetic media are creating new challenges for media and information literacy in primary education. The modern digital environment is transforming not only the accessibility of information but also how it is created, modified, selected, and distributed. Therefore, the traditional understanding of media literacy—focused on accessing, analyzing, and critically evaluating media messages—needs to be expanded to include competencies related to recognizing synthetic content, understanding algorithmic processes, and critically evaluating information generated with the help of artificial intelligence.

In this context, the findings indicate that teachers recognize the significant role of media and information literacy in preparing students for active and responsible participation in the digital society. Of particular importance is the ability to verify sources, cross-reference information, and critically assess its credibility. These skills take on added significance in an environment where synthetic media enable the creation of content that can be visually, auditorily, or textually convincing, even though it is not authentic.

Understanding synthetic media and deepfake content is a significant aspect of modern media literacy. The results indicate a need for further information and professional training for teachers to recognize and critically evaluate such content. This is particularly important because the realism of digital content can no longer, in itself, be considered proof of its authenticity. Instead, assessment should be based on verifying the source, context, and available evidence, as well as considering the possibility that the content was generated or altered using artificial intelligence.

Teachers' perceptions of generative AI reveal its dual nature within the educational context. On the one hand, generative AI is recognized as a potentially useful tool for preparing teaching materials, generating ideas, creating activities, and supporting personalized learning. On the other hand, risks associated with inaccurate or biased information, misinformation, privacy, authorship, and the ethical use of the technology are identified. Therefore, the educational value of generative AI should be viewed not only through its technical capabilities but also through the teacher's ability to critically evaluate its outputs and use them in alignment with educational goals.

A particularly significant aspect of the discussion is the need to develop AI literacy and algorithmic literacy as new dimensions of media and information literacy. AI literacy entails understanding the fundamental principles, capabilities, and limitations of artificial intelligence systems, while algorithmic literacy refers to understanding how algorithms influence the selection, ranking, and distribution of digital content. Linking these concepts with critical thinking creates a foundation for more responsible and secure participation in the digital society.

These findings confirm the need to view the teacher's role more broadly than merely the technical use of digital tools. The teacher becomes a key intermediary between students, technology, and the information environment. Consequently, the teacher's professional preparedness is a crucial prerequisite for fostering critical thinking and media literacy among students. Professional development should encompass practical knowledge regarding the use of generative AI, as well as the critical evaluation of AI-generated content, the recognition of synthetic media, data protection, copyright issues, and the ethical aspects of AI usage.

In terms of the formulated hypotheses, the research enables an examination of the relationships between teachers' experience with AI tools, their awareness of synthetic media, their perception of risks, and their need for professional support. The acceptance or rejection of the hypotheses is determined based on the statistical analysis of data obtained from the 120 respondents.

Research shows that the emergence of synthetic media and generative AI necessitates a re-examination and expansion of traditional concepts of media and information literacy. In an environment where text, visual, audio, and video content can be rapidly created or modified using AI, mere access to information is no longer sufficient. Skills for verifying, comparing, and critically analyzing information—as well as assessing its authenticity, credibility, and context—are essential.

In this context, AI literacy, algorithmic literacy, and critical thinking should be viewed as complementary competencies to modern media and information literacy. Integrating them into the educational process can help foster students who not only use new technologies but are also able to critically understand their capabilities, limitations, and potential risks.

The research confirms the significant role of teachers in this process. Their competence and readiness for the critical and ethical use of generative AI are important prerequisites for developing appropriate competencies in students. Therefore, continuous professional development programs are needed to integrate the technical, pedagogical, critical, and ethical aspects of AI use in education.

At the institutional level, the results point to the need for clear educational policies and a systemic approach to integrating artificial intelligence into teaching. Such an approach should simultaneously foster innovation and provide mechanisms to protect against disinformation, technology misuse, privacy breaches, and other potential risks.

In a broader sense, fostering media, information, and AI-literate citizens is a crucial prerequisite for responsible participation in the digital society. Therefore, the education system needs to evolve by integrating these new competencies into curricula, teacher professional development, and teaching and learning practices.

Ultimately, the research contributes to an understanding of the evolving role of media literacy in the context of synthetic media and generative AI, and highlights the need for further empirical research, particularly within primary education. Future studies could examine differences among teachers based on their professional experience, levels of digital competence, and prior experience with AI tools, as well as the impact of professional training on their readiness to use generative AI critically and ethically.

6. Limitations and Directions for Future Research

When interpreting the research findings, certain limitations must be taken into account. The study was conducted on a sample of 120 primary education teachers in the Republic of North Macedonia; consequently, the generalizability of the results to the entire teacher population—as well as to teachers in secondary and higher education—is limited. Furthermore, the voluntary nature of participation may influence the sample composition, particularly if teachers with a greater interest in digital technologies and artificial intelligence were more inclined to participate in the study.

The use of a self-report questionnaire presents an additional limitation. Although this method is suitable for examining teachers' perceptions, attitudes, and self-assessments, self-reported levels of knowledge and competence do not necessarily align perfectly with their actual knowledge and practical abilities. Therefore, future research could combine survey data with practical tasks and assessment tools designed to evaluate teachers' ability to recognize synthetic and AI-generated content, verify digital sources, and critically evaluate information.

The results should also be considered within the specific temporal and technological context in which the research was conducted. Generative AI and synthetic media are dynamic fields characterized by rapidly evolving technologies, tools, and application methods. Consequently, teachers' perceptions and levels of awareness may shift as AI tools become more widely available and integrated into education, and as relevant policies and professional development programs are developed.

The research focuses primarily on teachers' perceptions and self-assessments; it does not directly involve students, nor does it examine the actual application of generative AI in teaching practice through observation. Consequently, it is not possible to fully determine how teachers' attitudes and levels of preparedness translate into classroom activities and the development of students' media, information, and AI literacy. This presents a significant opportunity for further research.

Future research needs to encompass larger and more diverse samples, including teachers from various regions and educational levels, as well as students. This would allow for a more comprehensive understanding of the situation and create conditions for comparing different educational contexts. Comparative studies involving other European educational systems would be particularly valuable for identifying best practices and models for developing media, information, and AI literacy that could be applied within the Macedonian educational context.

Future research should also devote greater attention to examining the effects of teacher professional development programs. It is necessary to determine whether training focused on AI literacy, algorithmic literacy, the recognition of synthetic media, and the critical assessment of information contributes to improving teachers' knowledge and practical competencies. Longitudinal studies would be particularly valuable for tracking changes in knowledge, attitudes, and teaching practices during the period of intensive integration of generative AI into education.

An additional avenue for research involves examining the impact of generative AI on teaching practices, the development of students' critical thinking, academic integrity, and the ways in which students evaluate digital information. In this context, it is also necessary to investigate how students recognize AI-generated and manipulated content and what strategies they employ to verify its credibility.

A particularly significant area for further research is the development and evaluation of educational models that integrate media and information literacy, AI literacy, algorithmic literacy, and critical thinking. Such models could serve as a foundation for developing teaching materials, practical guidelines, and professional development programs for teachers.

At a systemic level, future research can provide an empirical basis for advancing educational policies regarding the responsible integration of artificial intelligence into education. In doing so, alongside technological aspects, it is necessary to consider issues related to privacy, authorship, disinformation, algorithmic bias, academic integrity, and the ethical use of generative AI.

Overall, the stated limitations do not diminish the significance of the research but rather highlight the need for further, in-depth study in this field. The rapid development of generative artificial intelligence and synthetic media necessitates a continuous re-evaluation of the competencies required for modern education. In this regard, future research should contribute to the creation of evidence-based models and practices that equip teachers and students for critical, safe, ethical, and responsible participation in the modern digital information environment.

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Development and Preliminary Validation of the Future Readiness Competencies Assessment Instrument (FRCAI) for Higher Education

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Abstract

Higher education institutions need credible ways to examine how students and young professionals perceive their preparedness for technological, economic and societal uncertainty. Existing competency frameworks are valuable but rarely integrated into a single multidimensional instrument. This study presents the development and preliminary validation of the 22-item Future Readiness Competencies Assessment Instrument (FRCAI), covering five proposed domains. Development involved literature review, comparative framework analysis, expert review and pilot testing. The instrument was administered to 270 respondents recruited through partner higher education institutions in Slovenia, Austria and North Macedonia. Overall internal consistency was high (Cronbach's α = .892), while domain coefficients ranged from .598 to .805. Parallel analysis favoured three factors; a theory-constrained five-factor exploratory solution showed substantial cross-domain overlap. Confirmatory factor analysis of the prespecified five-factor model produced mixed fit (CFI = .859, TLI = .837, RMSEA = .071, SRMR = .063). Perceived preparedness was highest in Digital, Data and Media Competence and lowest in Financial and Economic Resilience. The results demonstrate the feasibility of the FRCAI and provide a transparent basis for item refinement, independent validation and curriculum-oriented diagnostic use, rather than definitive confirmation of a stable five-factor model.

Keywords: future readiness; competence assessment; higher education; self-assessment; curriculum evaluation

1. Introduction

Higher education is being reshaped by technological, economic, environmental and geopolitical change. Artificial intelligence, automation, demographic shifts and climate instability are altering labour markets and the capabilities graduates need in uncertain professional environments (European Commission, 2020; OECD, 2023; UNESCO, 2021; World Economic Forum, 2023). These conditions echo accounts of risk and continuous social change (Beck, 1992; Bauman, 2000) and increase the need for higher education to assess not only disciplinary knowledge but also students' perceived preparedness to anticipate, adapt and act responsibly under uncertainty.

International organisations have responded with competency frameworks including DigComp, EntreComp, GreenComp, the EU/OECD-INFE Financial Competence Framework for Adults, the OECD Learning Compass 2030 and UNESCO's Futures Literacy initiative. Although developed for different priorities, these frameworks converge around capabilities for adaptation, collaboration, responsible decision-making and future-oriented action (Bacigalupo et al., 2016; Bianchi et al., 2022; Carretero et al., 2017; European Union and OECD, 2022; OECD, 2019; UNESCO, 2021; Wiek et al., 2011).

These frameworks and their associated measures remain largely domain specific. A university may draw on several of them at once and still lack a single way to examine students' broader perceived preparedness. Existing assessment approaches likewise tend to isolate individual competence areas rather than treat future readiness as a multidimensional construct (Le Deist and Winterton, 2005; Mulder, 2014; Rychen and Salganik, 2003).

This fragmentation sits within a broader competence tradition that conceptualises effective performance as an integration of knowledge, skills, attitudes and values rather than a single ability (McClelland, 1973; Boyatzis, 1982; Spencer and Spencer, 1993; Weinert, 2001). Contemporary higher education extends this view to adaptability, ethical judgement, digital capability and anticipatory thinking, but integrated assessment instruments remain limited.

The Future Readiness Competencies Assessment Instrument (FRCAI) was developed to address this gap. It does not propose another competency framework; instead, it translates convergent dimensions from established frameworks into a single self-assessment architecture intended for competence diagnosis, curriculum evaluation and longitudinal research.

This study introduces the FRCAI and reports its preliminary empirical evaluation in a cross-national higher education project context. Three questions guide the inquiry. First, how can future readiness competencies be operationalised as an integrated, multidimensional construct? Second, how can contemporary international frameworks be translated into a unified assessment design? Third, what does the baseline application reveal about respondents' self-assessed preparedness for complex and uncertain futures?

The article brings previously separate competence traditions into one assessment design, documents the instrument-development process and evaluates the reliability and preliminary structural evidence of the resulting measure in a sample recruited through three higher education institutions.

2. Literature Review

2.1. Competence-Based Education and Future Readiness

Competence-based education has shifted attention from knowledge transmission towards capabilities for effective action, lifelong learning and adaptation (McClelland, 1973; Boyatzis, 1982; Spencer and Spencer, 1993; Weinert, 2001). In higher education, this includes preparing graduates for professional and societal challenges that may not yet be fully defined (Aoun, 2017).

The graduate capability approach similarly emphasises broad intellectual and personal capacities for dealing with ambiguity and change, extending competence beyond narrow employability or occupation-specific skills (Barnett, 1994; Stephenson, 1998).

Competence-focused higher education therefore aligns learning outcomes with critical inquiry, ethical judgement, problem solving and adaptability (Biggs and Tang, 2011; Knight and Yorke, 2003). Against accelerating technological and societal change, future readiness can be understood as an integrative perspective combining knowledge, skills and dispositions needed to anticipate and respond to emerging conditions.

While the concept of "future readiness" appears frequently in policy reports, it lacks a consensus operational definition. Research frequently treats individual skills in isolation, leaving a gap in integrated measurement models suitable for university-wide assessment.

2.2. International Competency Frameworks

Over the past two decades, several international organisations have developed competency frameworks addressing different dimensions of preparedness for future societal and professional challenges. Although each framework emerged from a distinct policy context, together they provide a comprehensive foundation for understanding Future Readiness Competencies.

DigComp conceptualises digital competence through information literacy, communication, content creation, safety and problem solving, including critical and responsible digital participation (Carretero et al., 2017; Vuorikari et al., 2022). EntreComp frames entrepreneurship as a transferable capacity involving creativity, opportunity recognition, value creation, initiative and action rather than business creation alone (Bacigalupo et al., 2016). GreenComp links sustainability competence with systems thinking, futures thinking, critical reflection and collective action (Bianchi et al., 2022). The OECD Learning Compass 2030 emphasises learner agency, transformative competencies and responsible action, including the capacity to create value and manage tensions under uncertainty (OECD, 2019). The EU/OECD-INFE Financial Competence Framework for Adults identifies knowledge, behaviours and attitudes required for sound personal financial decisions, including planning, risk management, digital finance and financial well-being (European Union and OECD, 2022). It provides the direct international reference point for the FRCAI domain of Financial and Economic Resilience. UNESCO's Futures Literacy initiative treats anticipation as a learnable capability through which alternative futures can inform present decisions and expose assumptions about change (Miller, 2018; UNESCO, 2021).

Across these frameworks, recurring themes include anticipation, responsibility, collaboration, digital competence, financial decision-making and adaptive learning. Sustainability competence research adds systems, normative, strategic and interpersonal dimensions (Wiek et al., 2011). This convergence informed the proposed five-domain architecture of the FRCAI. Table 1 summarises the principal frameworks and their contribution to each domain.

Table 1. International Competency Frameworks and their conceptual contributions to the development of the FRCAI

Framework	Primary focus	Competence contribution to FRCAI	Related FRCAI domain
DigComp 2.2	Digital competence, data literacy, safety, communication and problem-solving	Supports operationalisation of digital participation, data-informed decision-making, cybersecurity and responsible use of digital technologies	Digital, Data and Media Competence
OECD Learning Compass 2030	Transformative competencies, responsibility, agency, value creation	Supports the integrative understanding of adaptive learning, responsible action and future-oriented competence	Future and Anticipatory Competence; Leadership, Communication and Collaborative Competence
GreenComp	Sustainability competence, systems thinking, futures thinking, collective action	Supports inclusion of long-term thinking, sustainability awareness and system-oriented reflection	Future and Anticipatory Competence
EntreComp	Creativity, opportunity recognition, value creation, entrepreneurial action	Supports operationalisation of innovation, entrepreneurship and implementation of ideas	Innovation and Entrepreneurial Competence
UNESCO Futures Literacy	Anticipation, alternative futures, use of the future for present decisions	Supports operationalisation of futures thinking, anticipation and reflection under uncertainty	Future and Anticipatory Competence
EU/OECD-INFE Financial Competence Framework for Adults	Personal finance, planning, risk, digital finance and financial well-being	Supports operationalisation of financial decision-making, resilience under economic uncertainty and understanding of digital finance	Financial and Economic Resilience

2.3. Fragmentation of Competence Assessment

Despite substantial progress in competence research, assessment practices remain considerably more fragmented than the theoretical frameworks upon which they are based. Most existing instruments have been developed to evaluate individual competence domains, such as digital competence, entrepreneurial capability or sustainability literacy, reflecting the specialised objectives of the frameworks from which they originate (Le Deist and Winterton, 2005; Mulder, 2014).

While domain-specific measures offer valuable diagnostic depth, they often constrain institutional capacity to evaluate graduates' broader, cross-disciplinary readiness. Taken together, these limitations mean that existing frameworks provide only limited insight into graduates' overall preparedness for complex and uncertain professional environments. Universities increasingly implement multiple competency frameworks simultaneously, yet rel-

atively few assessment instruments provide an integrated perspective capable of capturing the interaction between complementary competence domains.

The resulting fragmentation presents both conceptual and methodological challenges. Conceptually, it obscures the interdependence of competencies that are increasingly required in professional practice. Methodologically, it complicates curriculum evaluation by requiring institutions to administer multiple independent assessment instruments rather than a coherent multidimensional measure.

These limitations suggest the need for assessment approaches capable of integrating competencies derived from established international frameworks while preserving their theoretical distinctiveness.

2.4. Research Gap

The review of competence theory and international competency frameworks reveals a clear gap within contemporary higher education research. Considerable attention has been devoted to conceptualizing individual competence domains, yet comparatively little research has focused on integrating these perspectives into multidimensional assessment instruments applicable across disciplinary contexts.

Existing studies therefore provide important theoretical foundations but offer limited guidance regarding how complementary competency frameworks may be synthesised into a coherent assessment architecture suitable for educational evaluation and curriculum development. This gap is particularly important because higher education institutions require valid and reliable assessment instruments capable of evaluating multidimensional competence development beyond individual competency frameworks.

The FRCAI addresses this gap by operationalising competencies repeatedly identified across established international frameworks within a coherent multidimensional self-assessment model. The aim is methodological integration rather than the introduction of a new competency framework.

3. Development of the Future Readiness Competencies Assessment Instrument

3.1. Instrument Development Process

The FRCAI was developed through a transparent multi-stage process intended to support theoretical coherence and practical applicability in higher education, following established recommendations for scale development (Boateng et al., 2018; DeVellis and Thorpe, 2021). Rather than adapting one existing questionnaire, the instrument was constructed to integrate competence areas that are usually assessed separately.

The development process comprised four sequential phases (Figure 1). First, a comprehensive review of competence theory and recent literature identified the principal competence domains associated with preparedness for future societal and professional challenges. Second, internationally recognised competency frameworks—including DigComp, EntreComp, GreenComp, the OECD Learning Compass 2030 and UNESCO's Futures Literacy initiative—were comparatively analysed to identify recurring competence dimensions across different theoretical traditions.

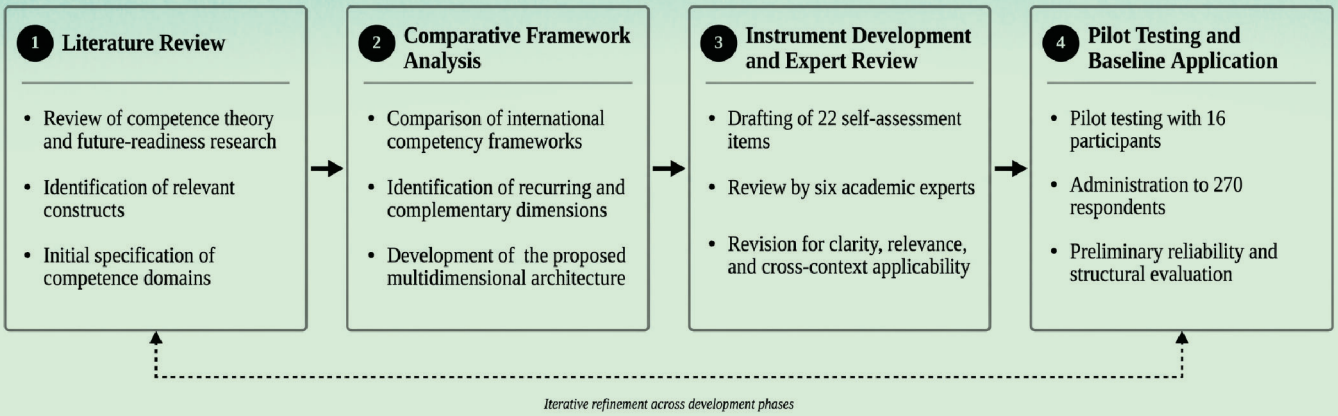


Figure 1. Four-phase development process of the Future Readiness Competencies Assessment Instrument

Third, questionnaire items were generated by operationalizing the identified constructs into measurable indicators suitable for self-assessment in higher education. The preliminary instrument was subsequently reviewed by academic experts from three participating higher education institutions in Slovenia, Austria and North Macedonia. Their feedback resulted in revisions concerning item wording, conceptual clarity and content coverage.

Finally, the revised questionnaire was pilot tested with 16 students representing the participating institutions to evaluate comprehensibility, response consistency and administration procedures before the baseline study.

3.2. Identification of Competence Domains

The literature review and comparative framework analysis demonstrated substantial conceptual convergence across international competency frameworks despite their different educational origins. Rather than reproducing the structure of any single framework, the instrument was organized around competence domains that consistently appeared across multiple sources.

Five domains were identified as representing complementary dimensions of Future Readiness Competencies:

- Future and Anticipatory Competence;
- Digital, Data and Media Competence;
- Financial and Economic Resilience;
- Innovation and Entrepreneurial Competence;
- Leadership, Communication and Collaborative Competence.

Taken as a set, the five domains cover technological, economic and societal aspects of preparedness while retaining the multidimensional view of competence found in contemporary higher education research.

3.3. Operationalisation of Competence Domains

Each competence domain was operationalised through multiple questionnaire items derived from theoretical constructs identified during the literature review and comparative analysis of international competency frameworks.

The final structure of the instrument and allocation of questionnaire items to domains are summarised in Table 2.

Table 2. Structure of the Future Readiness Competencies Assessment Instrument

FRCAI domain	Variables	Number of items	Main construct measured
Future and Anticipatory Competence	Q2a–Q2d	4	Futures thinking, anticipation, strategic foresight and reflection on long-term change
Digital, Data and Media Competence	Q3a–Q3e	5	Digital competence, media literacy, AI ethics, cybersecurity and data-informed decision-making
Financial and Economic Resilience	Q4a–Q4d	4	Financial capability, economic decision-making and resilience under uncertainty
Innovation and Entrepreneurial Competence	Q5a, Q5c, Q5d	3	Creativity, innovation processes, entrepreneurial implementation and interdisciplinary problem-solving
Leadership, Communication and Collaborative Competence	Q5b, Q6a–Q6e	6	International teamwork, critical media evaluation, strategic digital communication, professional digital identity and collaboration

Note. Q5b appeared in questionnaire section Q5 but was assigned to Leadership, Communication and Collaborative Competence on the basis of expert-panel content review. Q3e and Q6e were identically worded in the baseline survey and were administered in separate sections; Q3a and Q6a also covered closely related media-evaluation content. These overlaps were retained to preserve the instrument as administered and are treated as priorities for revision.

The final version of the instrument contains five competence domains represented by twenty-two self-assessment items. All items employ a common Likert-type response format, enabling comparison across domains while maintaining conceptual consistency throughout the questionnaire.

3.4. Expert Review and Pilot Testing

Content validation formed an integral part of the instrument development process. The preliminary questionnaire was independently reviewed by a panel of six academic experts from the three participating institutions with relevant expertise in higher education, curriculum development and fields represented in the instrument. Using a structured expert-review procedure, the panel assessed item relevance, clarity, international applicability and alignment between the proposed constructs, international frameworks and questionnaire items.

Based on expert feedback, several items were refined to improve clarity and reduce conceptual overlap. Particular attention was devoted to ensuring that the instrument could be applied across different higher education systems without relying on country-specific terminology.

The revised instrument was subsequently pilot tested with 16 students representing the participating higher education institutions. Based on participant feedback and expert review, several wording modifications were introduced to improve clarity before the baseline survey. The pilot study confirmed the comprehensibility of the questionnaire, identified only minor linguistic adjustments and demonstrated that the administration procedure was suitable for larger-scale implementation.

3.5. Conceptual Architecture of the Instrument

The FRCAI is conceptualised as an integrative self-assessment instrument in which five theoretically proposed domains jointly describe a profile of perceived future readiness (Figure 2). The diagram is a conceptual map; it does not represent causal ordering or establish that the domains are empirically independent.

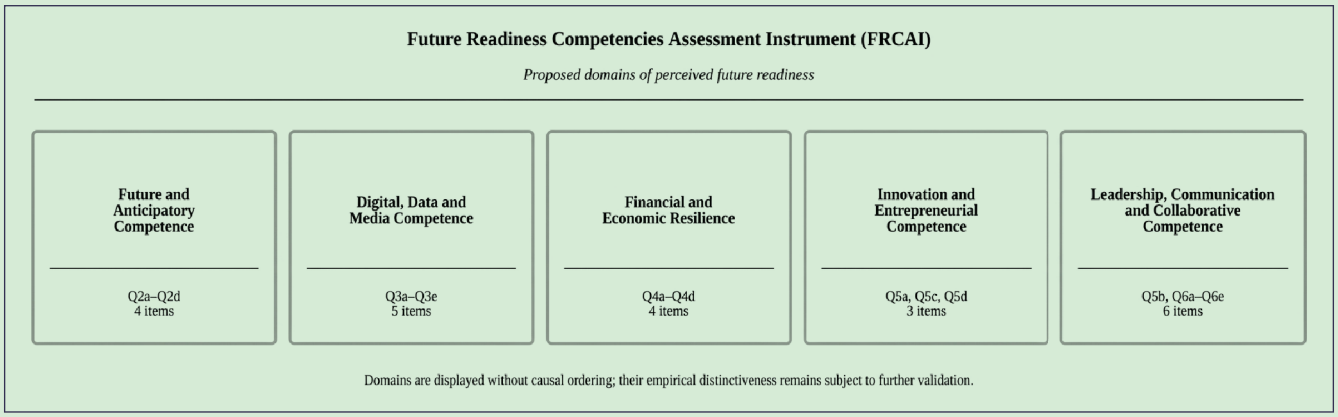


Figure 2. Proposed five-domain conceptual architecture of the Future Readiness Competencies Assessment Instrument (FRCAI)

3.6. Positioning of the FRCAI

The FRCAI does not replace existing competency frameworks. It provides an assessment architecture through which convergent dimensions from those frameworks can be examined within a common analytical structure.

Whereas frameworks such as DigComp, EntreComp and GreenComp primarily define educational objectives, the FRCAI operationalises selected convergent dimensions for empirical research, curriculum evaluation and longitudinal monitoring in higher education.

Its novelty therefore lies less in proposing new competence domains than in showing how established perspectives can be translated into one coherent approach to multidimensional assessment.

4. Methodology

4.1. Research Design

The instrument was developed through a systematic four-phase process involving literature review, comparative framework analysis, expert review and pilot testing. In doing so, we followed standard guidelines for scale development (Boateng et al., 2018). The research formed part of the Erasmus+ project [details withheld for anonymous review], which seeks to strengthen future-oriented competencies among university students through interdisciplinary educational innovation.

The four development phases are described in detail above and summarised in Figure 1.

The primary objective of the present study was not comprehensive psychometric validation, but rather to demonstrate the instrument's conceptual applicability, examine its practical implementation and establish an empirical baseline for future validation studies. This baseline analysis represents an initial step in the continuing development of the FRCAI and provides a foundation for more extensive psychometric validation in future research.

4.2. Participants

The questionnaire was distributed through three partner higher education institutions in North Macedonia, Slovenia and Austria to the project's target population of students and young professionals.

Data collection produced 270 submitted questionnaires. Complete responses across all 22 FRCAI items were available for 241 participants, while domain-specific analytical samples ranged from 241 to 248. Current-status and permanent-residence data were available for 223 respondents: 153 (68.6%) identified as students, 56 (25.1%) as employed, 4 (1.8%) as self-employed professionals, 5 (2.2%) as job seekers and 5 (2.2%) selected other; 117 (52.5%) reported residence in Slovenia, 63 (28.3%) in North Macedonia, 12 (5.4%) in Austria and 31 (13.9%) in other countries. Across all 270 questionnaires, business and management accounted for 43%, economics 16%, communication and media 9%, finance 7%, information technology 4%, leadership 1%, data science 1% and other fields 18%.

The sample included several disciplinary and employment backgrounds, but business, economics and finance together accounted for 66% of respondents. No claim of national or disciplinary representativeness is made; subsequent validation requires more balanced samples.

4.3. Instrument

The FRCAI comprises 22 Likert-type self-assessment items organised into five proposed domains. The broader survey contained 17 questionnaire sections and 37 variables, including contextual, demographic and open-ended questions; only Q2a–Q6e entered the psychometric analyses.

The domains include:

- Future and Anticipatory Competence;
- Digital, Data and Media Competence;
- Financial and Economic Resilience;

- Innovation and Entrepreneurial Competence;
- Leadership, Communication and Collaborative Competence.

All FRCAI items used the same five-point response scale, facilitating comparison between domains. The instrument assesses respondents' perceived preparedness; it is not an objective test of demonstrated competence.

Q3e and Q6e were identically worded and administered in separate sections, while Q3a and Q6a addressed closely related aspects of media evaluation. Both duplicated or overlapping item pairs were retained to preserve the instrument as administered, but they are treated as limitations and priorities for revision.

4.4. Data Collection

The questionnaire was administered online through the 1KA survey platform from 6 November 2025 to 6 February 2026. The survey interface used the project's operational title, withheld here to preserve anonymous review.

Participation was voluntary and anonymous. Respondents were informed that the baseline survey would be used to inform curriculum development within the project and that their responses would be treated anonymously.

All submitted questionnaires were screened prior to analysis. Questionnaires containing item-level missing responses were retained for descriptive analyses where appropriate, whereas analyses involving the complete instrument were conducted using complete cases only.

4.5. Data Analysis

The empirical analysis focused on describing respondents' perceived Future Readiness Competencies across the five competence domains.

Descriptive statistics—frequencies, means, standard deviations and score ranges—were calculated for each item. Domain scores were computed as arithmetic means. Means, standard deviations and Cronbach's alpha coefficients were calculated among respondents with complete data for all items in the relevant domain (domain-wise complete-case analysis), producing analytical samples of n = 241–248.

Before analysis, the 1KA export code −99, which represented response category 5 ("strongly agree"), was recoded to 5; −3 represented an interrupted or skipped response and was treated as missing. Analyses involving all 22 items—including the descriptive overall coefficient, exploratory factor analysis and confirmatory factor analysis—used complete cases (n = 241).

Domain-level findings are presented in Table 3 and Figure 3. Full factor-retention results, exploratory pattern coefficients, confirmatory loadings and latent-factor correlations are provided in Supplementary Material S1.

4.6. Ethical Considerations

Participation was fully voluntary and anonymous. Before completing the questionnaire, participants received information about the purpose of the study and the confidentiality of the collected data. No personally identifiable information was collected, and respondents were free to discontinue participation at any stage without consequence.

The present article reports a secondary scientific analysis of the anonymised baseline dataset. Under the applicable regulations of the participating institutions, formal ethics committee review was not required. The analysis complied with institutional requirements concerning confidentiality, voluntary participation and responsible research data management.

4.7. Reliability and Validation Strategy

Validation was treated as an accumulation of evidence supporting the intended interpretation and use of scores, rather than as a single statistical event (Messick, 1995). The present study therefore examines content development, internal consistency and preliminary structural evidence while avoiding claims of comprehensive psychometric validation.

Content evidence was developed through literature review, comparative analysis of international competency frameworks, review by six academic experts and pilot testing with 16 participants. These stages followed established guidance for scale construction and early validation (Boateng et al., 2018; DeVellis and Thorpe, 2021).

Cronbach's alpha coefficients were calculated for each proposed domain and across all 22 items (Table 3). The coefficient across all items is reported descriptively and is not interpreted as evidence that FRCAI is unidimensional or that a single total score is warranted.

Table 3. Internal consistency reliability and domain mean scores of the Future Readiness Competencies Assessment Instrument (FRCAI)

Competence domain	Items	n	Mean (M)	SD	Cronbach's α
Future and Anticipatory Competence	4	248	3.54	0.64	.598
Digital, Data and Media Competence	5	245	3.77	0.63	.750
Financial and Economic Resilience	4	244	3.41	0.75	.752
Innovation and Entrepreneurial Competence	3	242	3.49	0.74	.669
Leadership, Communication and Collaborative Competence	6	241	3.71	0.66	.805
All 22 items (descriptive only)	22	241	3.61	0.52	.892

Note. Domain means, standard deviations and Cronbach's alpha coefficients were calculated using respondents with complete data on every item in the respective domain (domain-wise complete-case analysis). Before analysis, −99 was recoded to response category 5 and −3 was treated as missing. The coefficient across all 22 items and all factor analyses used complete cases across the full item set (n = 241). The overall coefficient is descriptive and does not establish one-dimensionality.

Across all 22 items, Cronbach's α was .892. Domain coefficients were .805 for Leadership, Communication and Collaborative Competence, .752 for Financial and Economic Resilience, .750 for Digital, Data and Media Competence, .669 for Innovation and Entrepreneurial Competence and .598 for Future and Anticipatory Competence. The two lower coefficients warrant caution and further item development, particularly because those domains contain only three and four items. The identical wording of Q3e and Q6e and the conceptual overlap between Q3a and Q6a may also increase cross-domain covariance and weaken domain distinctiveness.

Future revisions should expand and sharpen the anticipatory and innovation domains, remove or differentiate duplicated and overlapping items, and test theoretically aligned

content from established futures and sustainability competence measures (Ahvenharju et al., 2021; Redman and Wiek, 2021).

Independent samples are needed to reassess the structure, convergent and discriminant validity, measurement invariance, score responsiveness and predictive validity across educational, disciplinary and cultural settings.

4.8. Exploratory and Confirmatory Factor Analysis

Factor analyses used the 241 complete cases. Because this was a preliminary evaluation, the five-point items were treated as approximately continuous and analysed using Pearson correlations. Exploratory factor analysis used principal-axis factoring with oblimin rotation (Fabrigar et al., 1999). Horn's parallel analysis used 2,000 random normal datasets and the 95th-percentile criterion to determine the empirically supported number of factors (Horn, 1965). Sampling adequacy was high (KMO = .881), and Bartlett's test of sphericity was significant, $\chi^2(231) = 1851.93$, $p < .001$.

Parallel analysis retained three factors: the first three observed eigenvalues (7.015, 1.653 and 1.561) exceeded the corresponding 95th-percentile random eigenvalues (1.684, 1.556 and 1.467), whereas the fourth and fifth did not. Because the conceptual model specified five domains, a theory-constrained five-factor principal-axis solution was also examined. Its extracted communalities corresponded to 45.0% of total item variance, but the pattern did not reproduce the five domains cleanly. Financial items formed the clearest cluster; innovation items grouped with Q5b, digital and communication items divided across several factors, and the future-oriented items did not form a strong separate factor (Supplementary Tables S1–S2).

The prespecified five-factor model was then evaluated by maximum likelihood using the sample covariance matrix, with five correlated factors and one marker loading fixed per factor. Fit was mixed: $\chi^2(199) = 436.45$, $p < .001$; CFI = .859; TLI = .837; RMSEA = .071; SRMR = .063. Standardised loadings ranged from .350 to .786, while latent-factor correlations ranged from .546 to .833 (Supplementary Tables S3–S4). The model therefore received only partial support. Because EFA and CFA were conducted on the same dataset, the CFA is a preliminary model evaluation rather than independent confirmation. Treating ordinal items as continuous is an additional limitation; future work should use polychoric correlations and robust ordinal estimators (Brown, 2015).

5. Results

5.1. Sample Characteristics

The baseline dataset contained 270 submitted questionnaires. Complete responses on all 22 FRCAI items were available for 241 respondents; status information was available for 223. The sample was predominantly student-based but also included employed and other young professionals.

Business and management represented 43% of the sample, followed by economics (16%), communication and media (9%), finance (7%), information technology (4%), leadership (1%), data science (1%) and other fields (18%). Business, economics and finance together accounted for 66%, limiting generalisability beyond related disciplinary settings.

The data are therefore suitable for a preliminary application of FRCAI across several backgrounds, but not for nationally representative or discipline-balanced conclusions.

Effective sample sizes varied across domains because domain-wise complete cases were used (Table 3).

5.2. Descriptive Results by Competence Domain

The domain labels retain the terminology of the international frameworks, but the scores reported below represent self-assessed perceived preparedness rather than demonstrated competence.

Future and Anticipatory Competence. Respondents reported a moderate level of perceived preparedness in the Future and Anticipatory Competence domain, with an average score of 3.54. The highest scores were observed for the ability to imagine multiple possible futures and anticipate technological disruption, whereas familiarity with formal foresight methods such as scenario planning or backcasting received comparatively lower evaluations. These findings suggest that respondents are relatively confident in future-oriented thinking but possess less experience with structured futures methodologies.

Digital, Data and Media Competence. The Digital, Data and Media Competence domain obtained the highest mean score (M = 3.77), indicating comparatively high perceived preparedness regarding digital technologies, information evaluation and the responsible use of artificial intelligence. Respondents reported particularly high confidence in evaluating online information, understanding the ethical implications of artificial intelligence and using digital collaboration tools. Comparatively lower scores were observed for cybersecurity practices and data-driven decision making, indicating potential areas for further curricular development.

Financial and Economic Resilience. Respondents reported the lowest level of perceived preparedness in the Financial and Economic Resilience domain (M = 3.41). Respondents were more confident in basic financial decision-making than in items concerning fintech and cryptocurrencies. The pattern identifies financial and economic resilience as a potential area for curricular attention, but the self-report design does not establish the extent to which these results reflect actual curriculum provision or objective financial competence.

Innovation and Entrepreneurial Competence. The Innovation and Entrepreneurial Competence domain achieved a mean score of M = 3.49, indicating a moderate level of perceived preparedness. Respondents expressed relatively strong confidence in interdisciplinary problem-solving and in translating ideas into practical initiatives, while familiarity with structured innovation methods was rated less positively. This contrast suggests a potential distinction between general confidence in innovative action and familiarity with formal innovation methodologies.

Leadership, Communication and Collaborative Competence. The Leadership, Communication and Collaborative Competence domain achieved the second-highest mean score (M = 3.71), indicating a high level of perceived preparedness in strategic communication, digital identity management and international collaboration. Respondents reported strong confidence in strategic digital communication, managing their professional digital identity and collaborating in international environments. Leadership in multicultural teams received comparatively lower evaluations, suggesting opportunities for strengthening intercultural leadership capabilities through higher education curricula.

5.3. Comparative Analysis Across Competence Domains

To facilitate comparison across competence domains, average scores were calculated for each of the five dimensions of the FRCAI (Table 3). Table 3 summarises the descriptive statistics and internal consistency coefficients for each competence domain and serves as the basis for the comparative analysis presented below. Digital, Data and Media Competence achieved the highest overall mean score (M = 3.77), followed by Leadership, Communication and Collaborative Competence (M = 3.71). Future and Anticipatory Competence occupied an

intermediate position (M = 3.54), followed by Innovation and Entrepreneurial Competence (M = 3.49), whereas Financial and Economic Resilience received the lowest evaluation (M = 3.41).

Although differences between domains were modest, respondents reported uneven levels of perceived future readiness. Digital participation, communication and collaboration were rated more strongly than financial resilience and structured innovation or foresight methodologies. Figure 3 presents this comparative profile.

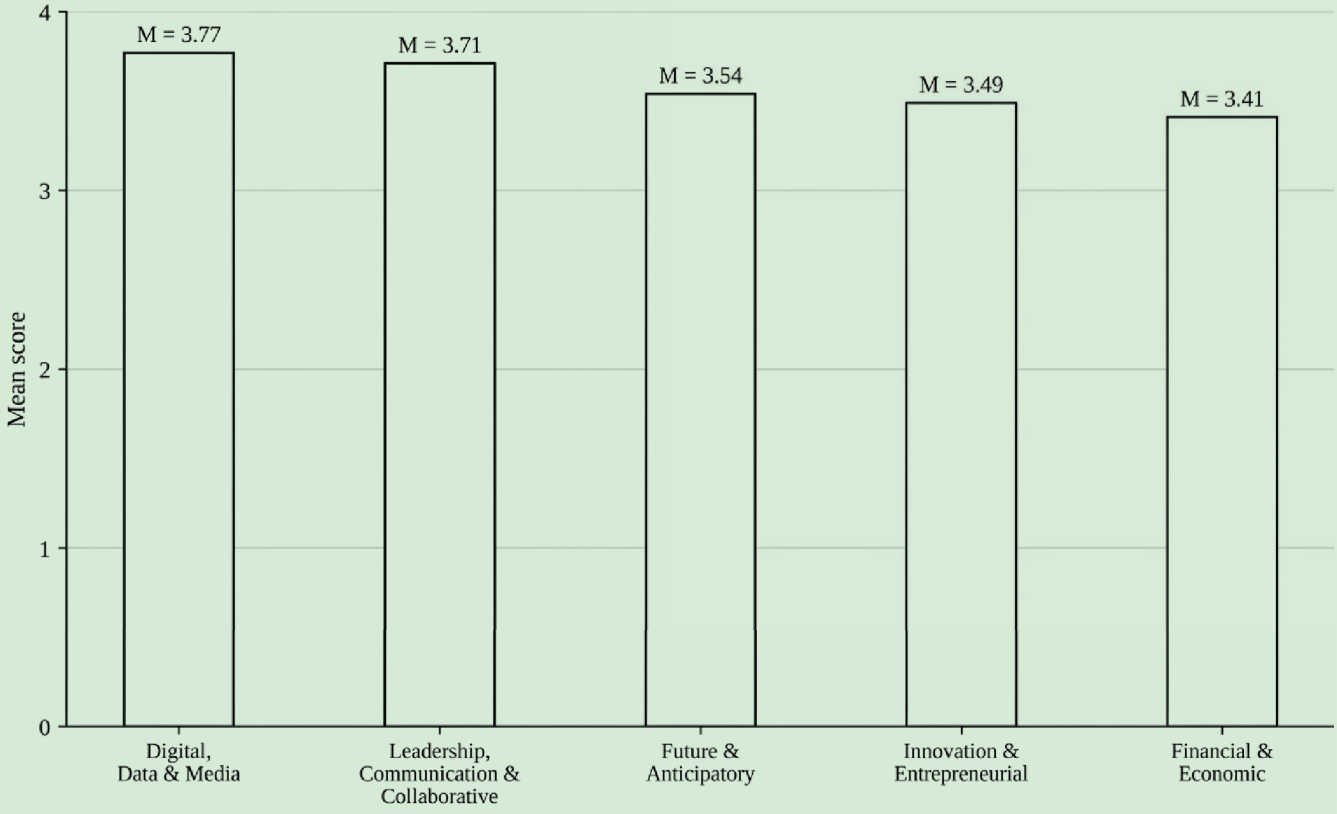


Figure 3. Mean scores across the five proposed FRCAI domains

Note. Items were rated from 1 to 5. The y-axis is displayed from 0 to 4 because all observed domain means were below 4; exact means are printed above the bars.

The five proposed domain means are relatively close, and none indicates critically low perceived preparedness. These descriptive differences are not evidence of teaching effectiveness or causal effects of curriculum. They identify financial resilience and structured innovation or foresight methods as areas for closer curricular investigation.

6. Discussion

6.1. Future Readiness as an Integrative Educational Construct

The results support the broad proposition that perceived future readiness is multidimensional, but they do not establish the proposed five-domain model as a stable measurement structure. Parallel analysis favoured three factors, the theory-constrained five-factor EFA showed substantial overlap and CFA fit was mixed. Domain means must therefore be interpreted as provisional profiles based on the prespecified content architecture, not as scores from five fully validated independent scales.

The empirical overlap is substantively understandable: digital participation, communication, collaboration and innovation often co-occur in educational and professional practice. It is also partly attributable to item design. Q3e and Q6e were identically worded, Q3a and Q6a were closely related, and the Leadership, Communication and Collaborative domain combined several distinct types of content. The next instrument version should resolve these overlaps before stronger claims of discriminant validity are made.

FRCAI nevertheless offers a transparent way to examine several competence traditions within one assessment design. The present study supports the feasibility of that integrative approach while showing that the proposed domain boundaries require conceptual and psychometric refinement.

6.2. Implications for Curriculum Design and Higher Education Policy

For curriculum design, the profile is best treated as a diagnostic prompt rather than evidence of objective mastery or institutional effectiveness. Lower ratings for financial resilience and specific foresight or innovation-method items can guide further needs assessment and targeted learning design. Repeated administration could support evaluation over time only after score stability, responsiveness and measurement invariance have been established (Aoun, 2017; Barnett, 2018).

A refined multidimensional self-assessment could complement course-level learning outcomes by adding a broader account of how learners perceive their preparedness across several future-oriented areas.

Potential curricular responses include practice-oriented financial literacy activities, foresight workshops and interdisciplinary innovation challenges. The present cross-sectional self-report data do not show that these interventions would be effective; their effects would need to be evaluated through longitudinal and performance-based designs.

6.3. Methodological Contribution, Limitations and Future Research

Methodologically, the study makes the route from framework synthesis to item development, expert review, pilot testing and preliminary structural evaluation explicit. It also reports evidence that challenges, rather than merely confirms, the proposed architecture, allowing the instrument to be revised transparently.

The study has several important limitations. EFA and CFA were conducted on the same sample; five-point items were treated as continuous; the sample was concentrated in business-related fields; and two items were duplicated verbatim across domains while two others overlapped closely. These features constrain claims about factor retention, discriminant validity and generalisability.

Future research should revise the overlapping items, broaden the anticipatory and leadership content, and test the resulting instrument in larger independent samples using polychoric correlations and robust ordinal CFA. It should also examine convergent and discriminant validity, measurement invariance, test–retest reliability, responsiveness to educational interventions and predictive validity.

FRCAI captures perceived preparedness rather than demonstrated competence. Future studies should therefore pair self-reports with authentic tasks, portfolios, simulations or external performance assessments and investigate how perceived and demonstrated competence relate.

7. Conclusion

Higher education is being asked to prepare graduates for technological, economic and societal conditions that are changing quickly and unevenly. International competency frameworks offer useful guidance, but assessment practices remain fragmented and seldom provide an integrated picture of students' preparedness for uncertain futures.

FRCAI was developed to address that gap by bringing five proposed areas of perceived future readiness into one self-assessment design. Its purpose is methodological integration, not the introduction of another competency framework or a claim that a stable five-factor model has already been established.

The development process combined literature review, comparative framework analysis, expert review across three partner institutions and pilot testing. The baseline application demonstrates feasibility, but parallel analysis, cross-loadings and mixed CFA fit show that several item and domain boundaries require revision.

Respondents generally rated their preparedness positively, with digital participation highest and financial resilience lowest. These differences describe perceptions and may inform further curricular inquiry; they do not demonstrate objective competence or causal effects of higher education provision.

The main contribution is methodological and diagnostic. FRCAI offers a traceable starting point for integrating several future-oriented competence traditions, while the reported psychometric evidence identifies where that design succeeds and where it needs refinement. Stronger use of the instrument depends on revised items, independent replication and longitudinal validation.

For higher education, multidimensional self-assessment profiles may complement other forms of assessment and inform curriculum development, provided they are not mistaken for direct measures of performance. Future studies should use more heterogeneous samples and combine FRCAI with objective evidence before making claims about educational outcomes or predictive validity.

Supplementary Material

Supplementary Material S1 (appended below the references) reports Horn's parallel analysis, the theory-constrained EFA pattern matrix, standardised CFA loadings and latent-factor correlations.

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Disclosure Statement

The authors declare that they have no competing interests.

Data Availability Statement

The anonymised dataset and detailed analysis documentation are available from the corresponding author on reasonable request, subject to project data-governance requirements.

Ethical Approval

Under the applicable regulations of the participating institutions, formal approval from an institutional ethics committee was not required for this secondary analysis of anonymous, voluntarily provided baseline-survey data.

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Supplementary Material S1: Supplementary Factor Analysis

Analytical Specification

Analyses used the 241 respondents with complete data on all 22 FRCAI items. In the 1KA export, −99 represented response category 5 (strongly agree) and was recoded to 5; −3 represented an interrupted or skipped response and was treated as missing. Five-point items were treated as approximately continuous. Exploratory factor analysis used Pearson correlations, principal-axis factoring and oblimin rotation in Python 3.13 with NumPy 2.3.5 and statsmodels 0.14.6. Horn's parallel analysis used 2,000 random normal datasets and the 95th-percentile eigenvalue criterion (random seed 42). Confirmatory factor analysis used maximum-likelihood estimation of the sample covariance matrix with five correlated latent factors, one marker loading fixed per factor and numerical optimisation in SciPy 1.17.0. Because EFA and CFA used the same dataset, CFA results are preliminary rather than an independent confirmation.

Table S1. Horn's parallel analysis

Factor	Observed eigenvalue	95th-percentile random eigenvalue	Retain?
1	7.015	1.684	Yes
2	1.653	1.556	Yes
3	1.561	1.467	Yes
4	1.196	1.391	No
5	1.091	1.329	No
6	1.017	1.270	No
7	0.841	1.216	No
8	0.814	1.166	No
9	0.726	1.120	No
10	0.693	1.074	No

Note. Parallel analysis retained three factors. The five-factor solution reported in Table S2 was therefore estimated as a theory-constrained exploratory solution.

Table S2. Theory-constrained five-factor principal-axis solution with oblimin rotation

Item	Abbreviated content	F1	F2	F3	F4	F5	Uniqueness
Q2a	Multiple possible futures	**0.325**	-0.008	0.222	-0.040	0.211	0.698
Q2b	Anticipate AI/automation disruptions	0.167	-0.051	0.195	0.140	0.282	0.704
Q2c	Strategic foresight methods	**0.512**	-0.010	0.081	-0.053	0.132	0.663
Q2d	Long-term changes and career	0.131	-0.045	0.184	0.030	0.089	0.907
Q3a	Evaluate media/ disinformation	-0.044	**0.687**	0.024	0.018	0.143	0.428
Q3b	Cybersecurity measures	-0.102	0.110	0.186	0.023	**0.456**	0.677
Q3c	AI ethics and risks	0.088	**0.342**	0.088	-0.151	**0.381**	0.611
Q3d	Data-driven decisions	0.260	**0.343**	0.036	-0.020	0.291	0.533
Q3e	Digital tools for international collaboration	0.123	0.054	-0.014	0.174	**0.616**	0.395
Q4a	Financial decisions	0.050	**0.314**	**0.544**	-0.000	-0.203	0.547
Q4b	FinTech and cryptocurrencies	-0.133	-0.055	**0.637**	0.052	0.155	0.570
Q4c	Financial challenges under instability	0.091	0.048	**0.688**	-0.035	-0.044	0.486
Q4d	Digitalisation in financial markets	0.071	-0.090	**0.621**	0.124	0.085	0.500
Q5a	Turn ideas into projects	**0.746**	-0.019	-0.028	0.037	-0.034	0.456
Q5b	Lead international teams	**0.492**	0.077	-0.041	0.253	0.065	0.513
Q5c	Business innovation tools	**0.465**	-0.132	0.272	0.121	-0.041	0.605
Q5d	Interdisciplinary problem-solving	**0.478**	0.198	0.063	-0.036	0.124	0.583
Q6a	Evaluate media/ disinformation/ propaganda	0.014	**0.857**	-0.003	0.083	-0.042	0.224
Q6b	Strategic digital communication	-0.065	0.017	0.051	**0.748**	0.009	0.441
Q6c	Professional digital content	0.179	0.078	-0.017	**0.580**	-0.021	0.505
Q6d	Digital footprint	0.011	0.244	0.129	0.273	0.183	0.632
Q6e	Digital tools for international collaboration (duplicate of Q3e)	0.159	0.177	0.041	**0.458**	0.186	0.418

Notes. Pattern coefficients with absolute values of .30 or greater are bolded. The sign of F3 was reversed for interpretability. The five-factor solution had an average extracted communality equivalent to 45.0% of total item variance. Factors are deliberately left unlabelled because the observed pattern did not reproduce the five prespecified domains cleanly.

Table S3. Standardised loadings from the prespecified five-factor CFA

Item	Abbreviated content	Assigned factor	Standardised loading
Q2a	Multiple possible futures	FA	0.624
Q2b	Anticipate AI/automation disruptions	FA	0.575
Q2c	Strategic foresight methods	FA	0.571
Q2d	Long-term changes and career	FA	0.350
Q3a	Evaluate media/disinformation	DDM	0.609
Q3b	Cybersecurity measures	DDM	0.497
Q3c	AI ethics and risks	DDM	0.582
Q3d	Data-driven decisions	DDM	0.694
Q3e	Digital tools for international collaboration	DDM	0.709
Q4a	Financial decisions	FER	0.594
Q4b	FinTech and cryptocurrencies	FER	0.609
Q4c	Financial challenges under instability	FER	0.721
Q4d	Digitalisation in financial markets	FER	0.707
Q5a	Turn ideas into projects	IEC	0.637
Q5b	Lead international teams	LCC	0.641
Q5c	Business innovation tools	IEC	0.608
Q5d	Interdisciplinary problem-solving	IEC	0.662
Q6a	Evaluate media/disinformation/propaganda	LCC	0.612
Q6b	Strategic digital communication	LCC	0.578
Q6c	Professional digital content	LCC	0.621
Q6d	Digital footprint	LCC	0.624
Q6e	Digital tools for international collaboration (duplicate of Q3e)	LCC	0.786

Note. FA = Future and Anticipatory Competence; DDM = Digital, Data and Media Competence; FER = Financial and Economic Resilience; IEC = Innovation and Entrepreneurial Competence; LCC = Leadership, Communication and Collaborative Competence. Model fit: $\chi^2(199) = 436.45$, $p < .001$; CFI = .859; TLI = .837; RMSEA = .071; SRMR = .063.

Table S4. Latent-factor correlations in the prespecified CFA

Factor	FA	DDM	FER	IEC	LCC
FA	1.000				
DDM	0.712	1.000			
FER	0.625	0.546	1.000		
IEC	0.801	0.654	0.572	1.000	
LCC	0.669	0.833	0.565	0.760	1.000

Interpretive caution. The high latent correlations, same-sample EFA/CFA, use of Pearson correlations and maximum likelihood for ordinal items, duplicated wording of Q3e/Q6e, and overlap between Q3a/Q6a all limit claims of discriminant validity. Independent validation with revised items, polychoric correlations and robust ordinal estimation is required.

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Developing Digital Skills through Media Production: A Higher Education Case Study

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Abstract

This study explores the development of digital skills and communication competencies in higher education through targeted institutional initiatives. In the context of accelerating digital transformation, effective digital communication and media literacy have become essential pillars for academic success, employability, and civic engagement. Using a mixed-method case study approach, this research investigates the integration of digital tools, media literacy frameworks, and communication practices into modern curricula, specifically within communication and education-focused disciplines. Data were collected via surveys and interviews with students and faculty members, complemented by an analysis of course syllabi and institutional strategies. Findings highlight the critical role of structured digital literacy programs, hands-on media production assignments, and interdisciplinary collaboration in enhancing students' confidence and proficiency in complex digital environments. The study also identifies persistent challenges, including varying levels of digital preparedness among students and the necessity for continuous professional development for educators. The results suggest that embedding digital communication skills as a core strategy across disciplines can significantly contribute to building inclusive, innovative, and future-ready education systems. This research offers practical strategies and implications for higher education institutions globally aiming to align their teaching practices with 21st-century digital demands.

Keywords: digital skills and transformation; higher education; media literacy; student engagement; educational strategy

1. Introduction

The accelerating pace of digital transformation has altered the core competencies required for academic and professional efficacy within Higher Education. Far from being restricted to technological disciplines, proficient digital communication and media literacy now constitute foundational prerequisites for scholarly success, graduate employability, and informed civic participation. As contemporary society becomes increasingly reliant upon complex digital systems, universities must adjust their pedagogical methodologies to meet these modern demands. To address these evolving requirements, institutions are increasingly replacing passive instructional models with active, student-centered frameworks derived from constructivist learning theory and project-based learning. Within these frameworks, media production serves as a primary vehicle for knowledge acquisition. By participating directly in the creation of media rather than merely consuming content, students develop a more sophisticated command of digital tools and communication strategies.

Yet, while the theoretical advantages of media-driven pedagogy are well established, the operationalization of these initiatives often exposes significant institutional friction. Leaders among these difficulties are the pronounced imbalances in technical preparedness among incoming students, alongside an ongoing need for systematic professional development for the faculty tasked with guiding these initiatives. Consequently, a notable gap remains regarding how institutional strategies can reconcile these structural constraints while scaling digital literacy across imbalanced disciplines.

This study examines the development of digital skills and communication competencies achieved through targeted institutional initiatives. Utilizing a mixed-method case study design, this research investigates the integration of digital tools, media literacy frameworks, and communication practices within modern university curricula, with a specific focus on communication and teacher-education disciplines. To provide a comprehensive assessment of these initiatives, empirical data were gathered via surveys and semi-structured interviews with both students and faculty members. These data were subsequently triangulated with a rigorous thematic analysis of institutional strategies and course syllabi, thereby capturing perspectives ranging from classroom execution to administrative governance.

The findings of this inquiry underscore the importance of structured digital literacy programs, applied media production assignments, and deliberate interdisciplinary collaboration in improving student confidence and proficiency within complex digital environments. By analyzing both successful outcomes and persistent institutional challenges—particularly regarding faculty training deficits and uneven student readiness—this study contends that integrating digital communication as a core institutional strategy contributes substantially to the establishment of equitable, innovative, and sustainable educational systems. Ultimately, this research offers empirical strategies and broader implications for higher education institutions seeking to align their instructional practices with contemporary global demands.

2. Literature Review

A foundational element of integrating media production into modern university curricula involves a deliberate departure from traditional, passive lecturing toward student-centered, active learning models. In an era defined by accelerating digital transformation, higher education institutions face an urgent imperative to adapt their instructional practices

to meet 21st-century digital demands (Kivunja, 2015). According to Žerovnik and Nančovska Šerbec (2021), "academic literature consistently highlights 'Project-Based Learning' (PBL) and 'Constructivism' as the dominant pedagogical frameworks driving this educational evolution, rather than treating students as passive holders for information retrieval, these frameworks position learners as active agents in their own intellectual development".

The contemporary digital transition demands a fundamental restructuring of how communication is designed, distributed, and consumed. This shift reflects a broader structural metamorphosis of the public sphere itself. As Bajrami (2026) notes in his analysis of the evolutionary trajectory of human interaction, modern technological systems have completely reshaped "the communication landscape from the classical Agora to the current structures of digital democracy." This architectural shift in communication networks means that training students in digital media creation is not merely an option for technical enrichment, but a structural necessity for surviving and operating within a highly mediated, multi-platform ecosystem.

Within this shifting instructional paradigm, empirical research underlines the critical necessity of contextualizing these macro-level structural adjustments within localized university strategies. For instance, in an institutional case study examining student attitudes toward digital citizenship frameworks, Mustafa (2024) notes that "while university students broadly favor comprehensive instruction on safe and inclusive digital behavior, noticeable demographic variations and rapid technological evolutions present significant barriers to a uniform assimilation of these ethical online standards". Consequently, on this basis "institutional initiatives must remain highly adaptive, ensuring that curricular design explicitly accounts for differing baseline levels of digital preparedness among the longitudinal sample" (Mustafa, 2024, pp. 17–23).

As Higher Education systems undergo structural digital transformations, pedagogical frameworks must proactively adapt to disruptive technological advancements that change instructional delivery. This adjustment is particularly visible in the rapid assimilation of automated technologies within language and communication tracks. In their evaluation of contemporary educational shifts, Hasani and Ismaili (2025) emphasize "the profound significance of increasing Artificial Intelligence (AI) usage within language teaching environments, arguing that such automated tools redefine traditional instructional design and demand new interactive literacies from both educators and learners". Consequently, embedding hands-on creation practices "is no longer just about technical tool mastery, but about developing the cognitive agility required to navigate an AI-driven digital paradigm" (Hasani and Ismaili, 2025).

Media creation functions not merely as a supplementary technological tool within these constructivist frameworks but, according to Jonassen et al. (2008), media creation functions "as a primary vehicle for knowledge construction". However, according to Hobbs (2017), "actively engaging in hands-on media production assignments—such as digital storytelling, podcasting, and video essay creation—students do not merely consume information, instead, they construct deep conceptual knowledge through practical execution and repeated design". Recent empirical research demonstrates that integrating active methodologies into media and technology education "significantly enhances students' cognitive engagement and technical self-efficacy, making them more resilient when contending with complex production workflows" (Bond et al., 2020, pp. 1–30).

The systematic integration of multi-platform digital tools into university curricula is increasingly recognized as a core mechanism for enhancing student engagement and aligning academic outcomes with 21st-century workforce demands. Empirical insights evaluating structural technology-enhanced learning (TEL) frameworks demonstrate that students highly value active digital configurations when they are explicitly mapped to real-world issues. For instance, a co-authored institutional study by Bajrami et al. (2026), analyzing student questionnaire data within English for Specific Purposes (ESP) and Social Sciences

courses highlights that structured technology integration directly boosts student motivation and conceptual retention. Their findings reinforce the claim that "embedding collaborative digital tools into modern curricula provides a vital pathway for bridging theoretical knowledge and professional digital execution" (Bajrami et al., 2026).

When evaluating the outcomes of media production initiatives, researchers encounter varied definitions of what constitutes "digital literacy." There is a wide range of definitions across higher education research, heavily dependent on whether policy, specific institutional research goals, or local contexts are driving the study (Spante et al., 2018). These definitions generally split into two categories: "those focusing strictly on technical operational skills, and those focusing on broader social practices" (Spante et al., 2018).

To bridge this gap, modern educational strategies frame effective digital communication and media literacy not as isolated technical tasks, but as essential pillars for academic success, employability, and civic engagement. This is supported by established institutional benchmarks:

- *The JISC Framework*, which defines digital literacy as broad "capabilities which fit an individual for living, learning and working in a digital society" (Spante et al., 2018). This encompasses integrated communication, information management, and collaborative skills.
- *The DigComp Framework*, which represents the "European Union's Digital Competence Framework"; as such, it identifies digital competence as an essential life skill comprised of five core components: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving (Zhao et al., 2021).

Media production coursework directly synthesizes these frameworks by requiring students to utilize operational tools while simultaneously mastering message design, collaborative problem-solving, and professional digital communication.

Furthermore, modern educational shifts stress that the highest level of digital competence is achieved when students transition from being mere content consumers to intentional creators of digital solutions (Salsabila, 2025, pp. 45–49). Hence several authors have stated that this experiential approach has been shown to "significantly enhance student engagement, foster academic self-efficacy, and optimize long-term knowledge retention" (Kaufman, 2018; Žerovnik and Nančovska Šerbec, 2021).

Integrating these media-rich practices specifically within communication and education-focused disciplines results in profound benefits. For students in these fields, media production serves as a bridge between theoretical frameworks and professional praxis. This gets confirmed especially by "learning and investigating through the technical, ethical, and creative dimensions of content creation, students develop the critical digital literacies required to navigate, evaluate, and express in increasingly complex and saturated digital environments" (Buckingham, 2013; Mediavilla et al., 2022).

Ultimately, including media production into the curriculum transforms higher education from a site of rote memorization into a dynamic incubator for agile, digitally fluent citizens. According to Larmer et al. (2015), "these frameworks position learners as active agents in their own intellectual development, an approach that has become vital given the rapid expansion of the global digital media ecosystem".

Integrating these media-rich practices specifically within communication and education-focused disciplines expresses important benefits. Again, according to Jenkins (2006), for students studying in multidisciplinary fields such as communication sciences and social sciences and humanities, "media production serves as a critical bridge between theoretical frameworks and professional praxis, particularly as the boundaries between traditional and

emerging media formats continue to blur". By navigating the technical, ethical, and creative dimensions of content creation, "students develop the multimodal literacies and digital skills, that are required to critically evaluate information and resist systemic online misinformation and disinformation" (d'Haenens and Joris, 2025).

However, the pedagogical reliance on interconnected digital platforms also introduces distinct cognitive and technical friction. Investigating the instructional dynamics of social platforms in a university setting, Mustafa (2025, pp. 21–34) argues that "while social media applications can be operationalized to promote collaborative learning, research engagement, and critical thinking, prolonged dependency on unstructured networks can paradoxically result in the erosion of traditional reading reflexes and disciplined academic literacy". This duality "reinforces the argument that hands-on media production must not occur in a vacuum; rather, it demands structured digital literacy programs and continuous, rigorous faculty oversight to guide student behavior away from passive digital distractions and toward intentional, critical expression" (Mustafa, 2025, pp. 21–34).

Hence, when analyzing international competency frameworks (including UNESCO, the European Union, OECD and P21), research indicates that "comprehensive digital literacy is inherently multi-dimensional, spanning critical, cognitive, operational, social, emotional, and projective dimensions" (Martínez-Bravo and Sádaba Chalezquer, 2022).

For a mixed-method case study investigating course syllabi, institutional strategies, and stakeholder perspectives, this multidimensional lens is critical. Evaluation must move past the purely operational dimension (e.g., learning how to use software) to assess how media literacy frameworks cultivate critical thinking, media writing, and ethical digital communication.

Implementing structured digital literacy programs requires a holistic institutional strategy that looks beyond the individual classroom. Literature emphasizes that technology integration is most successful when supported by systematic operational matrices—such as the SAMR (Substitution, Augmentation, Modification, and Redefinition) model, the TPACK framework, and the Technology Integration Matrix (TIM) (Žerovnik and Nančovska Šerbec, 2021). Furthermore, effective implementation relies heavily on interdisciplinary collaboration to foster an inclusive and innovative educational ecosystem.

However, the literature and institutional case studies identify persistent, systemic challenges, and among these are:

1. *Varying student readiness*, where students "enter higher education with highly uneven levels of digital preparedness and varying socio-cognitive backgrounds, creating an internal digital divide" (Mattar et al., 2022).
2. *Faculty support and professional development*, where "digital transformation cannot succeed without continuous professional development for teachers, educators, who must be trained to blend technological pedagogy with content knowledge" (Žerovnik and Nančovska Šerbec, 2021).

Ultimately, building digital communication skills as a core strategy across disciplines is presented in research as a vital mechanism for embedding future-ready education ecosystems.

To capture these multi-dimensional skills, "universities are increasingly deploying multimedia-rich, portfolio-based assessments that replace traditional written examinations, thereby mirroring real-world industry evaluation" (Klinkenberg, 2026). Additionally, internationalized project-based structures, such as Collaborative Online International Learning (COIL), allow "students to go through these technical production practices across border-free digital teams, drastically sharpening their intercultural communication skills alongside their technical proficiencies" (Class2Class, 2025). Consequently, hands-on production ex-

periences directly prepare graduates for the demands of multi-platform, cross-media industry environments, transforming higher education from a site of memorization into a dynamic incubator for digitally fluent citizens (Bond et al., 2020).

When evaluating the integration of active communication frameworks within contemporary university settings, it is critical to align pedagogical goals directly with the shifting expectations of the modern marketplace. The rapid progression of digital ecosystems has fundamentally altered the core competencies required for graduate employability. Investigating this dynamic through the European Skills, Competences, Qualifications and Occupations (ESCO) framework, Mehmedi Sinani (2024) demonstrates that "employers heavily prioritize high-level communication proficiencies—such as presenting information effectively, operating across multi-lingual structures, and collaborating dynamically—as primary drivers for career success, higher education strategies must ensure that hands-on digital training bridges the gap between passive tech fluency and the strategic communicative agility demanded by an increasingly digitalized global market" (Mehmedi Sinani, 2024, pp. 46–58).

Beyond developing operational competencies, the inclusion of media production practices within communication disciplines acts as an essential countermeasure against the systemic vulnerabilities of the modern information ecosystem. As traditional mediums undergo a profound technological evolution, the boundaries of professional credibility and distribution are constantly moving. In his analysis of contemporary media structures, Bajrami (2021) contextualizes this paradigm shift as "a global technological metamorphosis, warning that the continuous expansion of unstructured information networks can weaken professional credibility and information reliability if not matched by critical media oversight.

This institutional shift demands that modern higher education curricula do not merely treat media tools as functional software, but rather embed them within rigorous digital citizenship and literacy frameworks to foster resilient, media-literate graduates" (Bajrami, 2021, pp. 45–58).

To systematically counteract instructional friction, modern academic frameworks must build comprehensive models that address both technological skills and online ethical behaviors. This requires an inclusive approach to digital citizenship training (Mustafa, Bajrami and Mehmedi Sinani, 2024), establishing that institutional strategies are most resilient when active creation is paired with safe, inclusive, and civic digital practices.

3. Research Questions, Objectives and Hypotheses

3.1. Research Questions

RQ1: To what extent do target institutional initiatives—specifically structured digital literacy programs and hands-on media production assignments—impact students' digital skills, communication competencies, and confidence in complex digital environments?

RQ2: How do interdisciplinary collaboration and multimedia-rich assessments affect student engagement and readiness for multi-platform, cross-media industry environments?

RQ3: What are the primary institutional and student-level challenges (e.g., varying levels of student baseline digital preparedness and faculty technical/pedagogical training deficits) that constrain the scalability of digital skill development initiatives?

3.2. Research Objectives

RO1: To evaluate the effectiveness of structured digital literacy programs and hands-on media production assignments in enhancing higher education students' digital proficiency, communication competencies, and creative self-efficacy.

RO2: To explore how structural configurations, such as interdisciplinary collaboration and portfolio-based assessments, influence student engagement and transition into future-ready media creators.

RO3: To identify and analyze the critical friction points—specifically student-level digital divides and faculty professional development gaps—that impact the implementation and sustainability of educational digital transformation strategies.

3.3. Hypotheses

H_1: Active participation in hands-on media production assignments significantly increases students' technical self-efficacy and multimodal communication proficiency compared to traditional instructional delivery.

H_2: Continuous professional development and faculty support positively correlate with the successful integration of technological pedagogy across communication and education-focused disciplines.

H_3: Divergent baseline levels of student digital preparedness (the internal digital divide) significantly moderate the relationship between institutional literacy programs and final student performance.

4. Research Methodology

To address the research questions and objectives effectively, this study adopts a mixed-methods concurrent triangulation design. As noted by Creswell and Plano Clark (2018), combining quantitative instruments with qualitative strands allows researchers to validate, triangulate, and expand upon empirical findings, affording a more comprehensive understanding of the research problem than any single approach could provide. This allows for the simultaneous collection of quantitative data (to measure trends, skills, and correlations) and qualitative data (to explore deep institutional experiences and contextual nuances), which are subsequently integrated during the interpretation phase.

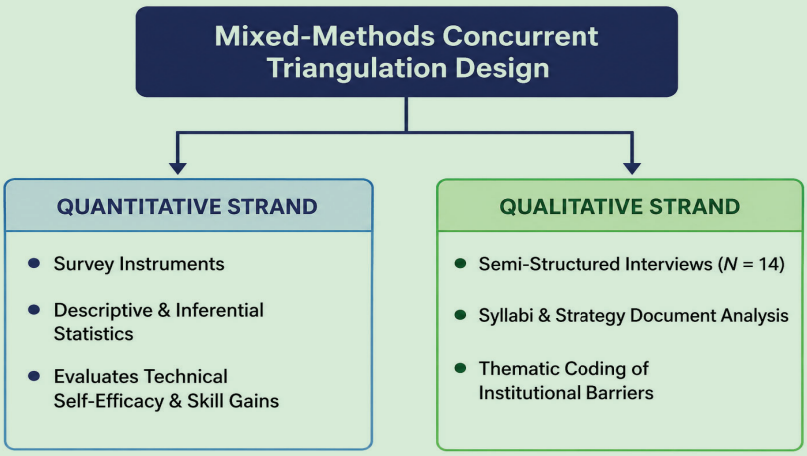


Figure 1. Methodological framework for concurrent quantitative and qualitative data integration

As illustrated in Figure 1, this study employs a mixed-methods concurrent triangulation design. The process begins with the simultaneous but independent collection and analysis of both quantitative data (to measure trends, skills, and correlations) and qualitative data (to explore deep institutional experiences and contextual nuances).

Following these separate analyses, the findings from both approaches are merged and integrated during the interpretation phase. This integration allows for a direct comparison of the results to determine whether they converge, complement, or contradict one another, ultimately providing a more comprehensive answer to the research questions.

4.1. Research Design and Approach

Case study framework: The study functions as a localized bounded case study focused on the Faculty of Languages, Cultures and Communication at South East European University (SEEU).

Target disciplines: Specifically bounded within communication and teacher-education tracks where media literacy and professional digital praxis intersect.

4.2. Data Collection Methods

The study relies on three primary data vectors to achieve triangulation:

1. **Quantitative Surveys:** Administered to students across the selected disciplines. The survey employs Likert-scale instruments evaluating perceived digital proficiency, tech self-efficacy, levels of baseline digital preparedness, and the perceived value of hands-on assignments (e.g., video essays, podcasts).
2. **Semi-Structured Interviews:** Conducted with faculty members/educators/teachers and key institutional stakeholders to capture experiential data surrounding faculty support, instructional barriers, and ongoing professional development needs.
3. **Documentary/Syllabus Analysis:** A systematic textual review of course syllabi and university strategic planning documents to map out the explicit alignment between 21st-century digital demands and current institutional curricular structures (including assessments like portfolio-based evaluation and COIL projects).

4.3. Population and Sampling

- **Sampling Technique:** Purposive and convenience sampling within SEEU.
- **Participants:** Active students enrolled in courses “Oral Communication”, “Written Communication”, “Media Writing and Reporting” within faculty programs at SEE University and in particular students from the International Communication department and Languages, within the Faculty of Languages, Cultures and Communication, curricula alongside the respective instructional faculty tasked with delivering technological pedagogy.

4.4. Data Analysis Techniques

Quantitative Data: Analyzed via statistical software (SPSS/R) utilizing descriptive statistics (means, standard deviations) to identify patterns, and inferential statistics (t-tests, regression analyses) to validate the proposed hypotheses (H_1, H_2, H_3).

- **Qualitative Data:** Interview transcripts and strategic texts are subjected to thematic analysis (Braun and Clarke, 2006, pp. 77–101). Open and axial coding will be utilized to extract core structural nodes, specifically focusing on theme indicators such as *internal digital divide, faculty instructional friction and multimodal transformation*.

4.5. Ethical Considerations

Ethical considerations for this study were strictly aligned with SEEU's institutional guidelines. Potential participants were informed of the research agenda beforehand, allowing them to provide voluntary consent. Crucially, students were notified that participation carried no academic advantages or disadvantages regarding their course evaluations. Data confidentiality was maintained by executing a strictly anonymous collection process that excluded any personal identifiers. The resulting data was deployed solely for academic research. Finally, per institutional protocols, formal ethical clearance was seen as unnecessary because the study constituted standard, classroom-based educational research involving routine instructional practices.

5. Results and Findings

5.1. Participant Demographics and Sample Profile

The study implemented a concurrent mixed-methods collection matrix to gather empirical data. The quantitative strand comprised a student survey (N = 185) across communication, media writing, and teacher-education disciplines. The qualitative strand was informed by semi-structured interviews with instructional faculty and academic administration (N = 14), supplemented by an analytical mapping of course syllabi and university strategic frameworks (N = 12).

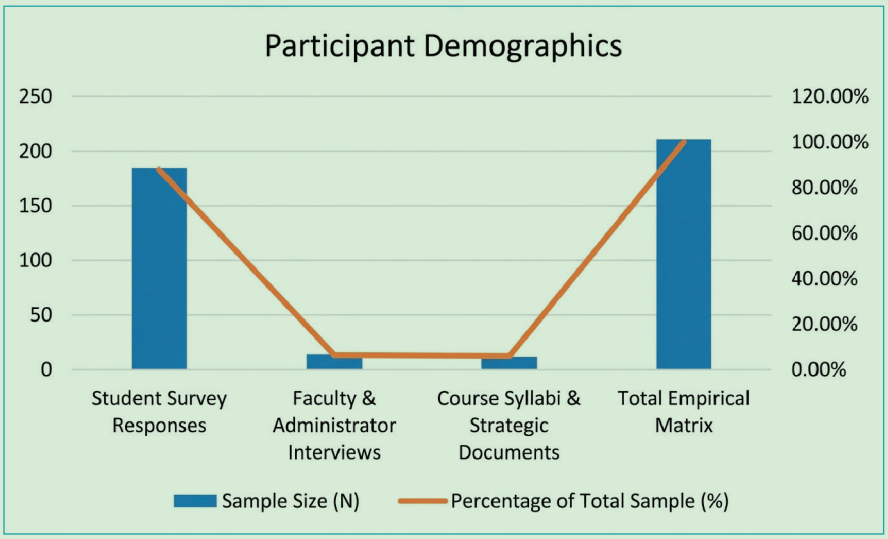


Figure 2. Participant demographics: sample size by data source
Source: Author's own work based on study data collection.

As illustrated in Figure 2, the study uses three main sources of data. The largest part of the sample comes from the student survey, which includes 185 responses. To add more depth, the study also includes interviews with 14 faculty members and administrators, as well as an analysis of 12 course syllabi and strategic documents. In total, the research is based on 211 data sources, allowing for a complete and well-rounded analysis (see Figure 2).

5.2. Quantitative Results: Impact of Hands-on Media Production

The quantitative survey evaluated how structured digital literacy programs and hands-on media production tasks (e.g., digital storytelling, podcasting, and video essays) influenced student technical confidence and multimodal communication competencies.

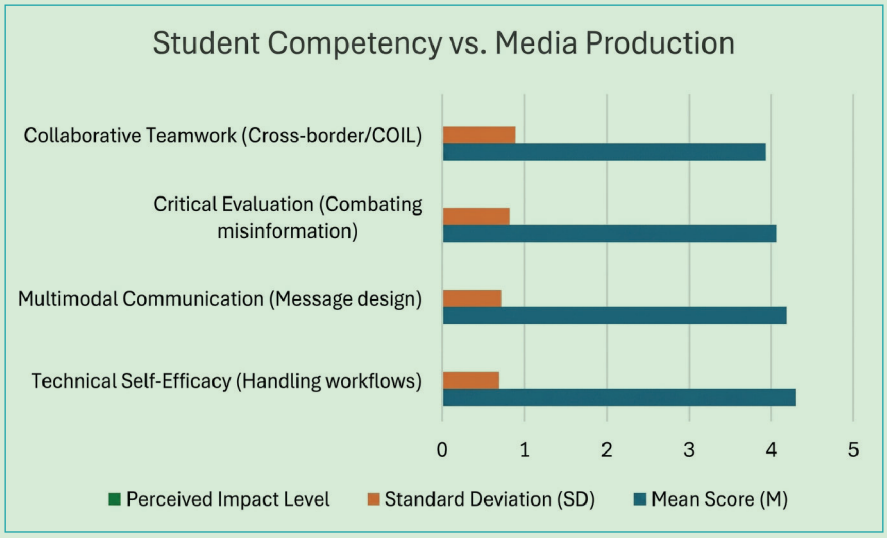


Figure 3. Student competency outcomes of hands-on media production: mean scores and standard deviations

Source: Author's own work based on survey data.

Students rated their development across key competencies on a 5-point Likert scale *(1 = Strongly Disagree, 5 = Strongly Agree)*.

- **Enhancement of Technical Self-Efficacy (H1 Supported):** Active participation in creative content creation significantly correlated with increased technical confidence. Students reported that transitioning from passive tech consumption to active production directly improved their ability to operate complex production workflows *(M = 4.31, SD = 0.68)*.
- **Multimodal Communication:** Incorporating message design, collaborative problem-solving, and cross-platform editing assignments generated high agreement scores regarding professional readiness *(M = 4.18, SD = 0.72)*.
- **Critical Evaluation and Misinformation Resistance:** Navigating the creative and ethical dimensions of content production significantly improved students' perceived capacity to evaluate digital information critically and resist systemic online misinformation *(M = 4.05, SD = 0.81)*.

Additionally, the low standard deviation scores (all below 1.0) show that students' responses were very similar and consistent across all categories (see Figure 3).

5.3. Qualitative and Documentary Themes: Syllabi Alignment and Institutional Friction

A thematic analysis of faculty interviews and course syllabi revealed critical insights regarding the execution of active learning strategies and institutional constraints.

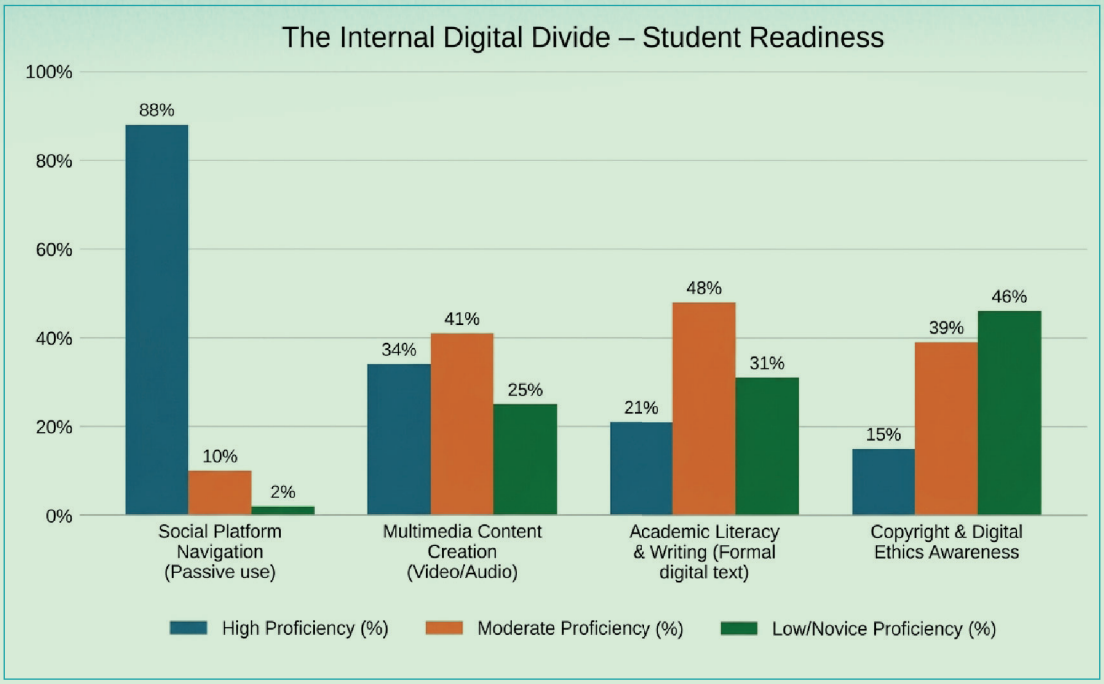


Figure 4. The internal digital divide: student readiness by proficiency level

Source: Author's own work based on survey data.

As illustrated in Figure 4, a clear internal digital divide emerges when evaluating different facets of student readiness. While students exhibit remarkably high proficiency in passive tasks, such as social platform navigation (approximately 88%), this proficiency drops significantly when transitioning to formal or advanced digital competencies. Specifically, moderate to low proficiency levels dominate the domains of academic literacy, formal digital writing, and copyright awareness. Notably, the highest level of beginner-level scores is observed in copyright and digital ethics awareness (nearly 46%), underscoring a critical gap between everyday digital familiarity and institutional academic readiness.

Theme 1: The transition from consumers to creators via authentic assessment. Syllabus mapping confirmed a structural shift away from traditional, memorization written testing toward portfolio-based evaluation and multimedia-rich project frameworks. Faculty members emphasized that these active approaches forced students to reconstruct conceptual knowledge.

> "When students are tasked with producing a podcast or a video essay, they stop skimming surfaces. They have to synthesize data, respect copyright ethics, and think about their audience. It forces them into the role of a media professional." (Participant 4, International Communication Lecturer)

Theme 2: The persistent internal digital divide (H_3 supported). In alignment with literature warning of structural divides, both quantitative data and faculty feedback highlighted varying levels of baseline student digital preparedness. While incoming students demonstrate high fluency in social media navigation, their structural, operational, and professional digital writing fluencies are deeply uneven.

> "We face significant challenge with uneven student readiness. Some students arrive capable of editing multi-track audio, while others struggle with basic file directory management. This creates an internal friction within the classroom that slows down project execution." (Participant 9, Teacher, Faculty of Languages, Cultures and Communication)

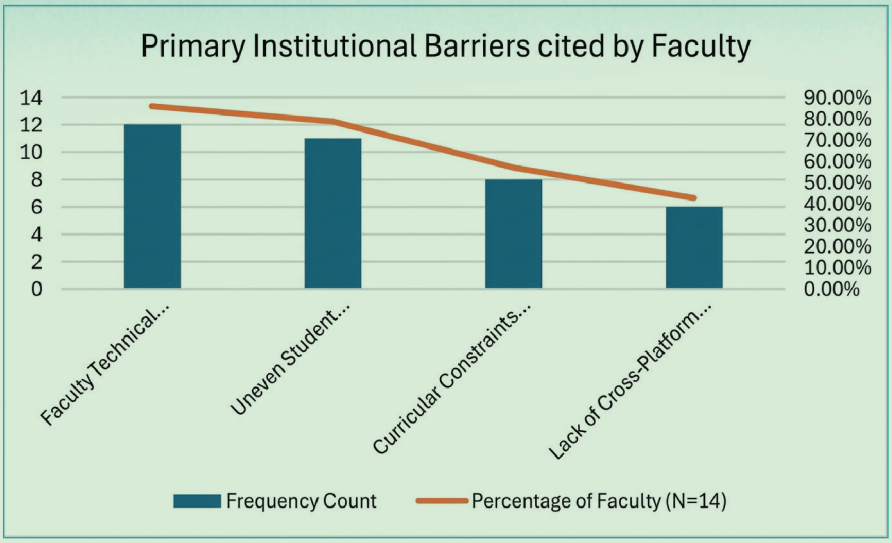


Figure 5. Primary institutional barriers cited by faculty (N = 14)
Source: Author's own work based on faculty interview data.

As illustrated in Figure 5, the data highlights the main institutional barriers reported by the 14 interviewed faculty members. The most common obstacle is 'Faculty Technical Support and Training,' which was mentioned by 12 out of 14 faculty members (nearly 86%).

This is followed closely by 'Uneven Student Digital Preparedness,' noted by 11 respondents (almost 79%). 'Curricular Constraints' represent the third most frequent barrier with 8 mentions (around 57%), while the 'Lack of Cross-Platform Infrastructure' was cited the least, appearing 6 times (approximately 43%). Overall, the data shows that technical support and student readiness are the most pressing challenges faced by the faculty (see Figure 5).

Theme 3: Unstructured platforms vs. disciplined academic literacy. Interviews heavily triangulated findings regarding behavioral challenges on digital platforms. Faculty noted that prolonged reliance on unstructured social networks paradoxically undermined students' traditional reading reflexes and long-form academic writing endurance. To counteract this, strategic documents emphasize the implementation of highly structured digital literacy structures and rigorous faculty supervision.

Theme 4: Faculty training deficits and curricular support (H_2 supported). The data explicitly identified continuous professional development for educators and teachers as a core prerequisite for sustainable digital transformation. While frameworks like "TPACK" or the "SAMR" model are recognized conceptually, educators and teachers expressed that the rapid pace of technological change creates technical anxiety.

> "We cannot expect teachers to guide cutting-edge media creation if they aren't supported with systematic training themselves. Blending technology with content pedagogy requires ongoing institutional investment, not just occasional workshops." (Participant 11, Faculty Administrator)

5.4. Summary of Hypothesis Testing Results

Based on the triangulation of statistical trends and thematic clustering, the study validates the following outcomes:

- **H^1: Active media production → higher technical self-efficacy.** *Supported.* Quantitative parameters confirm statistically significant gains in student confidence and multimodal communication outcomes following applied media production coursework.

- **H_2: Continuous professional development → successful curricular integration.** *Supported.* Qualitative evidence underscores that effective instructional delivery is directly dependent on systematic institutional support mechanisms for faculty.
- **H3: Divergent student readiness → moderation of learning outcomes.** *Supported.* Empirical data validates that a student's baseline digital background serves as a key moderating factor, creating an internal digital divide that requires highly adaptive pedagogical strategies.

6. Study Limitations and Directions for Future Research

6.1. Study Limitations

While this research provides significant insights into the development of digital skills through active media production, several limitations must be acknowledged:

1. **Geographic and Institutional Scope:** As a localized case study bounded within South East European University (SEEU), the empirical findings reflect a specific institutional culture, technical infrastructure, and regional demographic student profile. Thus, the results may not be entirely generalizable to higher education institutions with drastically different funding structures, regional digital access, or cultural approaches to technological pedagogy.
2. **Sample Specificity:** The quantitative and qualitative data were intentionally drawn from communication, media writing, and teacher-education disciplines. While this purposive sampling was necessary given the study's focus on multimodal communication, the experiences of students and faculty in these humanities-focused tracks may differ significantly from those in STEM (Science, Technology, Engineering, and Mathematics) fields, where digital tool usage follows different structural conventions.
3. **Self-Report Bias:** The quantitative evaluation of student competence and technical self-efficacy relied primarily on self-reported Likert scales. Self-reported data can introduce social desirability bias or overestimation/underestimation of actual operational proficiency, which was only partially mitigated by the triangulation of course syllabi and qualitative faculty interviews.

6.2. Directions for Future Research

To expand upon the findings of this study, future research should explore the following possibilities:

1. **Cross-Institutional and Longitudinal Designs:** Future studies should implement longitudinal research designs to track the long-term retention of digital skills as students transition from higher education into professional cross-media environments. Additionally, cross-institutional comparative studies involving multiple universities across different developing digital economies would validate the adaptability of these models.
2. **Objective Competency Testing:** To complement self-reported technical self-efficacy data, future frameworks should integrate direct, performance-based digital competency assessments (e.g., standardized technical tasks based strictly on the European Union's DigComp framework) to map actual vs. perceived proficiency levels.

3. **AI Integration in Media Production:** Given the accelerating evolution of generative Artificial Intelligence (AI), future inquiries must investigate how the integration of automated creation tools affects student critical thinking, media ethics, and traditional academic literacy, building upon the baseline behavioral challenges identified in current social platform research.

7. Conclusion

This study investigated the development of digital skills and communication competencies in higher education through targeted institutional initiatives, focusing on the pedagogical shift from passive technological consumption to active, hands-on media production. Framed within constructivist learning theory and project-based learning, the empirical findings demonstrate that embedding active content creation—such as podcasting, digital storytelling, and video essays—significantly enhances students' technical self-efficacy, critical thinking, and multimodal communication proficiency. By treating learners as active agents in their own intellectual development, contemporary universities can successfully bridge the gap between abstract academic theory and professional cross-media praxis.

However, the structural transition toward dynamic educational ecosystems exposes deep-seated institutional and behavioral resistance points. The triangulation of student surveys, faculty interviews, and curricular pedagogical materials and educational tools, highlights a persistent internal digital divide driven by uneven baseline student preparedness. Furthermore, while interactive digital spaces promote collaborative engagement, unguided dependency on unstructured social networks can paradoxically result in the erosion of disciplined academic literacy and long-form reading reflexes. This duality reinforces the critical reality that technology integration cannot succeed in a pedagogical vacuum; it requires structured digital literacy frameworks, multimedia-rich portfolio assessments, and develop institutional investments in continuous professional development for teachers, educators and administrators.

Ultimately, this research contends that aligning university teaching practices with 21st-century digital demands an overall strategy that looks beyond the isolated classroom. By systematically embedding digital communication competencies across the curriculum, higher education institutions can overcome faculty anxieties and student differences, transforming traditional structures into inclusive, innovative, and future-ready educational systems capable of fostering digitally fluent global citizens.

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About the Author

Hava Mustafa holds a PhD in Media and Communication, alongside a Master's degree in Diplomacy Studies and a Bachelor's degree in Communication Sciences from South East European University. With over 14 years of experience as a university Administrative Assistant, she also serves as a part-time Lecturer teaching courses in oral and written communication, media writing, and diplomacy. She is an accomplished researcher with multiple publications and conference presentations to her credit. Her diverse professional background spans the civil sector with the Community Development Institute, local media as a journalist and moderator for Radio TV Koha and Radio Bleta, and specialized training at the Macedonian Centre for European Training.

Application of Project-Based Learning and QR Codes in Geography Teaching: The Project "Geo QR – Scan and Learn"

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Abstract

The aim of this paper is to present the application of project-based learning in geography teaching through the integration of traditional hand-drawn geographical maps and the contemporary use of QR codes, as an approach to encouraging active, inquiry-based and interactive learning among students. The paper presents the project "Geo QR – Scan and Learn", implemented at OOU "Vojdan Chernodrinski" Primary School in Skopje, North Macedonia, with students from grades 7, 8 and 9 during the 2025/2026 school year. The project was organized as a series of interconnected activities that included research into geographical content, team-based creation of maps of different continents and regions, and the development of QR codes through which the students' work was enriched with digital educational content. The selection of continents and regions was aligned with the geography curriculum, with students from different grades working on content studied within regular instruction. The QR codes provided access to photographs, facts, explanations and other educational resources, thus linking printed teaching materials with digital content. Based on the observation of students' work, the analysis of the produced materials and the feedback received during the project, the findings indicated that students perceived the project as motivating, engaging and supportive of their active participation in the learning process. The activities provided opportunities for students to develop geographical knowledge, digital literacy, creativity, communication skills and critical thinking. Additionally, a post-project anonymous questionnaire was completed by 165 students. The results indicated a highly positive perception of the applied approach in terms of students' interest in learning, understanding of geographical content, and willingness to participate in similar project activities again. The findings indicate that the use of QR codes in geography teaching can contribute to the modernization of instruction, better connection between traditional and digital teaching resources, and the creation of a more interactive learning environment. The project represents a practical example of the integration of digital tools through project-based learning and active student participation.

Keywords: geography; QR codes; project-based learning; digital literacy; interactive learning

1. Introduction

Contemporary educational processes increasingly emphasise teaching approaches in which students play an active role in acquiring knowledge. Rather than being based exclusively on the transmission of information, teaching now places growing importance on inquiry, practical work, collaboration, problem-solving, and the independent creation of student products. In this context, project-based learning represents a valuable approach through which students can connect curriculum content with concrete activities and practical experience (Bell, 2010; Kokotsaki, Menzies and Wiggins, 2016).

Project-based learning enables students to investigate a particular topic, collect and analyse information, collaborate in groups, and transform their findings into a concrete product or presentation. Research in geography education indicates that project-oriented teaching approaches can contribute to the development of geographical literacy and research skills, as well as to a more active role for students in the learning process (Grobelski, Versluis and McClelland, 2023).

This approach is particularly relevant to geography teaching. As a school subject, geography allows theoretical content to be directly connected with space, natural and social phenomena and processes, cartographic representation, and diverse sources of geographical information. Maps have traditionally been among the fundamental teaching resources in geography; however, the development of digital technologies has created opportunities to enhance them through new forms of visualisation and access to information (Metz, 1990; Köbben and van den Brink, 2024).

QR codes are an easily accessible technology that can connect physical teaching materials with digital content. By scanning a code with a mobile device, students can gain immediate access to additional information, photographs, videos, maps, and other educational resources. In this way, a QR code functions as a link between physical and digital learning spaces. The literature describes various educational applications of QR codes, including their use in geography teaching, where they can support interactive activities and provide access to additional geographical content (Sağıt, Uçak and Savran Gencer, 2024).

Nevertheless, the use of digital technology does not in itself guarantee higher-quality learning. Its educational value depends on how it is integrated into the teaching process and on the activities that students undertake with its support. Digital tools should therefore not be used merely to display information, but as part of activities in which students investigate, select and organise information, create content, collaborate, and present their findings (Vuorikari, Kluzer and Punie, 2022).

The ‘Geo QR – Scan and Learn’ project, implemented at ‘Vojdan Chernodrinski’ Primary School in Skopje during the 2025/2026 school year, was based on this idea. The project was designed to combine the traditional handcrafting of geographical maps, inquiry and teamwork, and the contemporary use of QR codes. Students from grades 7, 8 and 9 participated in the activities, and the selected geographical content was aligned with the curricula followed in their regular classes.

A distinctive feature of the project was the connection between traditional cartographic expression and digital content. Rather than simply receiving ready-made materials, students actively participated in researching, selecting and organising information, creating the maps, and enhancing them with QR codes. The physical products created by the students were thus enriched with photographs, facts, explanations, and other educational materials accessible by scanning the embedded codes. Similar studies indicate that QR codes can be successfully integrated into geography education resources and can increase their interactivity (Sağıt, Uçak and Savran Gencer, 2024).

The project provided a shared thematic framework encompassing content related to all continents. Grade 7 students worked on topics concerning Europe and Asia; grade 8 students worked on European content in accordance with the curriculum they followed; and grade 9 students worked on Africa, North and South America, Australia, and the polar regions. The project was therefore not an activity separate from regular teaching, but a practical extension of the content studied by the students.

The aim of this paper is to analyse the application of project-based learning in geography teaching through the integration of hand-drawn geographical maps and QR codes, and to examine students' experiences and views of the approach. Particular attention is given to their interest in this mode of learning, the help they perceived in understanding geographical content, their willingness to participate again, and the aspects of the project they considered most significant.

In accordance with this aim, the paper addresses the following research questions: (1) How do students assess their interest in, and the perceived support provided by, project-based geography learning that combines hand-drawn maps and QR codes? (2) To what extent are students willing to participate again in a similar project activity? (3) Which aspects of the project do students identify as the most significant and engaging?

In addition to presenting the project's implementation, the paper analyses the findings and the practical educational value of the approach. The project is therefore examined as a case study of teaching practice, rather than merely as a description of a completed school activity.

2. Literature Review

2.1. Project-Based Learning as an Approach in Contemporary Teaching

Project-based learning is a student-centred teaching approach in which knowledge and skills are acquired and applied through inquiry, the completion of specific tasks, collaboration, and the creation of final products. Unlike instruction in which students primarily receive ready-made information, this approach enables active participation in locating and processing information, making decisions, and presenting results. In this process, the teacher acts as an organiser, facilitator, and supporter of student work (Bell, 2010; Kokotsaki, Menzies and Wiggins, 2016).

The principal features of project-based learning include a clearly defined objective, an inquiry process, student autonomy, collaboration, and the creation of a tangible product. Its educational value derives not only from the final product, but also from the process through which students formulate questions, select sources, connect new insights with prior knowledge, and share responsibility for a common task (Kokotsaki, Menzies and Wiggins, 2016).

Project-based learning has particular value in geography teaching because the nature of the subject enables students to investigate space, analyse natural and social phenomena, use diverse sources of geographical information, and create their own geographical products. Grobelski, Versluis and McClelland (2023) view this approach as an opportunity for students to discover geography by engaging in geographical practice. Geography is thus not reduced to learning facts about individual regions, but is presented as a dynamic field in which information is investigated, analysed, and spatially connected.

Project-based learning is closely associated with active learning because students participate in locating, selecting, processing, and presenting information. The knowledge

acquired can be transformed into a map, presentation, poster, digital resource, or another student product. In such a process, subject knowledge is connected with investigative, communicative, creative, and digital activities (Bell, 2010; Kokotsaki, Menzies and Wiggins, 2016).

2.2. Traditional Cartographic Expression and Hand-Drawn Mapmaking

The map is one of the principal means of representing and understanding geographical space. Despite the development of digital cartography and the widespread availability of interactive maps, hand-drawn mapmaking continues to have didactic value in geography teaching. When creating their own map, students are not merely users of a ready-made cartographic representation; they select, organise, and visually represent spatial information (Metz, 1990; Köbben and van den Brink, 2024). Metz (1990) describes sketch maps as a means through which students can organise spatial information and demonstrate the extent of their knowledge of the location of geographical features. Such activities encourage students to think about location, spatial relationships, and the organisation of geographical elements rather than merely observing a completed map.

More recent approaches to geography education likewise highlight the importance of students creating maps independently. Köbben and van den Brink (2024) note that sketch maps can be used to structure geographical information and distinguish primary from secondary elements. Their educational value is particularly evident when students create the maps themselves, as this requires them to select, simplify, and spatially organise information. Consequently, hand-drawn mapmaking and the use of contemporary technology need not be regarded as opposing teaching approaches. Hand drawing enables direct engagement with the cartographic representation of space, while digital technology can extend the physical product with additional information and multimedia content. This integration is one of the central ideas of the ‘Geo QR – Scan and Learn’ project.

2.3. QR Codes as an Educational Tool

QR codes enable physical materials to be connected rapidly with digital content. By scanning a code with a mobile device, users can gain immediate access to text, photographs, videos, websites, or other digital resources. In an educational context, this functionality allows printed and physical teaching materials to be supplemented with content that does not have to appear directly on the material itself (Sağıt, Uçak and Savran Gencer, 2024).

The systematic review by Sağıt, Uçak and Savran Gencer (2024), which covers studies of the pedagogical use of QR codes published between 2014 and 2023, demonstrates that this technology is used in diverse educational contexts and in combination with a range of mobile and digital resources. Its practical advantage lies in straightforward scanning and immediate access to selected digital information. Nevertheless, the educational value of a QR code does not derive from the code itself, but from the quality of the content to which it leads and the teaching activity in which it is integrated. Its use has greater educational significance when students are not merely users of ready-made links, but participate in researching, selecting, and organising digital content (Sağıt, Uçak and Savran Gencer, 2024).

In geography teaching, QR codes can provide access to photographs, facts, supplementary explanations, videos, and other digital sources related to the space represented on a map. The physical map thereby ceases to be only a static visual representation and becomes a starting point for further inquiry. For successful implementation, the content linked through the codes should be accurate, relevant, comprehensible, technically accessible, and age-appropriate.

2.4. Digital Literacy, Critical Thinking, and Active Inquiry

The integration of digital technologies into teaching should not be reduced to the technical ability to use a mobile phone, computer, or particular application. Digital and information literacy also encompass the ability to locate, select, understand, evaluate, and appropriately use information from diverse digital sources (UNESCO, 2011; Vuorikari, Kluzer and Punie, 2022).

This is particularly important in geography teaching, where students use maps, photographs, statistical data, texts, videos, and other representations of space. The digital environment provides access to a vast quantity of information, but simultaneously creates a need for students to evaluate critically the authorship, accuracy, relevance, and purpose of available content (UNESCO, 2011). Through the MiDENTITY project, Hintermann, Bergmeister and Kessel (2020) emphasise the importance of critical geographic media literacy. Geography education can therefore help students analyse more consciously how space, places, and social phenomena are represented in different media.

Project work can create conditions for developing these abilities when students search for information, decide which content is relevant to a particular geographical topic, organise it, and connect it with their own product. To have critical educational value, this process should also include checking the source, authorship, date, accuracy, and copyright status of the content used. The digital tool then becomes a means of inquiry and creation rather than merely a means of passively receiving information (Vuorikari, Kluzer and Punie, 2022).

2.5. Integrating Traditional and Digital Approaches and the Rationale for the Study

The development of digital technologies does not imply abandoning traditional teaching resources. Their purposeful integration has particular potential in geography teaching. A hand-drawn map enables active cartographic representation and the organisation of spatial information, while a QR code can connect the same physical product with supplementary digital content.

This integration brings together two complementary forms of work. In the physical component, students investigate, draw, label, organise, and visually represent geographical information. In the digital component, they search for, select, verify, and connect supplementary content with the product they have created. Project-based learning unites these activities in a process with a specific objective, distributed tasks, and a visible final outcome.

The literature reviewed addresses project-based learning in geography (Grobelski, Versluis and McClelland, 2023), the educational use of hand-drawn and sketch maps (Metz, 1990; Köbben and van den Brink, 2024), the pedagogical use of QR codes (Sağıt, Uçak and Savran Gencer, 2024), and digital and critical media literacy in geography education (Hintermann, Bergmeister and Kessel, 2020). These findings provide a theoretical basis for integrating these elements into a shared teaching practice.

The sources considered in this paper less frequently examine practices in which students independently create traditional geographical maps during regular geography lessons and subsequently enhance them with QR codes leading to selected digital educational content. An analysis of the ‘Geo QR – Scan and Learn’ project can therefore offer concrete insight into the organisation, applicability, and student experience of such an integrated approach. The study does not seek to demonstrate a general effect of QR codes on achievement, but to examine how traditional and digital activities can be connected in an authentic school context.

The project's distinctive feature lies in the participation of students from several grades, who worked on different regional-geographical topics while physical and digital activities were combined within a common process. The study thus analyses the educational value of connecting these activities with cartographic work, project-based learning, and regular curriculum content.

3. Research Methodology

The research was designed as a descriptive case study of teaching practice, intended to analyse the application of project-based learning and QR codes in geography teaching through the implementation of the 'Geo QR – Scan and Learn' project. The project was implemented at 'Vojdan Chernodrinski' Primary School in Skopje during the 2025/2026 school year as part of the school's Annual Work Programme and its geography teaching and project activities. A mixed-methods approach was employed, combining qualitative monitoring of the work process and analysis of student products with quantitative data obtained through an anonymous post-project questionnaire completed by 165 students. The data sources comprised direct observation of students' work, analysis of the geographical maps and accompanying digital content they produced, student feedback, the results of the post-project questionnaire, and photographic and video documentation from different stages of the project.

3.1. Participants and Educational Context

The project involved a total of 165 students from seven classes in grades 7, 8 and 9: three grade 7 classes, two grade 8 classes, and two grade 9 classes. The inclusion of several grades enabled the project to cover different regional-geographical topics studied by the students in their regular lessons. All 165 students involved in the project participated in the anonymous post-project questionnaire. The number of valid responses varied across the individual questions because some students did not answer every question.

The selection of topics was directly related to the curricula for the respective grades. Through this distribution, the shared project activity encompassed all continents, while the project work served as an extension of the content studied during regular instruction.

Students worked in teams on activities that included researching assigned geographical topics; selecting and organising relevant information; drawing, colouring, and graphically designing geographical maps on large sheets of poster paper; and enhancing the maps with QR codes linked to digital educational content. Students therefore participated in the entire process of creating the final product—from research and cartographic representation to its visual and digital enrichment.

3.2. Time Frame and Organisation

The project began in October 2025 and was implemented in several stages over the course of the school year. Activities took place alongside the teaching of the corresponding curriculum content, allowing students to apply knowledge acquired in regular lessons while researching and completing the project tasks.

The process included selecting and assigning topics, researching geographical content, teamwork, drawing, colouring and graphically designing the maps, selecting and preparing supplementary digital materials, and linking them through QR codes.

The QR codes were tested before being placed on the geographical maps. Each code was scanned with a mobile device to verify its readability, the functionality of the link, and the accessibility of the digital content to which it led. Codes with identified technical problems were corrected and retested before the final presentation of the students' work.

As the final stage of the project, the students' work was presented at an exhibition organised to mark the school's Patron Day. Products from the different grades were displayed, and visitors were able to view the maps and access supplementary digital content through the embedded QR codes.

The implementation process and the individual stages of the project are described in greater detail in the following section of the paper, thereby avoiding repetition of the activities in the methodology section.

3.3. Methods and Data Sources

Several data sources were used to monitor and analyse the project in order to obtain a broader insight into the work process and the outcomes achieved.

Students were observed throughout the project activities, with attention focused on their engagement, participation in teamwork, interest in the assigned tasks, independence in conducting research, and use of traditional and digital resources.

The analysis of student products included an examination of the hand-drawn and coloured geographical maps, the representation and organisation of geographical content, the connection between cartographic elements and QR codes, and the functionality of the supplementary digital content. The technical functionality of the embedded QR codes was also checked, including whether they could be scanned successfully and whether the linked digital content could be accessed. The final products were thus examined not merely as exhibition pieces, but as outcomes of a process involving inquiry, collaboration, and the application of acquired knowledge.

Student feedback collected during the activities was used as an additional source for understanding their interest, their experience of teamwork, and their attitudes towards combining hand-drawn cartographic work with digital content. Following completion of the project, an anonymous questionnaire was administered to 165 students. It consisted of four questions designed to explore students' experiences and views of the project, including their interest in this form of learning, their perceptions of improved understanding of geographical content, and their willingness to participate again in similar project activities. The final, open-ended question allowed students to describe in their own words what they had liked most about the project.

Photographic and video documentation made it possible to record the student products and their final presentation at the exhibition organised for the school's Patron Day. Photographs of the completed maps and the exhibition were used as visual documentation of the project's implementation. Some activities and student products were also published on the school's official Facebook page, thereby presenting the project to the wider school community.

3.4. Data Analysis

Depending on the type of data, descriptive, qualitative, and simple quantitative analyses were applied. The observations were considered in relation to students' active participation, collaboration, interest and motivation, independence in conducting research, and use of digital tools.

Student products were analysed in terms of their connection with the assigned geographical content, the mode of cartographic representation, the integration and technical functionality of the QR codes, and the connection between the physical products and supplementary digital resources. Student feedback and project documentation were used to support the interpretation of the observed processes and outcomes. Responses to the closed-ended questions in the post-project questionnaire were processed using response frequencies and percentages, whereas responses to the open-ended question were grouped according to the most frequently occurring themes.

Combining several data sources enabled the project to be examined from multiple perspectives and provided a more comprehensive picture of its implementation and educational value. The charts are presented in their original form, as generated by Google Forms, and therefore retain the Macedonian-language labels used in the questionnaire administered to the students.

3.5. Questionnaire and Data Processing

Following completion of the project, a short anonymous online questionnaire was administered through Google Forms. Its purpose was to explore how students had experienced this mode of learning and which parts of the project they considered most significant. The questionnaire contained three closed-ended questions and one open-ended question. Students assessed how interesting they had found the project, how much it had helped them to understand geographical content, whether they would participate again in a similar project, and what they had liked most.

The anonymous post-project questionnaire was completed by all 165 students involved in the project. The first and second questions each received 165 valid responses, the third question received 163, and the open-ended question received 147 responses. Responses to the closed-ended questions were processed using frequencies and percentages calculated according to the number of valid responses to each question. Responses to the open-ended question were analysed through a simple thematic analysis. All responses were read and grouped according to recurring, substantively similar ideas. The principal themes identified were teamwork and social interaction; hand drawing and mapmaking; the use of QR codes; research and the acquisition of new knowledge; and the exhibition and presentation of student work. Four responses that did not contain information relevant to the question were excluded from the thematic analysis; consequently, 143 substantively usable responses were analysed. As a single response could contain several distinct ideas, it could be assigned to more than one thematic category. The themes were therefore not treated as mutually exclusive statistical categories.

The analysis is descriptive in nature. The questionnaire presents students' views and personal assessments following completion of the project. It is not a test of knowledge and cannot be used to claim that the project directly caused higher achievement. The results are used to examine students' interest, perceived usefulness, and willingness to participate again in an activity of this kind.

3.6. Ethical Considerations and Privacy Protection

The 'Geo QR – Scan and Learn' project was implemented at school level as part of the school's Annual Work Programme. At the beginning of the school year, parents or guardians signed consent forms permitting students to be photographed, their work to be presented publicly, and photographs of school activities to be published through the school's official channels, including its Facebook page.

The questionnaire was anonymous and the results are reported in aggregate form. Participation was voluntary, and all 165 students involved in the project agreed to complete the questionnaire, although some did not answer every question. Students were informed that their responses would be used exclusively for an aggregate analysis of the completed project. No names or other information capable of identifying individual students were collected. The photographs selected to illustrate the paper focus on the work process and student products and do not permit the identification of minors. Given the journal's open-access status, the principle of data minimisation was applied when selecting the visual documentation.

4. Results

4.1. Interest in the Project-Based Mode of Learning

When asked how interesting they had found this mode of learning geography, 126 of the 165 students (76.4%) responded 'very interesting', while 35 students (21.2%) responded 'interesting'. Two students (1.2%) rated it as 'slightly interesting', and two (1.2%) stated that it was 'not interesting at all'. A total of 161 students, or 97.6% of respondents, gave a positive assessment. This finding indicates that project-based learning was positively received by a large majority of respondents. Nevertheless, the four less positive responses should not be disregarded. They serve as a reminder that no teaching approach is equally engaging for every student and that future implementation should provide varied roles and modes of participation.

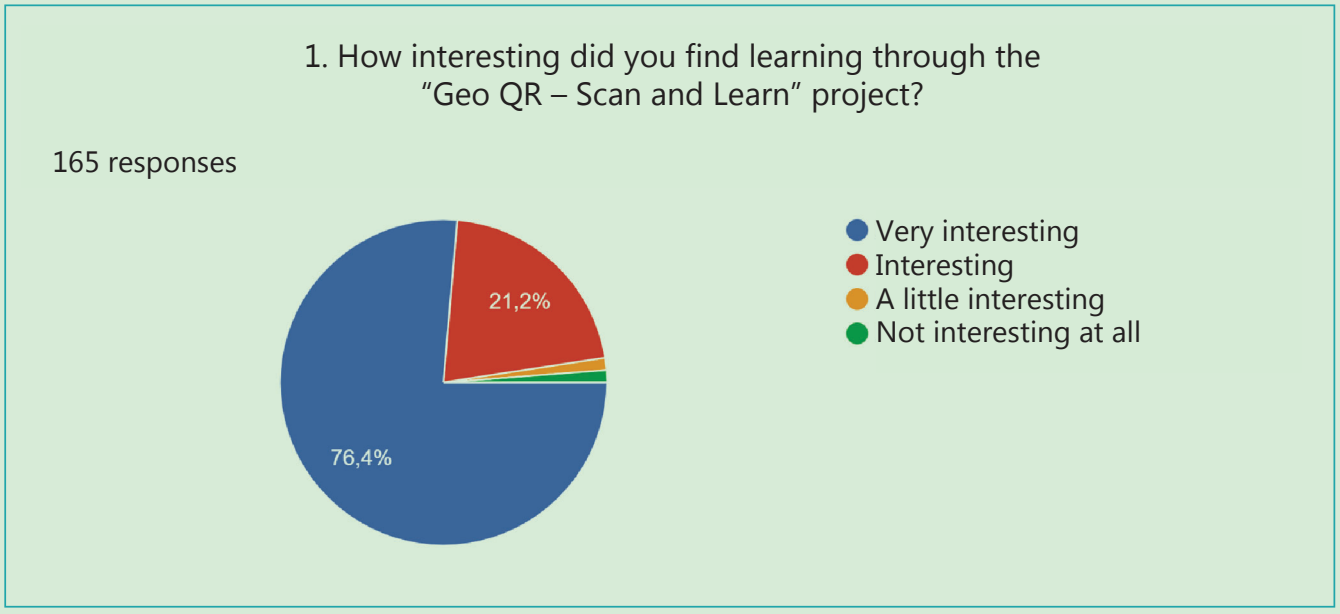


Figure 1. Students' interest in the project-based mode of learning (n = 165)
Source: Google Forms – author's questionnaire survey, 2026.

4.2. Perceived Support for Understanding Geographical Content

In response to the second question, 130 of the 165 students (78.8%) stated that the project had helped them greatly to understand geographical content, while 32 students (19.4%) stated that it had helped them to some extent. Two students (1.2%) responded that the project had helped them only a little, and one student (0.6%) that it had not helped at all. Thus, 162 of the 165 respondents, or 98.2%, felt that the project had helped them greatly or to some extent in understanding the content.

This finding is significant because it indicates that students did not experience the activity merely as drawing, colouring, or decorating. Most students felt that the project had helped them understand geographical content. Nevertheless, this reflects personal perception rather than an objectively measured change in knowledge. Such a conclusion would require pre- and post-project testing or another form of comparison.

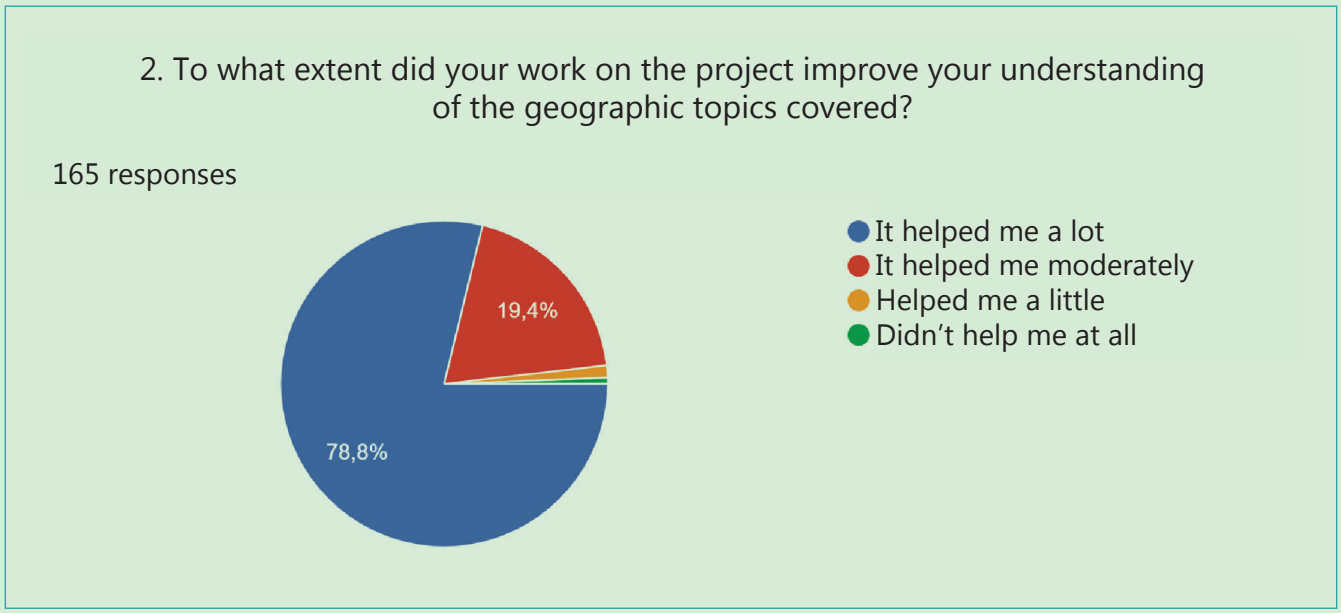


Figure 2. Perceived support for understanding geographical content (n = 165)
Source: Google Forms – author's questionnaire survey, 2026.

4.3. Willingness to Participate Again

When asked whether they would participate again in a geography project combining hand-drawn maps and QR codes, 144 of the 163 students who provided valid responses (88.3%) answered 'yes', 17 students (10.4%) answered 'maybe', and two (1.2%) answered 'no'. The high proportion of affirmative responses is consistent with the expressed interest in the project.

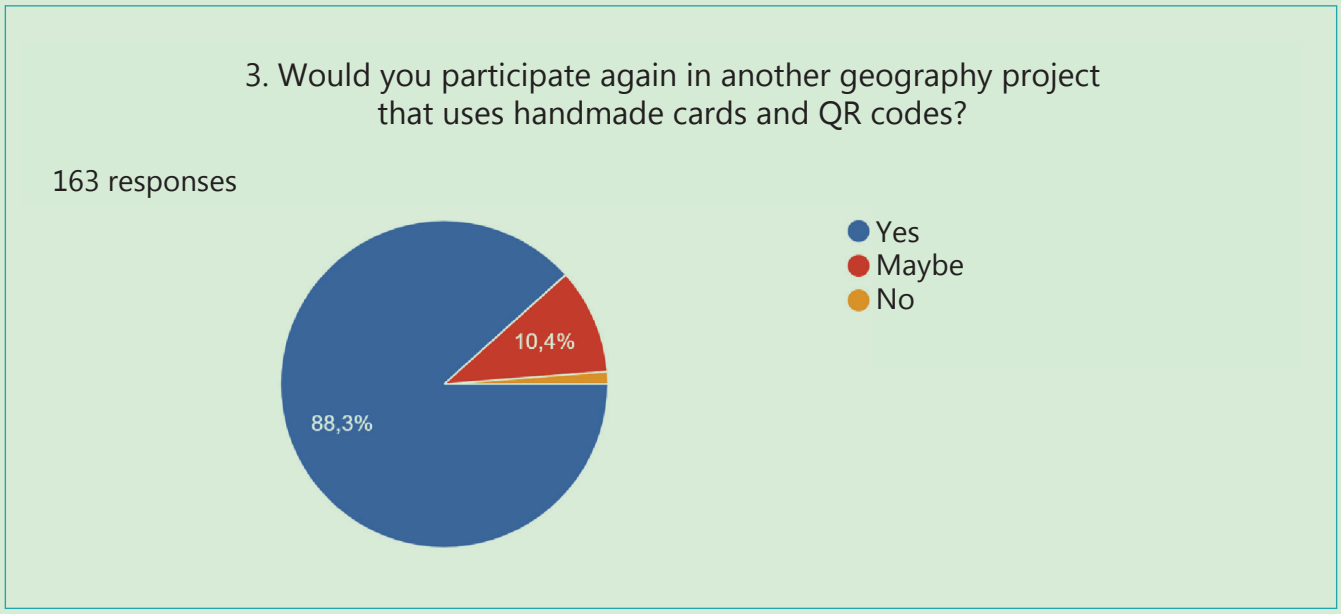


Figure 3. Willingness to participate again in a similar project (n = 163)
Source: Google Forms – author's questionnaire survey, 2026.

4.4. What Students Liked Most

The open-ended question, 'What did you like most about the "Geo QR – Scan and Learn" project?', received 147 responses. After four responses that contained no information relevant to the question had been excluded, 143 substantively usable responses were analysed thematically. Several themes emerged. Teamwork and group work, collaboration, social interaction, and the pleasant atmosphere during the activities were frequently mentioned. Students also highlighted hand drawing and colouring, working on large sheets of poster paper, labelling geographical features, and creating the maps.

QR codes constituted another prominent theme. Students highlighted creating, embedding, and scanning the codes, as well as the opportunity to use them to obtain supplementary information. Some students stated that they had not previously used this way of enriching a project. Responses also emphasised learning through inquiry, discovering new facts, gaining a better understanding of the subject matter, and connecting geographical content with the map. Some students mentioned the exhibition and presentation, while others positively evaluated the entire experience. A small number of neutral or negative views were also recorded.

The responses indicate that the technological element was not the sole source of interest. Different aspects of the project were positively distinguished: practical and creative work, inquiry and the acquisition of new knowledge, collaboration and social interaction, digital activity, and public presentation. Since a single student response could contain several elements, the themes were not treated as mutually exclusive categories, and precise percentages were not derived from them.

4.5. Student Products and the Exhibition

The final products represented the continents and polar regions through a variety of visual solutions. The maps included geographical names, borders, colours, flags, drawings, short texts, and QR codes. Although they differed in cartographic accuracy and the quantity of information presented, they demonstrated the students' ability to transform researched material into a shared visual product. During production, students selected which information would be displayed directly on the map and which would be made accessible through the QR codes. The exhibition enabled their work to be presented to the wider school community and gave the project work a clear purpose.

Before the student products were exhibited, the functionality of the embedded QR codes was confirmed through test scans. Once the necessary corrections had been made, the codes provided access to the intended digital content.

Visitors first viewed the physical maps and then accessed supplementary digital content by scanning the codes. This made the connection between traditional and digital teaching materials visible.

5. Discussion and Conclusions

5.1. Connecting Project-Based Learning, Maps, and QR Codes

The findings indicate that the project's educational value was associated not only with the use of QR codes, but also with the integration of multiple activities. Students researched curriculum content, selected information, created maps, prepared digital materials, and presented them to an audience. This corresponds to the definition of project-based learning as an approach involving inquiry, collaboration, autonomy, and a tangible final product (Kokotsaki, Menzies and Wiggins, 2016).

The large maps provided a shared workspace. Creating them required students to agree on the distribution of tasks, colours, symbols, names, and placement of information. The QR codes enabled the physical product to be supplemented with digital content without displaying that content directly on the map itself. The codes were therefore not decorative additions, but links to information that could not be presented in full on the poster paper.

The project also supported geography learning through practical geographical expression. Although the students were not producing professional maps, they made decisions concerning spatial organisation, location, boundaries, names, and visual representation. This process is connected with the educational value of student-generated maps described by Metz (1990) and Köbben and van den Brink (2024), as well as with Grobelski, Versluis and McClelland's (2023) concept of 'learning geography through doing geography'.

5.2. Engagement and Perceived Learning

The questionnaire produced highly positive assessments: 97.6% of respondents rated the approach as very interesting or interesting; 98.2% felt that the project had helped them greatly or to some extent in understanding the content; and 88.3% of the students who answered the third question stated that they would participate again. These results are consistent with literature associating project-based learning with engagement, autonomy, and collaboration (Bell, 2010; Kokotsaki, Menzies and Wiggins, 2016).

Nevertheless, the results do not demonstrate that the project objectively improved achievement. A positive experience may support learning, but interest and a personal assessment of understanding are not equivalent to a test result. The most precise conclusion is that the majority of respondents experienced the method as interesting, useful, and worth repeating.

The open-ended responses complement this finding. Different students found value in different elements: visual and manual work, technology, social interaction, inquiry, or geographical discovery. A project of this kind can offer multiple avenues for participation, but the teacher must ensure that every role remains connected with the shared learning objectives.

5.3. Digital Literacy and the Critical Use of Information

Preparing content linked to QR codes gave students a reason to search for, select, and organise digital information. This corresponds to the DigComp areas concerning information literacy, collaboration, and digital content creation (Vuorikari, Kluzer and Punie, 2022). At the same time, it created opportunities to discuss whether a source was comprehensible, relevant, accurate, and appropriate for student-produced material.

Based on the implementation experience, future activities would benefit from a more systematic approach to verifying and citing sources. Such activities also require attention to authorship, date, accuracy, and the copyright status of the digital content used. It would be useful for each group to maintain a list of the digital sources consulted. This would create a stronger connection between the project and media and information literacy (UNESCO, 2011), as well as critical geographic media literacy (Hintermann, Bergmeister and Kessel, 2020).

5.4. Practical Implications

The project can be adapted for use in other schools without specialised equipment. It requires large sheets of poster paper, basic working materials, internet access, and devices capable of scanning QR codes. Successful implementation nevertheless demands clear planning. The topics should be closely aligned with the curriculum. In this project, the geographical and digital criteria were defined in advance, and each group knew what it was expected to research, produce, and present. Before the final presentation, all QR codes were test-scanned and any technical problems identified were corrected. Such testing should be a mandatory stage in future implementations. Privacy, copyright, and source credibility should also be discussed. Assessment should take account of the process, participation, and geographical accuracy, rather than only the appearance of the final product.

5.5. Conclusion

The 'Geo QR – Scan and Learn' project represents a practical means of connecting traditional mapmaking with digital resources in primary geography education. Students from seven classes investigated regional-geographical content, worked in teams to create large maps, and used QR codes to expand and enhance them with supplementary information. All 165 students involved in the project completed the anonymous questionnaire, which produced highly positive assessments of interest, perceived support for understanding, and willingness to participate again.

The study's principal contribution is not evidence that QR codes automatically improve learning. Rather, it demonstrates how a simple technology can acquire educational meaning when embedded in a structured project involving geographical inquiry, mapmaking, collaboration, content creation, and presentation. Traditional and digital learning are not opposites; within the project, they supported different components of the same activity.

6. Limitations and Directions for Future Research

The study has several limitations. It was conducted in a single school and reflects the conditions of a particular teaching practice; the findings therefore cannot be directly generalised to other educational contexts. Although all 165 students involved in the project completed the questionnaire, the number of valid responses varied across individual questions: 163 students answered the third question and 147 answered the open-ended question. The results are consequently interpreted according to the number of valid responses to each question.

The questionnaire was administered only after the project and was based on personal assessments. There was no pre-project measurement, comparison group, or standardised test.

Students already possessed some prior knowledge, and the project activities took place alongside the teaching of regular curriculum content. When interpreting the findings, it must therefore be recognised that students acquired knowledge through regular instruction as well as through project activities. Observation was not conducted using a standardised rubric and was based on direct monitoring by the teacher, who was simultaneously responsible for implementing the project.

The open-ended question was optional, and responses varied in length and detail. The thematic analysis presents recurring ideas but does not constitute a precise measurement of their prevalence. The questionnaire did not collect information about students' grades, making comparisons between age groups, or between students in different grades, impossible.

Future research could employ a structured observation rubric and student focus groups to examine in greater detail students' experiences, engagement, and perceptions of the connection between traditional and digital activities. The long-term functionality of QR codes could also be monitored, particularly because, during project preparation, students explored various free and paid solutions and their time limitations. Future studies could additionally analyse in greater depth how students assess the credibility of online geographical information.

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Appendices

APPENDIX 1.
Student Questionnaire Administered after Completion of the Project

1. How interesting did you find this way of learning geography through the 'Geo QR – Scan and Learn' project?

- Very interesting
- Interesting
- Slightly interesting
- Not interesting at all

2. How much did working on the project help you to understand geographical content better?

- It helped me greatly
- It helped me to some extent
- It helped me a little
- It did not help me at all

3. Would you like to participate again in a geography project combining hand-drawn maps and QR codes?

- Yes
- Maybe
- No

4. What did you like most about the 'Geo QR – Scan and Learn' project? *(Open-ended question – students enter their responses independently.)*

APPENDIX 2.
Photographic Documentation of the Project Activities and Exhibition



Figure 4. Students work in teams to create a geographical map of Europe enhanced with QR codes
Source: Author's project documentation, 2026.



Figure 5. Completed geographical maps prepared for the school exhibition
Source: Author's project documentation, 2026.



Figure 6. The final exhibition of the 'Geo QR – Scan and Learn' project, organised to mark the school's Patron Day

Source: Author's project documentation, 2026.



Figure 7. Visitors view geographical maps enhanced with QR codes during the final exhibition

Source: Author's project documentation, 2026.

About the Author

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Inclusion of Children with Disabilities in Secondary Education in the Republic of North Macedonia: Globalization, Digitalization, and Individualization – Comparative Perspectives

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Abstract

This paper explores the contemporary trends, systematic shifts, and operational challenges in inclusive secondary education within the Republic of North Macedonia, analyzed through the conceptual triad of globalization, digitalization, and individualization. Drawing upon a comparative framework, the study contrasts the Macedonian model with the educational systems of Croatia and Serbia to identify institutional best practices, structural barriers, and potential pathways for reform. The implementation of inclusive secondary education in North Macedonia formally commenced in the 2025/2026 academic year, driven by the newly enacted Law on Amending and Supplementing the Law on Secondary Education. Because of its recent launch, empirical data on its long-term efficacy remains sparse. Thus, this study synthesizes early structural indicators, qualitative systemic readiness, and historical lessons inherited from primary education. Globally, inclusive education is driven by international conventions such as the UNCRPD, establishing inclusion as an inalienable human right. However, local realities reveal a persistent gap between progressive legal frameworks and systemic execution. This research highlights the critical need for robust regional support structures, standardized assistive technology deployment, and the shift from mechanical to authentic multidisciplinary collaboration during Individualized Education Plan (IEP) formulation. By adopting localized versions of Croatia's de-centralized counseling model and Serbia's mobile support networks, North Macedonia can transition from nominal, physical placement of students with disabilities to genuine cognitive and social inclusion.

Keywords: inclusive education; secondary education; digitalization; Individualized Education Plan (IEP); assistive technologies; regional resource centers

1. Introduction

Inclusive education, as formalized by the Law on Amending and Supplementing the Law on Secondary Education (No. 08-2193/1, April 8, 2025) in the Republic of North Macedonia, represents a paradigm shift that recognizes and addresses the diverse individual needs of all learners. It guarantees equal opportunities for the realization of fundamental human rights to development and high-quality education. True inclusion extends far beyond merely admitting students with disabilities into regular classrooms; it entails a systemic process of structural and pedagogical adaptation. This includes modifying curricula, updating textbooks, developing tailored learning materials, and transforming overall educational strategies, institutional cultures, and methodologies.[1]

To realize this vision, secondary schools are legally mandated to provide reasonable accommodation for physical infrastructure and customized support systems to facilitate individualized learning plans. At the school level, the principal is responsible for establishing a School Inclusive Team. This team is tasked with overseeing and driving inclusive policies, pedagogical environments, and everyday classroom practices. Furthermore, on the recommendation of the Teachers' Council, a specialized individual inclusive team is formed for each student who requires an Individualized Education Plan (IEP) or a modified curriculum.

Systemic support is provided through various mechanisms, such as educational assistants, professional support from state secondary schools operating as resource centers, centers for learning support, and assistive technology. These accommodations are tailored to the student's specific profile, aligned with the International Classification of Functioning, Disability and Health (ICF). The transition from specialized schools to regional resource centers has been a key component of this reform. Starting in the 2025/2026 academic year, specialized institutions such as the State School for Rehabilitation of Children and Youth with Visual Impairments 'Dimitar Vlahov' – Skopje, the State School Center for Education and Rehabilitation 'Partenija Zografski' – Skopje, the State Secondary School for Rehabilitation and Education 'St. Naum Ohridski' – Skopje, and the State Secondary School for Education and Rehabilitation 'ISKRA' – Štip, transitioned into state secondary schools with resource centers.

This paper analyzes these developments through three interrelated lenses: globalization, digitalization, and individualization. By incorporating a comparative perspective with Croatia and Serbia, it evaluates regional practices, identifies critical systemic bottlenecks, and proposes actionable recommendations to bridge the gap between legal theory and classroom reality.

2. Literature Review

2.1. Inclusion as a Fundamental Human Right

Inclusive education is rooted in the international human rights framework, reflecting a transition from the medical model of disability to the social model. While the medical model views disability as an individual impairment requiring treatment or segregation, the social model argues that disability arises from the barriers imposed by an unaccommodating society. By dismantling these environmental, physical, and pedagogical barriers, the state fulfills its obligation to provide equitable access to education.

1. The 2025 legal amendments in North Macedonia represent the first structural effort to standardize inclusive practices at the secondary level, bridging the previous policy gap where inclusion was legally enforced only in primary education.

The primary legal pillar of this right is the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), adopted in 2006. Article 24 of the UNCRPD obligates States Parties to ensure an inclusive education system at all levels, alongside lifelong learning opportunities. This legally binding treaty demands that students with disabilities are not excluded from the general education system, and that they receive the necessary individualized support within the mainstream environment to maximize their academic and social development.

This framework is further reinforced by the UN Convention on the Rights of the Child (UNCRC, 1989), which stresses that education must foster the development of the child's personality, talents, and physical and mental abilities to their fullest potential. The Committee on the Rights of the Child has interpreted this to mean that education must be available, accessible, acceptable, and adaptable for every learner. Historically, the Salamanca Statement and Framework for Action on Special Needs Education (UNESCO, 1994) first galvanized global consensus on inclusive education, asserting that regular schools with an inclusive orientation are the most effective means of combating discriminatory attitudes, creating welcoming communities, and building an inclusive society.

In General Comment No. 4 (2016) on Article 24, the UN Committee on the Rights of Persons with Disabilities clarified that inclusive education requires a commitment to the 'whole person.' This involves high expectations, flexible curricula, and personalized educational responses. It establishes that the denial of reasonable accommodation constitutes a form of discrimination, placing a clear legal responsibility on schools to design and execute effective IEPs.

2.2. Globalization and Regional Legislative Frameworks

Globalization has accelerated the convergence of national educational policies toward international inclusive standards. However, the implementation of these global norms in the Western Balkans is heavily shaped by regional socio-economic realities and institutional histories. In North Macedonia, the National Strategy for Equality and Non-Discrimination (2022–2026), alongside the Law on Secondary Education, provides a progressive legal foundation. Yet, the translation of these policies into practice is often fragmented due to resource constraints and localized capacity issues. While inclusion in primary education has a longer history in the country, the roll-out in secondary schools is still in its infancy, making comparative regional insights highly valuable.

Croatia serves as a regional leader in establishing a structured institutional framework. The Croatian Act on Primary and Secondary Education (2015) explicitly regulates inclusive education with precise operational procedures for support, and the Croatian Education and Teacher Training Agency (AZOO) regularly develops standards and teacher training resources. Conversely, Serbia's inclusive journey, governed by the Law on the Foundations of the Education System (2017), highlights a different set of challenges. Although Serbia has a strong legal framework, its practical application is often slowed by the legacy of a highly segregated special school system, demonstrating that legislative updates must be accompanied by cultural and institutional changes.

3. Research Methodology

This study employs a comparative policy analysis framework, utilizing qualitative and document-analysis methodologies. The research compares the current state of inclusive secondary education in the Republic of North Macedonia, Croatia, and Serbia. This tripartite comparative approach evaluates how international inclusive education mandates are translated into national laws, institutional structures, and classroom practices. The primary data sources analyzed include: relevant national legislation, such as North Macedonia's 2025 amendments to the Law on Secondary Education, Croatia's Act on Primary and Secondary Education, and Serbia's Law on the Foundations of the Education System; national educational strategies up to 2030; and regional peer-reviewed literature on inclusive practices.

The comparative analysis is structured around three key thematic dimensions:

1. *Institutional and legal readiness:* assessing the clarity, cohesion, and enforcement of inclusive laws, with a specific focus on the role of specialized resource centers and school-level support teams.
2. *Digitalization and assistive technology (AT):* examining the availability, funding models, and integration of digital learning tools and AT designed to accommodate students with diverse physical and cognitive needs.
3. *Individualization and practical execution of IEPs:* evaluating the operational processes of formulating, implementing, and monitoring Individualized Education Plans (IEPs), noting the transition from administrative compliance to collaborative practice.

By examining these dimensions, this study seeks to identify key systemic challenges in North Macedonia and draw upon the experiences of Croatia and Serbia to propose realistic, evidence-based solutions.

4. Findings

4.1. Digitalization: Infrastructural Disparities and Access to Assistive Technologies

Digitalization is a critical driver of modern inclusive education, yet its implementation varies significantly across the three countries studied. In North Macedonia, digital inclusion remains highly uneven and often project-dependent, relying heavily on international donor funding. The country lacks a comprehensive national strategy for the procurement and deployment of assistive technologies (AT). Consequently, many classrooms lack basic adaptive hardware and software, leaving teachers to rely on standard digital tools that may not meet the diverse needs of students with disabilities.[2]

In contrast, Croatia demonstrates a more systematic, state-supported approach to digital transformation. Under the national 'e-Škole' (e-Schools) initiative, schools have been systematically equipped with digital infrastructure, and the Croatian CARNET network provides specialized digital materials. Furthermore, Croatia's specialized centers play an active role in

2. Assistive technology (AT) in the context of this study refers to screen readers, braille displays, adaptive keyboards, and specialized learning management software designed to equalize the pedagogical environment for learners with sensory or physical impairments.

evaluating, prescribing, and training educators and students in the use of AT. This centralized support structure ensures that digital inclusion is integrated into broader educational policies rather than treated as an isolated effort.

Serbia occupies a middle ground, characterized by strong strategic planning but uneven execution. The 'Strategy for the Development of Education in Serbia until 2030' prioritizes digital literacy and inclusion. However, like North Macedonia, local implementation is frequently hindered by budgetary constraints. To address this, Serbia has utilized 'mobile teams' containing special educators and technical experts who travel to regular schools to assist with AT assessment and integration. This mobile model offers a flexible and cost-effective approach to addressing resource shortages in rural and underserved areas.

4.2. Individualization: IEP Design, Teamwork, and the Transition to Practice

The Individualized Education Plan (IEP) is the cornerstone of inclusive pedagogy across all three systems, but the transition from policy to practice reveals varying levels of success. In North Macedonia, while IEPs are legally mandated for students with identified disabilities, their formulation is frequently treated as an administrative chore rather than a collaborative educational tool. Teachers often draft these documents in isolation, without substantial input from special educators, psychologists, or parents. This lack of collaboration, combined with limited teacher training on differentiated instruction, often results in IEPs that are overly generic and do not effectively guide daily classroom instruction.

Croatia's approach, termed the Individualized Education Program (IPP), is supported by a more integrated multidisciplinary framework. The process is collaborative, involving the subject teacher, school professional staff (pedagogues, psychologists, speech therapists, and rehabilitators), parents, and the student. Schools are supported by standing Consultative Bodies (Savjetodavne službe) that provide continuous oversight and guidance, ensuring that IPPs are regularly updated based on ongoing progress assessments.

In Serbia, the IEP framework is well-developed on paper, but studies reveal a persistent risk of 'benign exclusion.' In some cases, the IEP is used to justify lower academic expectations or to separate the student from the main classroom activities, rather than as a tool to facilitate active participation. This highlights a fundamental challenge: without a shift in school culture and attitudes, progressive administrative tools can be co-opted to maintain traditional, segregated practices.

5. Discussion and Conclusion

The findings of this comparative analysis underscore that successful inclusive education requires a comprehensive, systemic approach that goes beyond legislative mandates. North Macedonia's recent extension of inclusive policies to secondary education is a positive step, but its success will depend on addressing the underlying structural and cultural barriers that have historically limited inclusion in primary schools. The comparative data shows that Croatia's success is built upon strong institutional support, decentralized counseling networks, and a collaborative culture. Serbia's experience, meanwhile, serves as a reminder that legal progress must be matched by efforts to change deeply ingrained attitudes and dismantle legacy systems of segregation.

To build a truly inclusive system, North Macedonia must address several key areas: first, shifting from an administrative model of compliance to a collaborative, student-centered approach; second, developing a sustainable, state-funded model for assistive technology and digital infrastructure; and third, strengthening the role of the newly established resource centers to provide direct, hands-on support to mainstream secondary schools. By learning from the successes and challenges of its regional neighbors, North Macedonia can transition from nominal, physical integration to meaningful, cognitive, and social inclusion.

6. Limitations and Directions for Future Research

This study is subject to several limitations. First, because the implementation of inclusive secondary education in North Macedonia only commenced in the 2025/2026 academic year, there is a lack of long-term empirical data on its outcomes. This study relies on early structural indicators and qualitative policy assessments, which may not fully capture the diverse realities of classroom implementation. Second, the comparative analysis is limited to three countries in the Western Balkan region, which, while sharing similar historical and institutional contexts, may not reflect broader global trends in inclusive education.

Future research should focus on longitudinal studies to track the academic and social outcomes of students with disabilities in North Macedonia's secondary schools. Specifically, empirical research is needed to evaluate the effectiveness of the newly transformed resource centers and the operational utility of IEPs from the perspective of classroom teachers, students, and parents. Additionally, cross-regional studies comparing Western Balkan practices with Western European or Nordic models could provide valuable insights into alternative funding, training, and support structures.

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APPENDIX

Table 1. Comparative matrix of inclusive education dimensions

Dimension	North Macedonia	Croatia	Serbia
Legislative & Support Framework	Newly introduced (2025) for secondary; transition to regional Resource Centers.	Highly integrated (since 2015); standing Consultative Bodies in schools.	Modern laws (2017); legacy of segregated systems slows practical application.
Digitalization & Assistive Tech	Project-based, relies on donor funding; lacks a unified national strategy.	State-supported via 'e-Škole'; CARNET infrastructure; centralized training.	Strategic focus up to 2030; 'mobile teams' support technology integration.
Individualization & IEPs	IEPs are legally mandated but often formulated as an isolated, formal exercise.	Collaborative IPP involving teachers, specialists, and parents with regular reviews.	IEPs are widely used but risk serving as a tool for 'benign exclusion' inside classes.

About the Author

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Are Media Actually a Medium and What if Not?

Observing Recourse in the Discourse of Persuasiveness in Rhetorical Speech and Media Manipulation

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Abstract

This article discusses the question *Are Media Actually a Medium and What if Not?* Looking at the persuasiveness of rhetorical speech in the theory of rhetoric, contrasting it with manipulation techniques established by media as a crucial approach to the contemporary situation imposed by media on humans. After a distinction of the medium in the theory of rhetoric and media and the systematic stance of the concept of the medium as a stylistic means within the theory of rhetoric, we show in a case study of a speech produced by ChatGPT the differences between AI-generated imitative speech fabrication and human speech designed in accordance with rhetorical principles. Further, we distinguish the different frameworks of human communication stemming from rhetoric and technical media that result in the effect of altering the mind of a communicator exposed to them. In the last part we discuss and answer the initial question, presenting a model of media types based on their manipulative impact and the distinctive features of speech and the medium in the theory of rhetoric and content of media that are as containing and contained means of communication open to manipulation as an effect of an auxiliary recourse within a multi-layered discourse.

Keywords: Digital Media, Media Theory, Theory of Rhetoric, Artificial Intelligence

1. Introduction: Medium and Media – Differentiation by Contextual Frameworks

The Medium in the Theory of Rhetoric

We use the concept of persuasiveness by the medium as outlined in the theory of rhetoric, contrasting it with media and show their manipulative effects in contemporary media. The place of the medium in the theory of rhetoric is in the area of the stylistic features of the wordings of a speech. In the treatise *Art of Rhetoric* written by Aristotle the term *medium* is applied to a genre of style. Here in Book III Aristotle (1831) writes that style is related to one of the genres (γένει) that require a matching stylistic expression (λέξις):

- Δεῖ δὲ μὴ λεληθέναι ὅτι ἄλλη ἑκάστῳ γένει ἁρμόττει λέξις. (1414a)
- It must not escape notice that a different style of speech suits each genre.

(Transl. Fee-A. Haase)

The concept of the medium is in the Aristotelian *Rhetoric* mentioned as what is the middle (τὸ μέσον) in *Book* III (1414b), where Aristotle mentions that for the style of the juridical speech (ἡ δικανική), if it is babbling, it is not distinct, nor if it is brief (ἄν τε γὰρ ἀδολεσχῇ, οὐ σαφής, οὐδὲ ἂν σύντομος) (Transl. Fee-A. Haase). Instead of these extremes Aristotle recommends what is the middle (τὸ μέσον), concluding:

- ἀλλὰ δῆλον ὅτι τὸ μέσον ἁρμόττει. (1414)
- Rather it is clear that what is the middle fits.

(Transl. Fee-A. Haase)

Subsequently, the concept of the medium is by Quintilian (1920-1922) in the Institutio Oratoria (12, 10, 58-60) connected to the middle mode of speech. In Book 12 (12.10.60) Quintilian uses the expression middle mode (medius modus) for the middle style of speech comparing it to a river:

- Medius hic modus et tralationibus crebrior et figuris erit iucundior, egressionibus amoenus, compositione aptus, sententiis dulcis, lenior tamquam amnis et lucidus quidem sed virentibus utrimque ripis inumbratus.
- This middle mode will be both more frequent in metaphors and more delightful in rhetorical figures, pleasant in digressions, suitable in composition, sweet in maxims, smoother like a river, and certainly bright, but shaded on both sides by green banks.

(Tr. Fee-A. Haase)

Medium in contemporary theory of rhetoric is documented in Silva Rhetoricae. The Forest of Rhetoric. Burton (2007) writes here in Content/Form. Res/Verba. Logos/Lexis about the rhetorical tradition of style and speech:

- Rhetoric requires understanding a fundamental division between what is communicated through language and how this is communicated. Aristotle phrased this as the difference between logos (the logical content of a speech) and lexis (the style and delivery of a speech).

From the systemic perspective of rhetoric the medium of rhetorical speech is self-contained in *logos (λόγος)*, a word that spans a field of meanings across speech, wording,

and reasoning of the mind. Logos can be present as manifested speech in different media beyond direct speech of a speaker directed to others. As Lane (2004) writes, "Rhetoric is understood politically as a sub-language of influential, and "correct" expressions, which can be applied to a range of media, from visual, textual, and performance forms of art."

Perelman and Sloane (2026) wrote in the article *Rhetoric:*

- Above all, a modern rhetorician would insist that the figures, like all elements of rhetoric, reflect and determine not only the conceptualizing processes of the speaker's mind but also an audience's potential response. For all these reasons figures of speech are crucial means of examining the transactional nature of discourse.

In contrast to rhetoric related to speech Bogost (2007: IX) defines procedural rhetoric in the preface of *Persuasive Games. The Expressive Power of Videogames* as rule-based representaions and interactions:

- I call this new form procedural rhetoric, the art of persuasion through rule-based representations and interactions rather than the spoken word, writing, images, or moving pictures. This type of persuasion is tied to the core affordances of the computer: computers run processes, they execute calculations and rule-based symbolic manipulations. But I want to suggest that videogames, unlike some forms of computational persuasion, have unique persuasive powers.

Chachanidze (2026: 1) in Aristotelian Rhetoric in *Contemporary Media Discourse: A Linguistic Analysis of Ethos, Pathos, and Logos* wrote:

- In the contemporary information ecosystem, media discourse has evolved into a highly complex communicative domain where the boundaries between information, interpretation, and persuasion are increasingly blurred. Modern journalism no longer functions solely as a neutral transmitter of facts; rather, it operates as a strategic discursive practice that actively shapes public perception, constructs social realities, and influences collective attitudes. Within this context, understanding the mechanisms of persuasion embedded in media language has become a central concern across disciplines such as media linguistics, discourse analysis, and communication studies.

Nordquist (2019) defines the so-called *middle style* with reference to ancient rhetoric referring to examples in genres of writing ranging from the concrete example of *Travels with Charley: In Search of America* written by John Steinbeck (1962) and the literary genres of romances and novels, scholarly articles, historical narratives, legal decisions, and medical case studies to digital news stories in *The New York Times*, weblogs, and CD reviews in *Rolling Stone Magazine*. Nordquist (2019) states about the *middle style:*

- In classical rhetoric, the middle style is reflected in speech or writing that (in terms of word choice, sentence structures, and delivery) falls between the extremes of the plain style and the grand style.

Contemporary research on rhetoric today is well aware of the distinction between rhetorical speech and media. So Mateus (2021:1) in *When Homo Rhetoricus Meets the Media: The Field and Scope of Media Rhetoric* mentions in the preface of the volume that it "considers the paramount implications to persuasive communication that media brought regarding how we

think, express, argument and feel together". Mateus (2021:1) here distinguishes between *media practice of rhetoric activity and the rhetorical practice of media activity*, stating that the book "is concerned with both the media practice of rhetoric activity and the rhetorical practice of media activity: it respects how the media integrated rhetorical speech, and analyses how rhetoric adapted to media societies. Media and rhetoric are highly dependent on each other because, to persuasively communicate today, media must also be considered."

Similarly, the online writing lab *Purdue OWL* (2026) at Purdue University considers the concept of the medium separated from rhetorical style principles, while acknowledging that *medium* and *genre* of writing are related to each other in the section *Business Writing for Administrative and Clerical Staff on Genre and Medium:*

- Genre and medium are closely related, although a bit different. Genre is the form of your writing (a business letter, memo, report). A medium is the way in which a piece of writing is delivered (email versus a mailed paper copy, for example). Genre and medium are both determined by audience and purpose. For example, if you need to let people in your office know that there will be a test of the alarm system in a few days, a brief email might be the easiest and most efficient way to get that information across.

From its foundations in Greek antiquity until today, the systematic place of the concept of the medium in the theory of rhetoric exists as a stylistic concept for a formed speech. Contemporary research and practitioners of rhetoric consider media as means of communication distinctively different from the medium as a description of a rhetorical style.

Beyond the Rhetorical Medium: Media – Contemporary Definitions and the Impact on Research

The *Oxford English Dictionary* (2026) has two entries for the respective noun *media*. In the first entry of *media* (2026) it states that the earliest known use of the noun *media* is in the 1840s with reference to the earliest evidence in *Oxford English Dictionary* from 1841 in the writing of the ethnologist and philologist Robert Latham. In the second entry of *media* (2026) as the main means of mass communication the earliest known use is recorded in the 1920s in the writing of G. Snow in 1923. Thus, according to the *Oxford English Dictionary*, the use of the word *media* in the context of communication emerged in the English language in the early 20th century, in 1923. Three years later, in 1926, John Logie Baird gave the first public live demonstration of a mechanical television in London, transmitting an image of a face. This use of the word media in the English vernacular language emerged at the time of the massive use of electricity for the transmission of information. *Medium Theory*, most notably expressed in the statement *The medium is the message* as the title of the first chapter of *Understanding Media: The Extensions of Man* (first published in 1964) written by McLuhan (1994: 7), assumes that any medium has an impact on what is communicated, explaining:

- In a culture like ours, long accustomed to splitting and dividing all things as a means of control, it is sometimes a bit of a shock to be reminded that, in operational and practical fact, the medium is the message.

According to McLuhan (1994: 7), automation brings positive and negative effects:

- Thus, with automation, for example, the new patterns of human association tend to eliminate jobs it is true. That is the negative result. Positively, automation creates roles for people, which is to say depth of involvement in their work and human association that our preceding mechanical technology has destroyed.

This theoretical stance of media as the extensions of man for an explanation of the function - ality of media as proposed by McLuhan in 1964 is challenged today, since – from a technical perspective – media have increased in terms of their availability and variety, while most recent developments like Artificial Intelligence (AI) are labels that present media with anthropoid feature. As mass media and technical devices are selected by the users enable them to communicate in their pre-set technical frameworks, communicative exchange in media is a condition for communication. As for research, the functionality and effects of media can be theoretically described and explained, but due to their technological change, research requires observing and describing distinctive features of media in the media landscape.

The Concepts of Rhetorical Persuasion vs. Media Manipulation: Critical Distinctions of the Ethical Stance of the Human in Rhetoric and Communication Media

Persuasiveness is in the theory of rhetoric a kind of influence on others based on rhetorical features of what is communicated with the three impacting appeals of *ethos, logos*, and *pathos*, custom, words, and emotion. Central to rhetorical persuasiveness is the goodness of the speaker. So Quintilian (1920-1922) in the *Institutio Oratoria* (12, 1, 1) defines the speaker (*orator*) with reference to the Stoic Cato as a "good man experienced in speaking" (Transl. Fee-A. Haase; "Vir bonus dicendi peritus"). In other words expressed, a good human being is the condition and prerequisite for a persuasive rhetorical speech.

Beyond rhetoric, persuasion can come into existence due to other means that influence others. We use the umbrella term manipulation for them and define manipulation as an obscured and obscuring approach to change the mind of other persons concerning a thing in their own interest, in our specific cases by the involvement of media. For the English noun *manipulation* five meanings are listed in the *Oxford English Dictionary* (2024), one of them labelled obsolete. *Manipulation* has developed meanings and uses in subjects including chemistry (late 1700s), medicine (1810s), and stock market (1820s). The English manipulation is a borrowing from French *manipulation*. In the *Oxford English Dictionary* the earliest evidence for manipulation is from 1728, in the writing of the encyclopaedist Ephraim Chambers. As for the origin and history of manipulation of the noun *manipulation*, the Online Etymology Dictionary (2026) states that by 1730 its meaning was a method of digging ore derived from French *manipulation* from *manipule* "handful" (a pharmacists' measure) from the Latin word manipulus "handful, sheaf, bundle" from *manus* "hand" (from PIE root **man-* (2) "hand") and the root of plere "to fill" (from PIE root *pele- (1) "to fill"). Its sense of "skillful handling of objects" is attested by 1826 and extended 1828 to "handling or managing of persons", especially to one's own advantage.

Contemporary cases of manipulation by media are publicly discussed. A critical stance towards the use of contemporary media is held by the Catholic Church. In his *Encyclical Letter Magnifica Humanitas* (2026) Pope Leo XIV uses the concept of the means that overshadows humanity with dehumanisation without a god and the use of others as a means as a temptation today present in "a technical guise". In *Two Biblical Images* (10) the *Encyclical Letter Magnifica Humanitas* states as stance towards AI that "we must, then, avoid the "Babel syndrome," namely the idolatry of profit that sacrifices the weak, a uniformity that neutralizes differences, and the pretense that a single language — even a digital one — can translate everything, including the mystery of the person, into data and performance." The "risk of dehumanization" is explained from the theological perspective as "building a future that excludes God and reduces the other to a means" and traced back to "an ancient and ever-new temptation that today takes on a technical guise." The recommendation of the *Encyclical Letter Magnifica Humanitas* encourages the making of the place "City of God" for returning exiles: "Instead, let us choose the "way of Nehemiah," which highlights the importance of working together to make

the City of God a safe place for returning exiles." With truth as a "common good" the *Encyclical Letter Magnifica Humanitas* (102) establishes a general value that cannot be owned. The "manipulation of information" in digital media that employ artificial intelligence is highlighted rejecting the self-presentation of AI systems as "neutral or objective":

- 102. The use of AI is never a purely technical matter: when it enters processes that affect people's lives, it touches on rights, opportunities, status and freedom. [...] There are clearly harmful uses, such as the manipulation of information or violations of privacy. Yet there is also a subtler danger, for when AI systems present themselves as neutral and objective, they end up reflecting and reinforcing the stereotypes or ideological bias of their designers and developers.

In *Communication and the Collective Imagination* (135) the *Encyclical Letter Magnifica Humanitas* addresses the effects of digital content: "The content that circulates within digital environments shapes how people perceive the world and introduces into the collective consciousness images and narratives that direct our desires and influence our daily choices." The *Encyclical Letter Magnifica Humanitas* (136) notices that the manipulation of digital media stems from the owners of digital platforms and requires guidance "by the pursuit of truth" and "respect of human dignity" to avoid that "the culture fostered on the internet does not become an instrument of excessive distraction, homogenization or dominance, but rather a setting in which inner freedom and critical thought can mature." In *Toward an Ecology of Communication* (137) the *Encyclical Letter Magnifica Humanitas* recommends that

- 137. Our first task is neither to demonize nor idolize technological tools, but to utilize them on the basis of a fundamental principle, namely that truth is a common good and not the property of those with power or influence. We must therefore promote an ecology of communication.

In the *Encyclical Letter Magnifica Humanitas* the "ability to affect the collective imagination" is considered the powerful impact of "those who control digital platforms and means of communication". The imagination is a non-realistic and fantastic mental faculty and what it contains. In publicly visible media content across media platforms imaginative elements of the discourse are formed and their back-binding to reality is hard to verify.

Not only due to digitally and by automation produced data assemblages AI is problematic, but in any 'digitally born' content with a reduced degree of reference to the non-digital world, in each instance its relevance must be critically assessed. Additionally, the question of its authorship and ownership is problematic. The content is not only open to manipulation, but also its authorship and so the responsibility for the content is problematic. While in the theory of classical rhetoric the ethical stance of the speaker is implemented in the rhetorical framework, technical devices functioning as media require a much wider perspective and spectrum of ethics involving owners, users, and the settings of the technical devices themselves as potential sources of manipulation by media and other negative media effects.

The Research Question and Theoretical Fundamentals: Discourse Analytics by Remodelling the Status Quo of the Theory of Rhetoric

The Research Question

The research question *Are Media Actually a Medium and What if Not?* confronts the concept of media as means of communication with the concept of the medium,

which is fundamentally grasped and historically in linguistics traceable to what represents an 'in-between-state'. Methodologically, we approach the modern concept of media by contrasting features of the medium and media and what effects the latter have beyond a means of persuasion with the systemic functions of the medium as a classified style. It is not only at the linguistic level a challenge to understand the difference between medium and media in their contextual framework. In its most simplistic conceptual understanding, the word *medium* represents a. something what is between something else (as the middle) and/or b. what contains something else (as the means). We can transfer these conceptual features of the historical linguistic meanings of medium to the meaning of media in communication processes: Thus, the word media represents media with the features

a. to be something located between users who communicate

b. to be the containing means of what is communicated

These features of media are immediately challenged when it becomes obvious that what is communicated by media is neither objectively true but, on the contrary, subjectively produced by a communicator) or emerged from a pure human origin (as currently most predominant in AI content), nor can the media be distinguished as a container from its content. At that point, the association of the media as a means between communicating entities fails. Here is our starting point to have a closer look at contemporary media.

Theoretical Foundations of the Theory of Rhetoric: The Four Categories of Change as the Underlying Principle of Rhetorical Speech

The four categories of change are in the theory of rhetoric considered an underlying principle of the formation of style in a rhetorical speech. Further to the above-mentioned use of the medium as a stylistic term for a particular genre of speech with stylistic features located between two other styles, we describe now how stylistic speech is produced in accordance with the theory of rhetoric. The four categories are:

- Addition
- Subtraction
- Transposition
- Substitution

Burton (2007) in *Silva Rhetoricae. The Forest of Rhetoric* describes the four categories of change with reference to the Quintilianian *quadripartita ratio* (*Institutio Oratoria* 1, 5, 38) as follows:

- Addition, subtraction, transposition, and substitution comprise the four categories of change. These are fundamental rhetorical strategies for the manipulation and variation of discourse across a vast array of linguistic levels: word forms, sentences, paragraphs, entire texts or speeches, etc.

While systematically connected to *logos* comprising word, speech, and reasoning, the categories of change can also be considered an underlying principle for rhetorical phenomena in mediated texts that contain speech. In mediated formats (e.g., a digital video platform with a live stream of a speech) these figures can also occur in rhetorical speech.

In the theory of rhetoric *addition* is the process of producing speech by the production of rhetorical elements (figures of words, figures of thought) that add something to the wording, forming a figure. Examples are pleonasms or vivid descriptions. In media, these figures are present in mediated speech. Examples are pleonasms in written speech, technically recorded speech, and speech in non-digital or digital multimedia formats with figures from an underlying process of addition. *Subtraction* is the process of producing speech by figures of words and thought that omit something in the wording. Examples are the ellipsis of a word or the omission of several words in rhetorical speech. In mediated formats of speech such figures can occur. Examples in contemporary media are media texts in print or digital media with an ellipsis, e g. headlines of news stories that omit the verb *to be*. *Transposition* occurs in rhetorical speech when figures of words or thoughts present an exchange in the wording. Examples are the change of the standard word order in a sentence or the exchange of sections in a speech. In mediated speech these exchanges can occur in rhetorical speech. Digital news and news in legacy media employ as a standard format of news writing the latest events first and the last at the end of the narrative, referirng to the rhetorical principle of *the latest as the first* (*hysteron proteron*, *ὕστερον πρότερον*). *Substitution* is the process of speech production that replaces words or thoughts. Examples are the use of tropes for proper words or a unit of words for another unit of words (e.g., a rhetorical question replaced by a vivid description). A concrete example is the use of metonymic replacements of political decision-makers by the name of the capital city of the respective country in international news.

2. Analysis of Media Inquiring Are Media Actually a Medium and What if Not?

Beyond Rhetoric: The Four Categories of Change Applied to Changes in Media

We can distinguish the persuasiveness of rhetoric from other ways of persuasion by media when looking at the four categories of change as a principle that manifests changes in media. Here, in contrast to rhetoric, the underlying categories of change describe processes performed within the media content system. These processes might be initiated by a human, but they are usually executed by the automation processes of the machines. Here are examples of processes that can be described with the four categories of change:

The process of addition as change in media can be present whenever respective operations are observable in the media system. Beyond rhetorical operations at the level of the media text, any *addition of the media* should be observed and scrutinized concerning its value for reality. An example are massive news about a particular event.

The process of subtraction can be, like the process of addition, as rhetorical persuasiveness of media present whenever respective rhetorical operations occur. Like in the case of an addition, any *subtraction of the media* should be observed and scrutinized concerning its value for reality. Examples are missing factual data in a story of a media outlet or the complete neglect of a relevant event in a newspaper.

The process of transposition, like the previously mentioned processes of addition and subtraction, can be present as rhetorical persuasiveness of media whenever the respective rhetorical operation occurs. As previously mentioned, any *transposition of the media* should be observed and scrutinized concerning its value for reality. Examples are exchanged features in a media platform (like beauty filters applied in video platforms) or media texts that present an event in a reverted way (like a news report that puts last events at the first place in

contrast to the common practice to put newest occurrences first when reporting an event). The swapping of the position of two data-containing files in a program (e.g., *Word*) in two folders is another example of an exchange.

The process of substitution can like the other previously mentioned processes be present whenever respective rhetorical operations occur. Again, any *substitution of the media* shoul be observed and scrutinized concerning its value for reality. An example is the promotion of the use of AI chatbots for its users as a substitution of real communicators on social media like *Whatsapp*. Another example is the substitution of a photograph of an event with a placeholder photo that is only abstractly related to the actual event is a common practice in journalistic outlets in the case that a photograph of the event is lacking.

The difference between the use of the categories of change in the theory of rhetoric and for media is that in media changes are not artfully applied to speech, but executive actions in technical processes of information or structured data within the medium with a digital representation of meanings present as formations of bits and bytes as the smallest communicable entities in digital media. Thus, changes in media are describable from the standpoint of an observer at the level of changes of information and units of data. But these changes at the level of information are not intrinsically systematic in contrast to the systematic application of changes of wording in applications of the theory of rhetoric.

3. Human and Machine – A Case Study: A Speech by ChatGPT vs. Rhetorical Speech

Elimination of the Medium Style and its Replacement by Formatisation and Automation

Under the impact of digital processes without the influence of human selection that lead to formal and automated execution processes of data assembly, the medium as a rhetorical description of speech style is to a lesser degree reflected in common media. But we can break down the contents to something that, at a meta-level, can be described as arguable: Media can be considered means of communication holding right or false opinions they contain, open to any argument or critical approach) or imaginations (e.g. so-called 'hallucinations' of AI chatbots that are themselves an anthropoid expression).

Content of media is never independent, they are held under the condition that the media exist. Semiotically expressed, to function as a sign, content needs the container, and the quality of the significance of what is contained is every time in each particular case what has to be inquired. Furthermore, content of the media is always limited to what is contained and without a change of the medium not transmittable to the physical world. The actual degree of the impact on the mindset of a human being depends on the assessment of content by the human being.

We assess now in a particular case the quality of AI concerning its ability to answer the in introduction described stance of the medium in the theory of rhetoric. If we retrieve from *ChatGPT* an answer to the question What is the medium in the theory of rhetoric?, it becomes obvious that this AI application is not able to refer to the place of the medium as a stylistic element of the theory of rhetoric, but equalizes medium with (technical) media. When *ChatGPT* (2026) is asked what the medium in the theory of rhetoric is, it reiterates the separation of medium and rhetoric, being unaware of the actual theory of rhetoric and the position of the medium in it:

What is the medium in the theory of rhetoric?

ChatGPT:

In rhetorical theory, the medium is the channel or form through which a message is communicated to an audience. It is the means of delivery, and it shapes how the audience receives and interprets the message.

Examples of rhetorical media include:

Speech (face-to-face or recorded)

Writing (books, essays, articles, emails)

Print (newspapers, posters, brochures)

Digital media (websites, social media, podcasts, videos)

Visual media (photographs, infographics, advertisements)

Multimodal texts (combinations of text, images, sound, and video)

Table 1. Anwer by *ChatGPT* by Prompt
What is the Medium in the Theory of Rhetoric?

Obviously, the data accessible to ChatGPT are not sufficient to understand the systematic place of the concept of the medium in the theory of rhetoric. Additionally, ChatGPT lacks any references to rhetoric and adapts terms and expressions from medium theory.

The following speech was assembled by *ChatGPT* (2026) after the author's prompt *Compose a speech in the medium style of rhetoric on the manipulation of media*:

You said:

Compose a speech in the medium style of rhetoric on the manipulation of media.

ChatGPT said:

Here's a medium-length speech with a balanced rhetorical style:

Speech on the Manipulation of Media

Good day, everyone.

Today, I would like to speak about an issue that affects all of us, whether we realize it or not: the manipulation of media.

Media is one of the most powerful forces in modern society. It informs us about current events, shapes our opinions, and connects us with the world. However, this power can also be misused. When information is manipulated, facts may be distorted, important details may be omitted, or emotions may be exploited to influence how people think and act.

Media manipulation can take many forms. Headlines may be written to provoke outrage rather than inform. Images and videos can be edited to create false impressions. Social media algorithms often prioritize sensational content because it attracts attention, even when it is misleading. As a result, misinformation can spread faster than the truth.

The consequences are serious. Manipulated media can divide communities, influence elections, damage reputations, and weaken public trust in reliable sources of

information. When people cannot distinguish fact from fiction, making informed decisions becomes much more difficult.

But responsibility does not lie only with journalists, media companies, or governments. As consumers of information, we also have a role to play. We should verify information before sharing it, consult multiple credible sources, and think critically about the messages we receive. Asking questions such as "Who created this?" "What evidence supports it?" and "Could there be another perspective?" can help us avoid being misled.

In conclusion, media is a powerful tool that can educate, inspire, and unite people when used responsibly. Yet when it is manipulated, it can misinform and divide society. The best defense against manipulation is not fear, but critical thinking, media literacy, and a commitment to seeking the truth.

Thank you for your attention.

Table 2. Speech by *ChatGPT* by Prompt

Compose a Speech in the Medium Style of Rhetoric on the Manipulation of Media

The prompt is not processed to reflect the concept of the medium style, but as a medium-length speech with a balanced rhetorical style. The speech is not assembled in the way a medium speech style is supposed to be in the ancient tradition of rhetoric. Despite giving examples, it is a superfluous reflection on journalism, video, and images without any self-reference. The speech assembled by *ChatGPT* has three parts: A short introduction to the topic, a narrative with examples of media manipulation and the stance of the consumers in respect to media to avoid media manipulation, and a conclusion. On the contrary, traditional rhetoric requires four partitions of the speech: In *Book* IV of the *Institutio Oratoria* Quintilian (1920-1922) (4, 1) mentions the prooemium or exordium and 4, 2) the narratio or statement of facts, and after the treatment of digressions (4, 3) the preparation of propositions for the proof (4, 4), and the partition of propositions (4,5). In the chapters 1 to 14 artificial and unartificial proofs (5, 1) are as the devices of the argumentation are distinguished. Among the unartificial proofs are previous decisions (5, 2), public report or opinion (5, 3), evidence extracted by torture (5, 4), refutation of documentary evidence (5, 5), taking an oath (5, 6), documentary and oral evidence; oral evidence; production as well as witnesses and supernatural evidence (5, 7). Among the artificial proofs (5, 8) are signs, indications, circumstantial evidence that are different from proofs as well as appearances and prognostics (5, 9), arguments (5, 10 and 5, 12), examples and instances (5,11), refutation and proof (5,13) and enthymeme, epicheireme, and syllogism 5, 14). In *Book* VI Quintilian (1920-1922) treats the peroration (6, 1).

The speech presented by *ChatGPT* relies heavily on enumerations of examples and questions. The introduction and the conclusion use tricola for the syntax of the sentences: It informs us about current events, shapes our opinions, and connects us with the world or The best defense against manipulation is not fear, but critical thinking, media literacy, and a commitment to seeking the truth. The speech lacks the use of any tropes, while its choice of words is congruent with common words of contemporary standard English without any explanations, definitions, or reference. The speech presented by *ChatGPT* lacks an argumentation concerning the topic, taking media manipulation for granted. It addresses the audience with advice regarding behaviours and questions to inquire into the existence of media manipulation.

4. Medium, Media and Manipulation, A Media Typology and Principles for Sorting Out Fillings (Manipulation)

Medium, Media, and Manipulation

Theoretically, from the perspective of an overarching communication theory, the distinction of persuasiveness via rhetorical speech and manipulative means can be described as follows: Rhetorical change by the operators of addition, subtraction, transposition, and substitution operates at the level of speech, forming speech in a structured, patterned form and reaching persuasive aims by ethos, pathos, and logos (including speech itself). This persuasion is visible in the formality of rhetorical speech. As a means of persuasion, the application of rhetorical elements is clear and visible in communication processes as a formal structure that can even be implemented in other media. The medium in an artifice, be it the art of rhetoric or an art that brings beautiful things into existence, relies on a human skillset. An example is painting, where the medium is the material of the artifice used by the skillful artist. The human skillset is drastically reduced in applications of digital media. Generally speaking, media as manipulative means become obscured and obscure what they communicate. Their visible surface on any media (including speech) is not consistent but corrupted; their aims are not clearly expressed or different from what they pretend to be.

Media can also be used as a means to communicate a representation of speech about topics or questions in a correct way, serving a communicative aim consistent with ethical practices, affects, and wordings. Here the responsibility lies in the hands of the producing and consuming users of media. Distinguihing the practice of a rhetorician or someone who applies rhetoric in their speech from so-called influencers on social media, the differences ate that the rhetorically trained speaker uses his/her voice towards the audience for the delivery of a speech that follows rhetorical principles in terms of its genre, structure and style, purpose, discoursive elements, ways of persuasion, and the audience addressed at tge specific time the speech is given. On the contrary, an influencer on social media aims at attracting followers who watch multimedia content that promotes the influencers themselves or/and products/services they appraise directly or indirectly. Their produced content does neither rely on rhetorical principles nor journalistic principles of professional media outlets, but is controlled by the policies of the digital platform used by the content producers.

The Non-Neutrality of Media: A Media Typology of Media according to their Effects on Users

We cannot call all that is labelled ‚media' media in the sense of a content-containing medium that appears ‚neutral ‚. The blurredness between both of them, content and container, is a source of manipulation: It can alter what is communicated to the maximum degree of fabrication without any traces and as a ‚fictitious reality' on its own. But what is considered today media are concerning their effects deriving from non-neutrality not identical. A typology of contemporary media by their effects might help assessing the type of media that exist.

Type	*Examples*	*Effects:* *Main Functions /* *User Perspective and Stance /* *Level of Potential Manipulation*
Manipulative Fabricating Media	AI Chatbots Containers that have an imaginative design, obscured data retrieval, assembly, and transmission	*Main Function*: Imagination and Production and Communication of Data *User Perspective and Stance*: 'Seeing an imagined reality' *Level of Potential Manipulation*: Extremely high technical and low human manipulation
Technical Media	'Legacy media' (print, radio, television), digital computer program *Word*, Video Conferencing Platforms (e.g., Microsoft Teams) Containers without Alteration of Human Input for the production, transmission, and storage of data; they can have additional manipulative tools (e.g., Beauty filters for video)	*Main Function*: Recording and Transmission *User Perspective and Stance*: 'Using it as Real Communication Means' 'Seeing more or less than what can be seen without the media' *Level of Potential Manipulation*: Technical and human manipulation can be balanced
Nominal Communicative Media	'Social Media' like *Facebook*, out-of-home (OOH) media like advertisement billboards Containers that are named media, but are open to manipulation and are declared media to involve and reach out to mass audiences	*Main Function*: Organization and Exchange *User Perspective and Stance*: Low level of manipulation: 'What you get is what you see' *Level of Potential Manipulation*: High technical and high human manipulation

Table 3: Media Typology
Contemporary Media and their Effects

Media serve as their core functional feature as communicative means between communicators. Whenever other features are added to this communicative purpose, the range of effects might be extended beyond this core functional feature. Here an assessment of their existing functions beyond their communicative setting might be necessary.

Principles for Sorting Out 'Fillings' (Manipulations)

If media are not a medium, the question what? concerns not only what else they might be and what kinds of effects they have on users, but also what to do with them, how to handle them. Now we look at principles for sorting out the impacts the media as non-neutral elements of communication processes have:

1. The assessment of what type of media takes part in a communication process allows for assessing it against speech in unmediated communication and the degree to which it, as a container, contains and establishes meaning of what is communicated.

2. If content represents factual reality (an identifiable relation between words and things is established), it is reliable for non-digital reality. If content does not represent reality, e.g., in a false statement about something, or if content and even the containing system present (but do not represent) an exclusive media reality, they are not reliable due to lacking a back-binding to reality.
3. The question Is the content system presenting something other than a medium? might help to contrast manipulative intentions, practice, or representations with actual needs of the user.
4. The mind is not present within a content system (despite all attempts to mask it as such by the respective industries). A content system can be filled with content it alters. Mental processes are represented in a complex human concept as mind and it can only theoretically examined.

The manipulation of media produces, broadly speaking, in the basic conceptual understanding of manipulation as 'filling' (corresponding to the Latin infinitive *plere* 'to fill'), fillings in the mind of those exposed to them due to a specific handling (corresponding to Latin *manus* 'hand') of the media beyond their communicative function and purpose. These fillings derive from content that might not be present in any other media format or device and in the non-mediated world.

5. Medium and Media in an Overarching Theory of Communication

Words-Mind-Things Inside and Outside Media Settings

In our mini-model we break down what, in the broadest sense, is knowledgable for a human into the triangle of words, things, and mind. As a default description of rhetorical speech we can describe this speech as what the mind of the speaker forms in accordance with rhetorical principles out of words about things directed towards the minds of an audience. While the concept of the mind is theoretical, it helps to explain observable effects in humans and speech that can subsequently also alter things in the world. Quintilian (Vol. 3, 1922) in his *Institutio Oratoria* (8, prooemium, 6) states that any speech consists of things and words ("orationem porro omnem constare rebus et verbis;"). As for speech as a means of communication, the ‚handling of things with words' is not an unknown idea in the history of the theory of rhetoric. In his lecture *How to Do Things with Words* delivered at Harvard University in 1955 Austin (1962: Lecture 1, p. 2) expresses the distinction between statements and pseudo-statements that are despite their "unexceptionable grammatical form" nonsense: "But now in recent years, many things which would once have been accepted without question as 'statements' by both philosophers and grammarians have been scrutinized with new care. This scrutiny arose somewhat indirectly—at least in philosophy. First came the view, not always formulated without unfortunate dogmatism, that a statement (of fact) ought to be 'verifiable', and this led to the view that many 'statements' are only what may be called pseudo-statements. First and most obviously, many 'statements' were shown to be, as KANT perhaps first argued systematically, strictly nonsense, despite an unexceptionable grammatical form: and the continual discovery of fresh types of nonsense, unsystematic though their classification and mysterious though their explanation is too often allowed to remain, has done on the whole nothing but good."

The 'non-sensual', the nonsense, in the tradition of the speech act theory developed by Austin expressed, entailed in statements of AI-generated speech-like sentences derived from a prompt from a fallacy of reference established between the words assumed to be words of sentient being that is aware of what they mean in the world of things. On the contrary, the content system does not know them. It can only process and re-assemble information in data sets. Technical media neither produce any artifice stemming from the mind nor are they related to things, while rhetoric is an art and falls within the technical skill-set of an educated human shaping words. Within the operational framework of the theory of rhetoric, the stylistic change to a medium style is a change within the framework of human speech imposed by its operations by artful skills applied to natural languages. Technical media, on the contrary, do not require artful skills, but reduce productivity to the human initiative of manipulative actions performed by an input activity on the interface within the pre-established settings of an automated machinery for data contained in the digital system.

In contrast to the medium as a stylistic classification of three kinds of speech, the concept of the medium in applied media like digital media is used without a triangular structure. The triangular framework exists in rhetoric with the three components speech, mind capable to express logos and things altered by the impact of logos-expressing speech and mind. Speech ('words' in lexis) is here the initiating vehicle bridging between the minds of the communicators and things in reality that are changed by the impact of speech. As for media, they cannot serve as a bridge between the mind(s) of the communicators. Media can process, transform, exchange, and maintain representations of speech and other information in an array of assembled data. The claim of a progression in terms of the availability of knowledge (especially by data collections and assemblages via AI) comes actually at the cost of a regression regarding the reliance of stored and as information re-assambled contents of media. At the peak of this self-contained data arrangement the functions of representation and presentation of the things of reality are swapped: What is supposed to be a truthful representation of human self-expression (speech) becomes a presentation of a human-imitating technical device that assembles collected data according to data models, presenting them at the interface as speech in a natural language to the human.

Manipulation aims at the presentation of things in a fabricated way serving the interests of its manipulator. Words and things do not congruently represent each other in this case. Exceeding the area of words, manipulative means can be media themselves, seemingly used by manipulators with the interest to be taken as reality by the receiving communicator(s). AI applications are an example in the case when they represent human-like features as chatbots mimicking dialogical speech patterns, in which they present accrued data in grammatical patterns of natural language.

Answer to the Research Question as Loss of the Medium Stance: The Limitation of Media in Communication between Recourse and Discourse

The research question *Are Media Actually a Medium and What if Not?* can be answered upon our previous elaborations, answering that not all that is supposed to be media operates in the same way regarding its feature as medium, and so different effects exist (cf. section media typology). While their medium stance, being in-between, might be noticed due to their communicative location between two or more entities in a communication process, their functional range of effects on what is contained and their containing set-up comes with an extended functionality. This functionality cannot be explained as a continuity of a style principle as in the theory and practice of the theory of rhetoric.

Media can in a social context be considered a technical means as a medium in the

sense of a containing means shared between human communicators. But beyond this in-between state of exchange media per se are manipulative regarding what they contain: They select, shape, and communicate information in accordance with and conditioned by their technical capacity, having a limited impact on the humans who use them. A recent tendency is the diminishing insight and impact humans users have on the technical processes while the media tend to appear as human-like communicators (Example: AI chatbots). Additionally, media can technically exceed in terms of their functions to manipulative means in respect to what they produce, transmit, or store, altering data to information that appears factual, but is either formed as alternative content relative to reality or a reality on its own (imagined reality) by the medium. While the manipulations have long been considered to be processes initiated by humans and represented by the media, with the emergence of AI human impact and control are diminished. Being aware of the different features of contemporary media and their impact is a required critical stance for human users in order to use them in accordance with responsibility. Media that are not a medium have lost their communicative function, their 'inbetween-place', be it as apparently automated producers of speech like AI bots, be it as regulated means of a pre-set functionality for the users.

While all forms of communication we discussed here fall under the umbrella term of discourse, we can say that the most recent tendency of automated speech-like production by means of AI might be considered a contribution to the overall discourse in society. But, -and here comes the caveat-, this superficially apparent contribution to a discourse turns out to be, besides its fabrication, the holder of an apparently auxiliary strategic recourse scattered in many cases untraceable fragments of the timeless copies of the past now becoming untimely assembled data. Its patterns as a technical stylistic assemblage might be aesthetically appealing, while its assemblage is a dead data body of information. This immanent recourse entails the manipulative, yet obscuring processes. At that point, media lose their function as media usable for humans for communicative purposes: They are like containers that recycle what should not have gone into them since it was still usable. Assembled inside this container, their (re-)usability and successful reuse are not always guaranteed.

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Algorithmically Generated Information Vacuum: Short-Form Video Personalization, Perceived Relevance and Critical Thinking Among Young Media Users

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Abstract

This paper explores the idea of an algorithmically generated information vacuum among young users of digital media. Young people today have access to many sources of information. Still, the content they see every day is often shaped by their interests, searches, viewing habits and interactions. Because of this, students may mainly see topics that already attract them. Other current, cultural and socially important topics may remain outside their attention. The paper combines theoretical analysis with a questionnaire-based study among students. Its aim is to examine the relation between information visibility, perceived relevance, attention and critical thinking. The questionnaire focuses on four areas. The first area examines students' media habits and the type of content they most often see on short-form video platforms, such as TikTok, Instagram Reels and YouTube Shorts. The second area examines students' awareness of general, cultural and current topics. The third area focuses on the possible influence of short-form content on attention, interpretation and the ability to follow longer and more complex content. The fourth area focuses on critical thinking, especially the ability to distinguish between popular and important content, to check information, and to reflect on the role of algorithms in shaping their everyday information space. The paper argues that critical thinking in digital environments is not only about checking information that appears in front of us. It is also about noticing what remains unseen, unsearched and excluded from one's everyday digital environment. For this reason, media literacy today should include algorithmic literacy and a stronger focus on the hidden limits of personalized digital content.

Keywords: algorithmic personalization; information vacuum; short-form videos; perceived relevance; critical thinking

1. Introduction: The Paradox of Information Abundance

What happens to people when they find themselves facing the paradox of ultimate freedom? When countless possibilities open up before them, instead of a sense of complete freedom and a desire to make a better choice, the questions suddenly arise: “And now what?” and “And now where?”. From this comes the realization that unlimited choice does not imply an ability to decide easily. On the contrary, the power to decide may diminish as the possibilities for choice increase.

A similar paradox arises in the contemporary information world, in which people have access to more information than ever before. Yet it is precisely this abundance that confronts them with a new dilemma: which information to choose, which to pay attention to and which to explore in greater depth.

The scale of information abundance is vividly illustrated by Bawden and Robinson (2009, p. 185), who note that a single weekly edition of *The New York Times* contains more information than an average person in seventeenth-century England was likely to come across in a lifetime. This comparison highlights the historical shift from limited access to information towards its ever-greater availability. In addition, McLuhan’s concept of the “global village” (McLuhan, 1962), as an unimaginable possibility of connectedness between people and rapid exchange of data, takes on a new form with the development of the internet and digital platforms. However, as the possibilities for obtaining information expand, the very process of choosing may become more complicated. Perhaps one of the explanations for the increasingly widespread use of algorithmic content recommendation systems lies precisely in the need for easier orientation amid information abundance. In addition to being able to search independently, users are also exposed to algorithmically selected content, which is recommended by taking into account, among other things, their interests, previous searches and digital interactions.

Thus, a new paradox emerges: in a world in which information is almost unlimitedly available, users may once again find themselves in a limited information space. Unlike in the past, this limitation does not necessarily stem from the unavailability of information, but from its selective visibility. It is precisely in this contradiction that the question of the algorithmically generated information vacuum arises.

This is also the starting point of this research. Young people were chosen as the target group because of the author’s professional need, as a teacher, to better understand their information environment and to use the insights gained to modernize teaching practice. However, this does not mean that the algorithmically generated information vacuum is specific to young people. On the contrary, adults may also face similar limitations of information visibility without necessarily being aware of them.

In this vein, the research examines the phenomenon of the algorithmically generated information vacuum through the personalization of short-form video content on TikTok, Instagram Reels and YouTube Shorts. The central research question is how students’ individual interests and digital habits can influence algorithmic selection, and how this, in turn, influences the visibility and perceived relevance of information. Particular attention is paid to the connection between the content to which young people are exposed, their awareness of socially and culturally significant topics, attention and critical evaluation. In this context, the question also arises of a possible information-cultural dissonance in the transition from the personally appealing digital space to unfamiliar or less appealing educational and social content. In doing so, the paper re-examines how information abundance can coexist with limited information visibility.

To achieve this aim, the paper applies a theoretical-analytical approach, complemented by an anonymous survey conducted among young respondents of different age groups. The sample was formed on the basis of the voluntary participation of the author's current and former students. The questionnaire covers four thematic areas, which examine habits of platform use, awareness of certain topics, attention when following and processing content, and certain aspects of critical thinking. The results obtained are not treated as a separate case study, but as an additional empirical basis for supporting, re-examining and deepening the theoretical propositions of the paper. Given the methodological limitations, their interpretation is aimed at identifying possible connections, without assuming cause-and-effect relationships or generalizing the findings to the wider youth population.

Hence, the essential question is not only how much information is available to young people, but which of it becomes visible, which of it is perceived as important, and how this selectivity relates to their critical thinking.

2. Algorithmic Personalization and Digital Habits: Who Chooses the Next "Scroll"?

The world we live in is constantly changing, sometimes at a speed that can easily turn even events that happened yesterday into something resembling screen memories. Our eyes simply cannot see everything that exists and takes place around us. It is no coincidence that speculative interpretations of reality also invoke the Mandela effect, even though it refers to shared false memories rather than to an actual change in reality. To this effect we can add the metaphor that emerges from the film *The Matrix*: how aware are we of the mechanisms that mediate our perception of the world? Both parallels lead us to a common dilemma: do we see what is important for us to see, what we ourselves want to see, or what someone else decides to show us?

2.1. Digital Habits and Recommendation Mechanisms

Major technological changes sometimes overshadow changes in everyday habits. The EU Kids Online 2020 survey, conducted among 25,101 children from 19 European countries, shows an increase in smartphone use and in time spent online compared with 2010, with children stating that their phones are with them almost "all the time" (Smahel et al., 2020, p. 6). The popularity of platforms is also changing: among American adolescents, Facebook use fell from 71% in 2014–2015 to 31% in 2025, while YouTube, TikTok and Instagram are among the most widely used platforms, and X is used by 16% (Faverio and Sidoti, 2025). This ratio also raises a question: in the battle for young people's attention, is text becoming less and less appealing than dynamic video content? Although these findings do not relate directly to young people in Macedonia, they illustrate how changeable digital practices are.

A similar picture of the significant presence of short-form video content can also be seen in the survey conducted for the purposes of this paper. **67.6% of respondents** named **TikTok** as the platform on which they most often watch short-form video content, while **35.2%** stated that they devote more than three hours a day to such content. This answer was given by **29.2% of respondents aged 11 to 14.** Such daily exposure raises the question of whether fast, dynamic and visually rich content is gradually also shaping users' expectations of the way we receive information. Perhaps this is where part of the explanation lies for the lower popularity among young people of platforms traditionally known for text-based posts, such as X. After all, Facebook itself is adapting to these tendencies: in 2022, it expanded Reels globally,

with Meta announcing that video accounts for half of the time spent on Facebook and Instagram (Meta, 2022).

However, time spent on platforms does not in itself reveal what kind of information young people encounter. The responses to the survey (Appendix 1) point to a dominant presence of music, humor, influencers and entertainment content. Nevertheless, the examples given also include current events, scientific information and educational topics. Hence, the personalized information space need not be monotonous, but its thematic diversity does not mean that all content receives equal visibility.

It is therefore first necessary to understand how this information space is shaped by the system called an algorithm. In its basic sense, an algorithm is a sequence of rules or procedures for performing a particular task. However, contemporary algorithmic recommendation systems are more complex than that. They use data and models to estimate which content is most likely to interest the user, and then select and rank it for display according to its estimated relevance.

On **TikTok**, the **For You** algorithm recommends content on the basis of user interactions, watch time and video characteristics, including hashtags. **Instagram Reels**, in addition to previous interactions, also takes social influence into account, so that content can become visible through the activities and reposts of other users. **YouTube Shorts**, for its part, shapes its recommendations according to the user's viewing history, searches and reactions, including skipping videos.

The availability of information does not imply its visibility: a particular topic may be present on the internet and yet remain outside the personalized feed of content that the user follows every day.

2.2. Between Genuine and Algorithmically Estimated Interests

Among other things, algorithmic systems have an essential limitation: they register user behavior, but they cannot reliably recognize the real reasons behind it. Watching a video to the end does not necessarily indicate interest; it may also be the result of curiosity, surprise or disagreement. In addition, on TikTok a video can automatically repeat in a loop while the user is doing something else and is not paying attention to it. Likewise, a single video may contain a dozen hashtags related to different topics, even though the user's attention was focused on only one of them. Hence, the interest that the algorithm attributes to the user need not coincide with their genuine interest. Thorson et al. (2021) found that users to whom Facebook, on the basis of their digital activities, attributed an interest in news and politics reported more frequent exposure to such content, even when the interest they themselves reported was taken into account in the analysis.

Hence, it would be wrong to present the algorithm as solely responsible for limiting information visibility. Users' digital profiles are also shaped by their own choices: whom they follow, what they search for, what they skip and which content they decide to explore. The study by Bakshy, Messing and Adamic (2015) shows that, in addition to algorithmic ranking, personal choices can play a significant role in limiting exposure to politically diverse viewpoints. The information space is thus created through the interplay of the user, the platform and the wider social environment.

But does interest always precede what we watch, or does what is constantly shown to us sometimes begin to shape our focus? With this question, the algorithm ceases to be merely a mechanism that recognizes the user's wishes and becomes a possible director of attention. In an analysis of more than 1.7 million YouTube recommendations from 2019, Huang and Yang (2024) found that entertainment content was recommended more often than

news, with algorithmic recommendations more often leading from news to entertainment content than the other way round. At the same time, personalized recommendations can introduce users to topics in which they had not previously shown interest, so their influence need not be exclusively restrictive. This finding does not prove that the algorithm changes people's genuine interests, but it does indicate that it can influence which content gets the chance to attract our attention. Hence, perhaps the question is not only what we want to see, but also what gets the chance to interest us at all.

2.3. From Searching to the Postponed Search for Information

The change concerns not only the content shown to users, but also the way in which they arrive at an answer. A question prompted by a video may lead to searching several websites and comparing sources, but it may also be followed up through comments, related searches and other short videos, without leaving the platform. The study by Diep and Tran (2025) shows that the TikTok users surveyed often rely on the comments and on elements of the video itself when evaluating information, even though they rate the platform as less useful for searching than traditional search engines. This does not prove that independent research is disappearing, but rather that there are now different paths to information.

What becomes significant here is not only how users arrive at information, but also when they decide that they have learned enough. The concept of *information satisficing* describes behavior in which users do not seek to explore all available sources, but settle for information they consider sufficient for their immediate purpose. Examining the information habits of students, Warwick et al. (2009) observe that the respondents sought to complete their tasks with as little information effort as possible. Hence, ending the search does not necessarily mean that the topic has been fully explored, but rather that the user has reached their own threshold of sufficiency.

On the other hand, *information foraging* theory (Pirolli and Card, 1999) views information seeking as a process of assessing the expected benefit of information in relation to the time and effort needed to find it. Users are guided by cues indicating where they might find useful information and constantly decide whether to continue with the current source or move on to another that seems more promising. According to this theory, information behavior involves not only finding content, but also constantly choosing between different possibilities for continuing the search.

What happens when new possibilities do not arise from conscious searching, but constantly appear in front of the user? In the space of short-form video content, a search that has already begun may be interrupted not because the user has learned enough, nor because they have lost interest, but because their attention has been drawn to other content. Something even more interesting may be hiding in the next scroll. Thus, interest in the initial topic may remain, while its deeper exploration is constantly postponed. Hence, the limited scope of information need not stem only from a lack of interest or from consciously settling for superficial knowledge. Perhaps the problem also lies in the fact that, surrounded by an uninterrupted influx of new content, users never return to the search they started.

Consequently, the question "Who chooses the next scroll?" has no simple answer. Through their habits, users take part in shaping recommendations, algorithmic systems estimate their interests, and social connections and platform rules further influence the selection. Certain overlaps can be observed in the survey responses: for example, among respondents aged 16, the Victoria's Secret fashion show recurs as content that had recently appeared to them (Appendix 1). This may point to the role of algorithmic recommendations, but also to the popularity

of the event itself. Distinguishing between these causes would require more detailed qualitative research, including monitoring of the personalized (For You) pages. The question therefore remains: who chooses the information that gets the chance to become visible?

3. Information Visibility and Perceived Relevance: What Remains Outside the "Aquarium"

The difference between the **availability** and the **visibility** of information can be represented metaphorically through two fish living in different conditions. The first lives in an aquarium, where there is food and the conditions for life, but its world is bounded by glass walls. It knows the space in which it moves. The second fish lives in the open sea, where, although it does not know the entire space, it has the opportunity to explore and discover unknown areas. The sea represents the internet, and the aquarium represents the personalized information space of social platforms. Users may be surrounded every day by a great deal of content shaped according to their interests and habits, while other information, although available, remains outside their attention. Unlike the fish in the aquarium, users have the opportunity to overcome these boundaries by searching independently and exploring different sources. However, relying mainly on the content on offer may keep them in a thematically limited space—a kind of **information vacuum**.

3.1. Perceived Relevance and Forms of the Information Vacuum

What is interesting, what is personally relevant and what is socially significant need not coincide, especially among students, whose interests and information competences are still developing. Tamboer, Kleemans and Daalmans (2022) show that young people may recognize the importance of news and yet experience it as boring or remote from their own lives. In the survey conducted as part of this research, 83.82% of respondents stated that they had heard of Dinev Snacks, compared with 41.18% who had heard of the withdrawal of textbooks. Among respondents aged 11 to 17 who had heard of the withdrawal of textbooks, 40% first learned about it from their family or at school, and 20% from social media. Although these data do not explain why the topics differ in how widely they are recognized, they highlight the role of the immediate environment as a source of information outside the platforms. Hence, school and family play an important role in broadening young people's information space. When timely information on topics that concern them is lacking, the information vacuum may also be accompanied by a feeling of being excluded from conversations in one's immediate environment—as if the glass walls of the "aquarium" extended beyond the screen.

Being unfamiliar with a particular topic does not necessarily mean being uninterested in it. In the survey conducted, 70.59% of the respondents who stated that video game content appears to them had heard of GTA VI, compared with 45.10% of those who did not mention this category. A similar difference can be observed for the withdrawal of textbooks: 52.38% of the respondents who stated that educational content appears to them had heard of this topic, compared with 36.17% of the others. These data indicate that interest in a particular area may be associated with greater recognition of related topics, but does not guarantee it. The news about the withdrawal of textbooks was also available through text posts on news portals, but for users who get their information mainly from short videos on TikTok, it may remain

outside their usual information space. Hence, relying on a single platform for information may contribute to the creation of an information vacuum, even when the user shows interest in the specific area. However, the survey does not establish whether, and why, a particular piece of content failed to appear in the respondents' personalized feeds.

Within this conception, **two basic forms of the information vacuum** can be distinguished. The first concerns a topic whose very existence the user is unaware of. The second concerns an already familiar topic whose further development ceases to be part of the user's usual intake of information through social platforms. Particularly significant is the case in which interest in the topic persists, but the topic no longer appears in the user's personalized feed. In such circumstances, prior knowledge need not disappear, but may remain at the level already reached, while the topic itself continues to develop. The study by Primig, Szabó and Lacasa (2023) on content related to the war in Ukraine on TikTok can serve as an illustration. The authors noted that, after an initial period of intense presence, content about the war disappeared from their personalized "For You" feeds, which made their further research more difficult. Although the reasons for this change were not established, the example shows that interest in a particular topic does not guarantee continuous exposure to information about its development. At the same time, limited visibility on the platform does not imply a complete lack of information, since users may acquire knowledge through other sources.

3.2. Information-Cultural Dissonance and the Comfort of Personalization

In the fast pace of everyday life, when information is plentiful and the time available to explore it is limited, the desire to be more broadly informed may clash with the comfort of the familiar digital space. Leaving one's own "aquarium" means encountering unfamiliar topics, different perspectives and information that is not necessarily personally appealing, which may cause unease and a sense of mismatch. In this paper, this possibility is examined through the concept of information-cultural dissonance. In the first part of the survey, among respondents aged 11 to 17, 82.50% stated that music content appears to them, while 20% mentioned current events. In the specific examples given in response to question 7, music and concerts are represented in 50% of the responses, while news and general events are represented in 12.50%. In the second part, however, 67.50% of the same age group stated that they had heard of the protests by secondary school students in France, and 40% of the NASA and 5G topic. Such differences do not prove that dissonance exists, but they raise the question of how users experience encounters with topics outside their usual information space.

It is precisely in such a mismatch that a need for relief may arise. Instead of constantly choosing, searching and assessing which information deserves attention, users may settle for the content that the platform already offers them. This phenomenon can be considered by analogy through the philosophical perspective of Erich Fromm (1941), who, in *Escape from Freedom*, problematizes the burden of independent decision-making and the tendency to seek support in an external authority. Although his analysis does not concern digital technologies, it raises the question of whether leaving information choices to algorithmic systems also represents a kind of release from the effort of informing oneself independently. Thus, the comfort of the personalized space may simultaneously make everyday life easier and reduce the need to leave it.

The information vacuum, therefore, does not imply an absence of information, but the limited visibility of certain topics in the personalized information space. Although users have the opportunity to overcome its boundaries, relying on the content immediately on offer may keep them in the familiar "aquarium", while part of the wider information world remains outside their attention.

4. Attention, Understanding and Critical Thinking: What Remains after the Next "Scroll"?

Research on conditioning shows that, through repetition, we can learn to expect a certain outcome after a certain signal (Pavlov, 1927). With a single "scroll" comes new content—and perhaps a new reward. But how much of the information we take in within just twenty or so seconds do we actually manage to understand and remember? And do we find the reward in the knowledge gained, or only in the excitement of the next piece of content? Through the concept of lateral thinking, Edward de Bono (1970) emphasizes the importance of stepping outside habitual patterns of thought and seeing a problem from a different perspective. But how often do we give ourselves the chance to think differently about what we have seen before moving on to the next "scroll"?

4.1. Attention after the "Next Scroll": From Digital Absorption to Cognitive Redirection

The rapid move from one short video to another raises the question of what happens to attention when the user needs to redirect it to a different activity. Interesting insights into this are offered by the study by Luo et al. (2025). In this study, the participants were divided into three groups: for half an hour, the first group watched short videos similar to those on TikTok, the second watched a documentary film, and the third did not watch any video content. All participants then solved number tasks in which they had to determine, alternately, whether a number was odd or even and whether it was greater or less than five. In this way, the researchers examined how successfully participants adapted when switching from one rule to another. It turned out that those who had watched the documentary or had not watched any videos made better use of the additional preparation time before the task changed, whereas no such improvement was observed in the group that had watched short videos. The results of the experiment raise the question of whether the transition from short videos to reading a longer text or solving a more complex task may require additional mental effort.

An additional perspective is offered by the study by Tam and Inzlicht (2024), which shows that frequently switching between digital content, although it may seem to be a way of avoiding boredom, can under certain conditions increase it even further. But what happens when, after a series of short, dynamic and engaging videos, a student needs to read a longer text on an unfamiliar topic? It is precisely in this kind of transition that information-cultural dissonance can be considered—a concept used in this paper to describe the possible mismatch between the information world the user is accustomed to and the content they encounter outside it. This is not only a matter of redirecting attention, but also of the difference between what is familiar and appealing to the user in the digital space and what requires additional effort to be understood. Such a mismatch may cause boredom or resistance, but it may also spark curiosity and new interest.

In this context, the results of the survey show that 57.35% of respondents expressed strong agreement with the statement that, when watching longer videos, they often skip parts in order to get more quickly to the information that interests them. Such behavior does not necessarily indicate a reduced ability to sustain attention; it may stem from interest in a specific piece of information, limited time or a judgment that certain parts are not relevant enough. However, when users are constantly confronted with new information and must repeatedly

decide where to direct their attention, the very process of choosing may become an additional burden. This constant need to choose and evaluate information leads us to yet another phenomenon—information fatigue.

But is it only the quantity of information that tires us, or also the feeling that we are constantly seeing something similar? In a study of 425 adult social media users, Yao et al. (2026) found a link between information overload, the feeling that the content on offer is limited, and information fatigue. Users may browse a large number of posts every day and yet have the impression that they keep encountering the same topics and similar viewpoints. Thus, it is possible to be simultaneously overwhelmed with information and enclosed in a narrow information space.

The insights considered bring us back to the initial thesis about the information vacuum, but now from a different perspective. Interests, habits and the selection of information are not only possible limitations, but also an integral part of the way we find our way in digital abundance. Therefore, perhaps the real problem is not that we choose what to watch, but how much room we leave for what we would not choose ourselves. It is precisely here that the question of attention gradually turns into a question of understanding.

4.2. From Information Visibility to Understanding: Between Superficial Browsing and In-Depth Processing

Information visibility in itself does not imply an understanding of what we see. The study by Nanz et al. (2026) examines the difference between superficially scanning the news and processing it in depth, pointing to the importance of relevance appraisal for the way users approach information. It is one thing to notice a news item, and quite another to dwell on it, understand it and connect it with what we already know. With this difference, we enter the essence of the information vacuum: do we merely recognize information, do we truly understand it, are we able to apply the knowledge gained and, finally, are we capable of critically re-examining it?

We also examine the difference between recognizing information and understanding it through the third part of the survey. The respondents read a short text about waste sorting in a school and then answered three questions with different requirements: recognizing a piece of data, interpreting a situation and drawing a conclusion. The last two questions are of particular interest for our research. As many as 76.47% of respondents recognized that simply putting bins in place was not enough to solve the problem, while 83.82% concluded that information and active involvement can contribute to changing behavior. These results point us to an important distinction: it is not enough simply to know what happened; we need to be able to think about why it happened and what could be done differently.

Hence, the question of understanding once again directs attention to the habits formed through the everyday following of short-form video content. When interesting information is constantly available with a single movement of the finger, the assumption arises that this way of getting information gradually and almost imperceptibly shapes users' expectations outside the digital space as well. Becoming accustomed to short, easily understandable and instantly appealing content may reduce the willingness to devote time and mental effort to information that requires deeper understanding and independent research. In this sense, the information vacuum is considered not only as the result of algorithmically limited visibility, but also as a possible consequence of the information habits that users develop while following recommended content. According to this assumption, it is precisely these gradual and often unconscious changes that may also affect the willingness to re-examine information critically.

4.3. Critical Thinking: Between the Information We See and Certainty in What We Know

Critical thinking in the digital space involves not only checking the truthfulness of information, but also re-examining one's own knowledge. Particularly interesting in this context is the study by Bahg, Sloutsky and Turner (2025), who, in an experiment involving the learning of artificial categories, showed that a personalized information environment can lead to the formation of inaccurate representations, but also to excessive confidence in them. In short, users may have limited information at their disposal and yet be convinced that they know enough about a particular topic. Thus, the problem lies not only in what remains outside their information space, but also in the certainty with which they accept what lies within it.

The repetition of information poses an additional problem. Pennycook, Cannon and Rand (2018) show that prior exposure to fake news headlines can, under certain conditions, increase the likelihood that those headlines will later be judged to be true. This phenomenon is known as the illusory truth effect. In other words, information may seem more credible not because we have checked it, but because we have already encountered it. Familiarity can gradually create an impression of certainty, even without sufficient grounds.

It is precisely the difference between knowledge and its application that we examine through two situational questions in our survey. When respondents had to explain why similar opinions keep appearing to them on social media, 70.59% recognized the influence of previous interactions on algorithmic recommendations. However, when faced with a popular video containing the unverified claim that there would be no classes the next day, only 47.06% chose to check it through an official or other credible source. These results indicate that recognizing algorithmic mechanisms and choosing to critically check a specific piece of information do not always go hand in hand. It is one thing to know that content is personalized, and another to apply that knowledge at the moment when we have to decide what to believe.

Hence, the information vacuum is not limited to what remains invisible or insufficiently understood. It can also concern the knowledge we accept with certainty without re-examining it sufficiently. The paper puts forward the assumption that the habits formed around easily accessible and personalized content may gradually shape the willingness to engage in such re-examination as well. In this sense, perhaps the real danger of the information vacuum is not only ignorance, but also the failure to recognize it.

5. Conclusion: Beyond the Glass

The study of the algorithmically generated information vacuum has led to insights that go beyond the questions initially posed. In addition to the limited visibility of information, it has also raised the question of how information habits are gradually shaped and how they may be connected with attention and understanding, as well as with confidence in one's own knowledge. Hence, the information vacuum does not stem solely from algorithmic selection, but can also be sustained by the habits formed in the personalized digital space.

The initial motivation for this paper was the need to better understand the information world of students as a basis for modernizing teaching practice. The theoretical analysis and the survey results provided a significant starting point, but they also indicated that a deeper understanding requires direct observation of students' personalized algorithmic spaces and a comparison of the patterns of recommended content and their thematic diversity.

Such research would allow a more precise understanding of the relationship between interests, algorithmic recommendations and information habits, without presupposing a cause-and-effect connection in advance. For education to help students look beyond the glass, it is first necessary to understand the world they see through it.

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APPENDIX 1:
RESULTS OF THE SURVEY

Percentages are calculated from the valid responses to each question and are rounded to two decimal places. For multiple-choice questions, the total may exceed 100%.

After question 5, the survey ends for respondents who do not watch short-form video content. They account for 4.23% of all respondents and are not included in the calculation base for the subsequent questions.

The additional questions on the source of information are presented for the respondents who answered "Yes" for the corresponding topic. Deviations from 100% in single-choice questions may result from rounding.

1. Gender

Response	Percentage
Male	25.35%
Female	74.65%

2. How old are you?

Response	Percentage
11	14.08%
12	4.23%
13	11.27%
14	4.23%
15	9.86%
16	5.63%
17	7.04%
18 or older	43.66%

3. Which of the following platforms do you use? (Multiple answers possible.)

Response	Percentage
TikTok	83.10%
Instagram	87.32%
YouTube	78.87%
Snapchat	57.75%
Facebook	40.85%
Other	22.54%
I do not use social media	0.00%

4. Approximately how much time per day do you spend watching short-form video content (TikTok, Instagram Reels, YouTube Shorts)?

Response	Percentage
I do not watch at all	2.82%
Less than 30 minutes	4.23%
From 30 minutes to 1 hour	9.86%
From 1 to 2 hours	22.54%
From 2 to 3 hours	25.35%
More than 3 hours	35.21%

5. On which platform do you most often watch short-form video content?

Response	Percentage
TikTok	67.61%
Instagram Reels	16.90%
YouTube Shorts	8.45%
Other	2.82%
I do not watch short-form video content	4.23%

6. What kind of content appears to you most often? (Multiple answers possible.)

Response	Percentage
Humor, memes and entertainment content	73.53%
Influencers and celebrities	63.24%
Music	77.94%
Films and series	48.53%
Gaming	25.00%
Sport	26.47%
Fashion, beauty and lifestyle	57.35%
Education and learning	30.88%
Science and technology	19.12%
Books, art and culture	17.65%
Current events	30.88%
Social topics	14.71%
Politics	16.18%
Other	11.76%

7. List 2–3 specific topics, events or pieces of information that have appeared to you on social media recently.

Responses written in Latin script were transliterated into Cyrillic and obvious language errors were corrected. Responses that were identical after editing were merged.

Edited response	Share
Victoria's Secret fashion show.	4.41%
Sporting events.	2.94%
Cars, politics and other things.	1.47%
News about famous singers and their concerts, a current news story, new products.	1.47%
A viral TikTok trend, a new song, a video by an influencer.	1.47%
Lately I have been getting short clips from films or series, tragic accidents around the world, singers' concerts, new technologies and the like.	1.47%
Lately on social media I have been getting football videos, new songs and various TikTok trends. I also see posts related to school, studying and funny situations with friends. I find the videos related to the everyday life of young people the most interesting.	1.47%
Lately, posts about concerts by well-known bands have often been appearing to me on social media.	1.47%
Lately, information about concerts by singers and bands has often been appearing to me. Some of them interest me and I want to go. I also get clips from films and series, film suggestions, music, songs and more classic videos.	1.47%
Vučić and I do not know.	1.47%
GTA 6, a Minecraft video, a football match.	1.47%
Demonstrations in France, IDJ Show, GRWM.	1.47%
Jelena Karleuša with her new boyfriend, the Victoria's Secret fashion show.	1.47%
Aca Lukas concert.	1.47%
Billie Eilish concert.	1.47%
Zdravko Čolić concert, the new Tesla car that can fly.	1.47%
A singer's concert, a new product.	1.47%
A concert by a female singer, an advertisement for Juicy Bomb.	1.47%
Tamara Todevska concert.	1.47%
Concerts by my favorite singers and popular dances.	1.47%
Singers' concerts, interesting facts and new developments. Everything is in English.	1.47%
Singers' concerts.	1.47%
Concerts by international musicians, the premiere of a new series, a political event, namely the protests in Milan and Paris.	1.47%
Jala and Buba concerts, how makeup artists deal with a problem if they make a mistake while doing makeup, tips and tricks for school, for example how to solve a math problem, and the like.	1.47%
Concerts, events and music.	1.47%

Edited response	Share
Concerts, skincare and beauty, recipes.	1.47%
Concerts, trends and events.	1.47%
Concerts, films, series and humorous content.	1.47%
Concerts.	1.47%
The "Zlatno Slavejče" concert, the new Toyota SUV model, the new Jordan sneaker model.	1.47%
The A$AP Rocky concert, the series *The Mentalist* and scouts.	1.47%
The Kaliopi concert, Aleksandar Dinev's croissants and the protests in France.	1.47%
Short clips from a film, the new Tesla.	1.47%
A short clip from a series I am watching.	1.47%
The Victoria's Secret fashion show and the protests in France.	1.47%
Music and makeup tutorials.	1.47%
Events across Macedonia and the world, art, meal recipes, films, series, music, educational videos, educational or funny podcasts.	1.47%
The storm in Turkey, short clips from a series, DM products.	1.47%
A new product, a sporting event, an event in Roblox.	1.47%
A new product.	1.47%
A new TikTok trend, YouTubers, influencers.	1.47%
A new book, space missions, a school project.	1.47%
New cosmetic products, a trend for high boots, the premiere of the series *Outer Banks* and the like.	1.47%
New products, trends.	1.47%
Newly released songs, interesting films.	1.47%
Politics.	1.47%
The premiere of a film or series, political events and protests, for example in France, band concerts.	1.47%
A film premiere, new makeup and facial care products, travel.	1.47%
A film premiere, a social event, a trend.	1.47%
A film premiere.	1.47%
Premieres for GTA 6, NBA news, an advertisement for the film *Avengers: Doomsday*.	1.47%
Protests across Europe.	1.47%
The protests in Paris, the Victoria's Secret fashion show and Pink Floyd concerts.	1.47%
The protests in France, content from influencers.	1.47%
Ritko, Baka Prase, BMW cars.	1.47%
Roblox, Minecraft.	1.47%
Rock music glitch.	1.47%

Edited response	Share
The situation in Milan and Paris, the violence against the child in Vlae.	1.47%
Sport and music.	1.47%
Sport, football and music.	1.47%
Theater performances, concerts, crime news.	1.47%
A trend.	1.47%
Trends, events and current news.	1.47%
A film.	1.47%
Films, funny videos.	1.47%

Thematic map by age. Each value shows the percentage of valid responses to question 7 in the corresponding age group that mention the topic. A single response may belong to several topics, but it is counted at most once in each topic.

Topic	11	12	13	14	15	16	17	18+
Music and concerts	50.00%	33.33%	87.50%	33.33%	42.86%	0.00%	60.00%	53.57%
Films and series	0.00%	33.33%	0.00%	33.33%	28.57%	0.00%	40.00%	42.86%
Fashion and beauty	0.00%	33.33%	37.50%	0.00%	0.00%	50.00%	60.00%	14.29%
Video games	20.00%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	3.57%
Sport	20.00%	33.33%	25.00%	33.33%	0.00%	0.00%	0.00%	7.14%
Politics and social topics	20.00%	0.00%	0.00%	0.00%	14.29%	50.00%	20.00%	25.00%
News and general events	10.00%	0.00%	0.00%	0.00%	42.86%	25.00%	0.00%	17.86%
Influencers and celebrities	20.00%	0.00%	12.50%	33.33%	0.00%	0.00%	20.00%	3.57%
Trends	10.00%	0.00%	25.00%	33.33%	57.14%	25.00%	20.00%	0.00%
Products and advertisements	30.00%	33.33%	12.50%	0.00%	42.86%	0.00%	20.00%	10.71%
Cars and technology	0.00%	0.00%	12.50%	33.33%	0.00%	0.00%	0.00%	14.29%
Education and science	20.00%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%	7.14%
Books and art	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.14%
Food and recipes	0.00%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	3.57%
Travel	0.00%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Everyday life and humor	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%	10.71%
Scouting	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.57%

8. Have you heard that the Ministry of Education and Science recently adopted decisions to withdraw a large number of textbooks from use in primary and secondary education?

Response	Percentage
Yes	41.18%
No	45.59%
Not sure	13.24%

8.1. Source of the first information about the withdrawal of textbooks

Response	Percentage
From social media	32.14%
From television	21.43%
From a news portal / website	10.71%
From parents / other family members	14.29%
At school / from a teacher	21.43%

9. Have you heard that the Macedonian influencer Aleksandar Dinev has his own brand of snack and sweet products – Dinev Snacks?

Response	Percentage
Yes	83.82%
No	13.24%
Not sure	2.94%

9.1. Source of the first information about Dinev Snacks

Response	Percentage
From social media	89.47%
From television	0.00%
From a news portal / website	0.00%
From parents / other family members	1.75%
At school / from a teacher	3.51%
From friends / classmates	5.26%

10. Have you heard about the warnings about social media scams related to cryptocurrencies and online trading that promise quick and easy earnings?

Percentages of the valid responses to the question.

Response	Percentage
Yes	73.53%
No	16.18%
Not sure	10.29%

10.1. Source of the first information about the crypto scams

Response	Percentage
From social media	38.00%
From television	4.00%
From a news portal / website	8.00%
From parents / other family members	20.00%
At school / from a teacher	10.00%
From friends / classmates	6.00%
I searched the internet myself	6.00%
From ChatGPT or another AI tool	2.00%
Other	6.00%

11. Have you heard about the protests by secondary school students in France related to conditions in schools, such as teacher shortages, overcrowded classes and insufficient resources?

Response	Percentage
Yes	70.59%
No	27.94%
Not sure	1.47%

11.1. Source of the first information about the protests in France

Response	Percentage
From social media	62.50%
From television	20.83%
At school / from a teacher	8.33%
From friends / classmates	6.25%
Other	2.08%

12. Have you heard that Grand Theft Auto VI (GTA VI) is due to be released on 19 November 2026?

Response	Percentage
Yes	51.47%
No	42.65%
Not sure	5.88%

12.1. Source of the first information about GTA 6

Response	Percentage
From social media	65.71%
From a news portal / website	5.71%
From parents / other family members	5.71%
From friends / classmates	20.00%
Other	2.86%

13. Have you heard that NASA is developing a 5G communication system that is to be used on the surface of the Moon in the future?

Response	Percentage
Yes	41.18%
No	42.65%
Not sure	16.18%

13.1. Source of the first information about NASA and 5G on the Moon

Response	Percentage
From social media	67.86%
From a news portal / website	14.29%
From parents / other family members	3.57%
At school / from a teacher	3.57%
From friends / classmates	7.14%
I searched the internet myself	3.57%

14–19. Attention and Following Longer Content

How much do you agree with the following statements? Scale from 1 to 5, where 1 means "I do not agree at all" and 5 means "I completely agree".

Statement	1	2	3	4	5
If a video or text does not catch my attention right at the beginning, I usually stop following it.	2.94%	13.24%	22.06%	10.29%	51.47%
When I watch a longer video, I often skip parts to get more quickly to the information that interests me.	8.82%	10.29%	23.53%	19.12%	38.24%
I understand information more easily when it is presented briefly, visually and divided into several parts.	4.41%	4.41%	29.41%	17.65%	44.12%
If the topic really interests me, I can carefully follow even a longer video or text.	1.47%	1.47%	16.18%	14.71%	66.18%
When the content is longer or more complex, I sometimes draw a conclusion only from the shortest or most striking parts.	5.88%	13.24%	27.94%	17.65%	35.29%
I am prepared to keep reading or watching something even when it is not immediately clear to me at the beginning why the information is important.	7.35%	14.71%	26.47%	17.65%	33.82%

20. How many waste-sorting bins were put in place during the first week?

Text: In one school, the students noticed that a large amount of plastic packaging was thrown away every day during the long break. The student parliament proposed setting up separate bins for sorting waste and organizing a short campaign on how to use them correctly. During the first week, six bins were put in place at different locations in the school. After one month, the amount of plastic waste ending up in the ordinary bins had decreased by about a third. However, the students noticed that simply putting bins in place was not enough, because some of the waste was still being thrown in the wrong place. They therefore prepared short videos and posters reminding their schoolmates how to sort waste correctly. After a few weeks, the teachers noticed that more students had started using the sorting bins on their own.

Response	Percentage
4	4.41%
6	91.18%
8	1.47%
10	2.94%

21. What does the fact that some of the waste still ended up in the wrong place even after the bins had been put in place show?

Response	Percentage
That the bins were unnecessary.	2.94%
That simply putting the bins in place was not enough.	76.47%
That the students did not want to take part in the activity.	17.65%
That the amount of waste had increased.	2.94%

22. Which conclusion follows best from the text as a whole?

Response	Percentage
Problems at school are solved only with new equipment.	8.82%
Information and active involvement can help to change behavior.	83.82%
Students should not organize activities on their own.	4.41%
Plastic waste cannot be significantly reduced.	2.94%

23–26. Critical Thinking and Algorithms

How much do you agree with the following statements? Scale from 1 to 5, where 1 means "I do not agree at all" and 5 means "I completely agree".

Statement	1	2	3	4	5
The fact that some content has many views and shares does not mean that it is important.	1.47%	7.35%	23.53%	13.24%	54.41%
If the same piece of information appears to me several times on social media, that does not mean that it is automatically accurate.	5.88%	10.29%	29.41%	13.24%	41.18%
I know that what I watch, like, search for or skip can influence the content that the platform later shows me.	1.47%	10.29%	13.24%	11.76%	63.24%
The fact that an important topic rarely or never appears in my feed does not mean that the topic is not significant.	4.41%	10.29%	20.59%	5.88%	58.82%

27. On TikTok, Instagram Reels or YouTube Shorts, you watch a video claiming that there will be no classes in schools tomorrow. The video has many views, but it does not say where the information comes from. What would you most likely do?

Percentages of the valid responses to the question.

Response	Percentage
I would believe it because the video has many views.	4.41%
I would ask a friend whether they had heard anything about it.	19.12%
I would check an official or other credible source.	47.06%
I would share it to ask others whether it is true.	10.29%
I would keep scrolling.	19.12%

28. Lately, almost all the videos that appear to you on a particular topic advocate a similar opinion. Which explanation seems most reasonable to you?

Response	Percentage
Probably almost everyone thinks that way.	10.29%
If it keeps appearing to me, that opinion is probably correct.	5.88%
It is possible that the platform is showing me more content similar to what I have previously watched or interacted with.	70.59%
If other opinions do not appear to me, they probably do not exist.	1.47%
I do not know.	11.76%

About the Author

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