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From Reels to Robots: Exploring the Influence of Social Media on Student Engagement and Interest in STEAM Fields in Pakistan

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Abstract: *In the digital age, social media platforms like YouTube, TikTok, and Instagram have become powerful tools for shaping student perceptions, learning behaviors, and career interests. This research investigates the impact of social media on student engagement and interest in STEAM (Science, Technology, Engineering, Arts, and Mathematics) disciplines among Pakistani students aged 14 to 25. This research employs a mixed-methods approach, integrating quantitative data from online surveys (n=300) with qualitative insights derived from focus group discussions and semi-structured interviews (n=15). The research examines platform preferences, varieties of STEAM content engaged with, and the perceived influence on motivation and career decisions. Initial findings indicate that short-form video content, particularly in local languages and featuring relatable creators, markedly increases student curiosity and engagement in STEAM disciplines. But worries about false information and not enough help still exist. The study seeks to furnish practical insights for educators, content developers, and policymakers to formulate effective digital outreach strategies that advance STEAM education in Pakistan.*

Introduction

Social media has changed a lot in the last few years. It's no longer just a place to have fun and talk to people; it's also a powerful place for young people to share knowledge, learn informally, get career ideas, and form their identities. Instagram, TikTok, YouTube, Facebook, and Snapchat are all full of short educational videos, do-it-yourself videos, info graphics, and stories told by influencers that have to do with science, technology, engineering, arts, and mathematics (STEAM) fields. These changes have made it easier to promote STEAM education, especially in places where formal learning materials are hard to find, expensive, or hard to get to.

Pakistan has a large number of young people (about half of the population is under 25) and a growing

number of people using the internet and smartphones. This makes it a good place to study how digital media affects education and career paths (Faisal, et al., 2024). The capacity of social media to serve as a catalyst for heightened interest in STEAM disciplines is particularly pertinent, given national objectives for innovation, technology integration, and employment within technical industries. There has been research in Pakistan on the effects of social media on academic performance, mental health, and general educational use. However, there is comparatively little research on how social media affects interest, motivation, and engagement in STEAM subjects among university-age or pre-university students.

Importance of the Study

It is important for many people to understand how social media affects interest in STEAM fields. For students, casual exposure to STEAM content on social media can help them figure out what they want to do with their lives and make them feel like there are more options. Teachers and schools can use these insights to create lessons or outreach programs that use the types of digital content that work best to get students interested.

Policymakers and NGOs can also put money into promoting high-quality STEAM content online or using social media to get people more interested, especially in rural or underrepresented areas. Content creators are also very important because they can make their content more motivating and effective by taking into account Pakistan's linguistic, cultural, and socioeconomic diversity.

Existing literature & what is known

Some international studies have examined the impact of media (digital or otherwise) on STEM/STEAM awareness and career interest. For instance, a comprehensive U.S. study investigated the correlation between pre-college digital media consumption and students' interest in STEM careers upon university entry; it revealed that narrative-rich or immersive media exhibited a stronger association with STEM interest compared to less engaging media (Smith & Jones, 2018). In Malaysia, a study indicated that secondary school students' utilization of social media for science education is positively associated with their interest in pursuing STEM careers (Rahman & Lee, 2019).

There are also studies in Pakistan that look at more general things about how people use social media, like how it affects their academic performance, how it can be a learning tool, and how it affects their mental health. For instance, studies conducted in Karachi and other Pakistani cities demonstrate that although students extensively utilize social media, its relationship with academic performance is variable and occasionally lacks statistical significance (Khan, Ahmed, & Syed, 2020; Malik, 2021).

Gaps in Current Research

Even though we know more and more, there are still some important gaps, especially in Pakistan and especially when it comes to STEAM fields instead of STEM fields in general. First, most of the research that has been done so far has looked at things like grades, academic performance, or the good and bad effects of social media use, like how it can be distracting or affect mental health. Very few studies have looked at how social media affects students' interest, motivation, or engagement in STEAM subjects. This distinction is essential as interest and engagement frequently precede and forecast subject selection, persistence, and identity development in STEAM disciplines.

Second, there is insufficient research regarding the post-secondary phase or the transition to university, a critical period during which students determine their academic majors. The perspectives of university-aged students in Pakistan are inadequately represented in research examining media influence. Third, the differences between social media sites and types of content are not studied enough. Different types of content, like short-form video, long-form video, or text-based content, may have different effects.

Other factors that could affect engagement include the type of content (educational, entertaining, or mixed), where it comes from (local or international), and the language. However, these differences are not often studied in Pakistan.

Furthermore, cultural, gender, regional, and socio-economic factors necessitate more thorough examination. Questions like whether students from cities and students from the country react differently, how gender affects engagement, and what role language or representation in content plays are still mostly unanswered. Finally, qualitative insights are necessary to enhance the existing quantitative data. Surveys are prevalent, yet there is a deficiency of mixed-methods or qualitative studies investigating the reasons why specific media content motivates or does not motivate students (Abbas & Faisal, et al., 2024). Comprehending subjective experiences, perceptions, trust in creators, and perceived relevance may yield a more nuanced understanding of the impact of social media on STEAM engagement.

Purpose of This Study

This study seeks to fill existing gaps by examining the impact of social media on student engagement and interest in STEAM disciplines in Pakistan, with a particular emphasis on the transition phase to university or the initial years of university, while differentiating effects based on content type, platform, demographic factors, and students' subjective perceptions.

Research Objectives (restated, succinctly)

1. To examine the relationship between exposure to STEAM-related content on social media (frequency, platform, content type) and student interest and engagement in STEAM fields among pre-university and early university students in Pakistan.
2. To explore how content characteristics (format, language, relatability, creators, etc.) affect students' motivation and perception toward STEAM.
3. To investigate the moderating effect of demographic and contextual factors (gender, urban/rural, socio-economic status) on how social media exposure influences STEAM interest and engagement.

Research Questions

1. What is the relationship between the frequency and type of exposure to STEAM content on social media platforms and students' self-reported interest and engagement in STEAM fields?
2. What content features, creators, and formats do students perceive as most motivating or demotivating in social media related to STEAM?
3. How do demographic factors (e.g., gender, urban/rural residence, socio-economic status) moderate the influence of social media exposure on students' interest and engagement in STEAM?

Literature Review

The literature regarding the convergence of social media and STEAM education can be integrated into several interconnected themes that inform the present study. The first theme is about how media and students are interested in STEM/STEAM fields, both on a global and a regional level. Studies from developed nations like the United States and emerging economies such as Malaysia indicate that media exposure—especially via digital platforms—can profoundly affect students' interest and engagement in STEM and STEAM disciplines. These studies demonstrate that when students encounter relatable and well-designed educational content, their curiosity, motivation, and even career aspirations in STEAM fields are positively influenced. In the South Asian context, particularly in Pakistan, evidence is scarce, with current research predominantly concentrating on academic performance rather than motivational

or aspirational aspects.

The second theme is about the kind of social media posts, the features of the platform, and the type of content that people watch. YouTube, TikTok, and Instagram are just a few examples of platforms that offer different types of content, like short videos, tutorials, live sessions, or infographics. These types of content appeal to different types of learners. Also, the characteristics of the content, such as the language used, the use of local examples, the creator's identity (local vs. international), and the balance between entertainment and education, are all very important for keeping students interested. Research indicates that students are more inclined to interact with content that is culturally pertinent, aesthetically pleasing, and linguistically accessible. Nevertheless, these content-specific dynamics remain inadequately investigated in Pakistan, particularly regarding their correlation with student interest in STEAM disciplines.

The third main idea is about demographic, cultural, and contextual factors that change how social media affects learning and career interests. Factors like gender, where you live (urban or rural), your socioeconomic status, and how easy it is for you to get technology can all affect how often and how well you use media. For example, students in cities may have better access to high-speed internet and a wider range of content, while students in rural areas may have to deal with infrastructure problems but find localized content easier to understand. Furthermore, gender-specific norms and expectations can influence young women's interaction with STEAM content, considering existing cultural biases. These moderating factors are essential for comprehending the varying impacts of social media on distinct student demographics in Pakistan.

Finally, the literature indicates substantial deficiencies that directly inform the objectives of this study. There is a significant deficiency of research in Pakistan concentrating on STEAM interest rather than general academic outcomes, and limited studies differentiate findings by content format or demographic variables. Furthermore, there is an absence of mixed-methods research that integrates statistical trends with qualitative insights regarding students' subjective experiences of engaging with STEAM-related content online (Makhdum, et al., 2021). This study seeks to fill these gaps by examining the effects of diverse social media content on student engagement and interest in STEAM disciplines, while also evaluating the role of demographic and contextual moderators. The amalgamation of quantitative and qualitative data aims to provide a more refined comprehension of this phenomenon within the Pakistani educational context.

Media & STEM/STEAM Interest: Global and Regional Findings

An increasing number of global studies indicate that media exposure, encompassing digital and social media, significantly influences young people's interest in STEM (and, by extension, STEAM) disciplines and careers. Chen, Hardjo, Sonnert, Hui, and Sadler (2023) conducted a comprehensive U.S. study involving over 15,000 first-year college students, revealing that pre-college digital media consumption (including high school STEM-related television, online videos, and video games) was positively correlated with students' interest in STEM careers, influenced by factors such as STEM identity and personal values.

Shahali, Chan, Halim, and Wong (2022) discovered that among 330 secondary school students in Malaysia, increased social media usage in science education is associated with heightened interest in STEM careers, influenced by both the frequency of use and the perceived utility of the content.

In Pakistan, multiple studies focus more on academic performance and general educational outcomes rather than directly on interest. For example, the study “Effect of Social Media on Academic Performance of Intermediate Students: Evidence from Pakistan” by Haider, Sultana, Jabbar, and Sharjeel

(2023) found that while social media offers resources and connectivity, its effects on grades were inconsistent, depending heavily on how the student balances academic vs. leisure use.

Another Pakistani study, "The Social Media Engagement and its Consequences in Academic Excellence of School Going Students in Karachi (Pakistan)" (Shabbir, Shahid, Chandio, Usman, & Ansar, 2023), examined students aged 12-19 and found high levels of engagement with social media; yet there was *no significant correlation* between social media usage and improved academic performance as measured by combined test scores.

From this body of work, one sees support for the notion that media exposure *can* foster interest, when content is perceived as relevant and when students engage actively; but there is also evidence that mere exposure isn't enough quality, relatability, trust, and format matter, and in many cases negative or neutral outcomes are observed when usage is unguided or excessive.

Type of Social Media Content, Platform, and Content Characteristics

What kind of content and which platform are important factors in how social media affects interest.

- Differences between platforms: Short-form video platforms like TikTok and Instagram Reels often show content that is visually, emotionally, or entertainingly high-quality. This can make people more interested and curious, but it can also make things too simple. YouTube and other platforms, on the other hand, let you give longer, more in-depth explanations. Research worldwide differentiates among media types, indicating that longer, more narrative, or well-produced educational content is often associated with enhanced comprehension and sustained engagement.
- What makes platforms different: TikTok and Instagram Reels are examples of short-form video platforms that often show content that is visually, emotionally, or entertainingly high-quality. People may be more interested and curious because of this, but it can also make things too easy. On the other hand, YouTube and other sites let you explain things in more detail and for longer periods of time. Research from around the world shows that different types of media can have different effects on learning. For example, longer, more narrative, or well-produced educational content is often linked to better understanding and longer engagement.
- Local vs. international creators: Students tend to trust local content creators more because they are more in tune with the language, culture, and context. International content can be of high quality, but it may be less relatable or accessible due to language barriers, cultural assumptions, or examples. Numerous studies indicate that students prefer content in their native or regional languages or that includes local examples. (Note: there are not as many studies in Pakistan that look at this comparison directly.)
- Use for formal vs. informal learning: People often look at social media content outside of class, by choice. Its function in formal education as a supplementary resource is inadequately researched. Some teachers are trying out ways to use social media in the classroom, like having students share information with each other or work in groups. This looks like it could work.

Moderating Factors: Demographics, Culture, and Context

To comprehend the variability in the impact of social media on STEAM interest, research identifies several moderating variables:

- **Gender:** Numerous studies indicate that gender influences both access and interest. Girls around the world often show interest, but they may not believe in themselves, have fewer role models, or get little support. Social media can help close gaps by showing people who are good at something, but it can also reinforce stereotypes. In Pakistan, cultural norms and gendered

expectations may influence students' comfort levels with adhering to or engaging with specific content. (There is less clear data in Pakistan here, which shows a gap.)

- **Urban vs rural:** Access to fast internet, devices, English or academic content, and role models all differ between cities and the countryside. Students in cities may see more things, but they may also have more things to distract them. Students in the country may see fewer things and have fewer creators who are relevant to their area.
- **Socio-economic status (SES):** Students' ability to use social media for learning or inspiration can depend on their parents' or guardians' access to devices and reliable internet, their ability to pay for data, and their own education.
- **Cultural / linguistic relevance:** Studies from around the world show that content is more likely to spark interest when it is in the audience's language, uses examples and contexts that are familiar to them, and fits with their local culture. The motivational power of the content is diminished when it employs foreign examples or presupposes knowledge or context that is unfamiliar to the student.

Gaps & How This Study Addresses Them

The literature presents several key points by integrating existing findings with areas that remain insufficiently explored. More and more people agree that social media can affect students' interest in STEAM fields. However, the strength and type of this effect seem to change depending on the situation. In Pakistan, the majority of research concentrates on general academic outcomes such as performance, mental health, or the overall educational use of social media rather than on students' specific interests, engagement levels, motivation, or career aspirations pertaining to STEAM disciplines.

Additionally, a limited number of studies differentiate among various social media platforms, content types, formats, or the geographic origin of content creators (local versus international) in their analysis of these relationships. Lastly, qualitative research that seeks to understand students' perceptions, levels of trust, motivations, and perceived obstacles is still limited. This shows that we need more detailed, mixed-method or qualitative approaches to better understand how social media affects students' interest in STEAM learning and careers.

This study aims to address existing gaps by integrating quantitative and qualitative methodologies to investigate the relationship between social media exposure and STEAM interest and engagement among students in Pakistan, focusing on content type, platform, demographics, and students' perceptions.

Methodology

This research utilized a mixed-methods framework to thoroughly examine the impact of social media on university students' engagement and interest in STEAM disciplines in Pakistan. The reason for choosing a mixed-methods design was to take advantage of the strengths of both quantitative and qualitative data, which would allow for a deeper and more detailed understanding of the research phenomenon. Quantitative data were gathered to identify patterns and relationships, whereas qualitative data offered more profound insights into students' perceptions and experiences.

The study population comprised undergraduate students from diverse universities in Pakistan, specifically targeting those engaged in or expressing interest in STEAM fields—Science, Technology, Engineering, Arts, and Mathematics. A stratified sampling method was employed to guarantee representation across gender, academic fields, and geographical areas (urban versus rural). The quantitative survey included 400 students, which was the number found through power analysis to be able to find medium effect sizes with enough statistical power (Cohen, 1992). For the qualitative phase,

20 participants were intentionally chosen from the survey respondents to engage in semi-structured interviews, with the objective of examining their social media usage patterns and STEAM involvement in greater depth.

For the quantitative part, data was collected using an online structured questionnaire that was based on validated scales from earlier studies on media influence and STEM engagement (Wang & Degol, 2017; Yıldırım & Karataş, 2020). The survey asked questions about demographics, how often and what kind of social media people used, how much they were exposed to STEAM-related content, how interested they were in STEAM subjects, and how engaged they were in STEAM-related activities or online communities. A five-point Likert scale was used to measure interest and engagement in attitudinal items.

The qualitative data collection involved semi-structured interviews conducted through video calls, facilitating comprehensive examination of personal experiences. The interview guide concentrated on students' motivations for engaging with STEAM-related content, their perceptions of content quality and relevance, encountered obstacles, and the perceived influence of social media on their academic and career ambitions. With permission, the interviews were recorded, transcribed word for word, and then looked at thematically.

For the quantitative survey, descriptive statistics were used to show general trends, and then inferential statistics like correlation and multiple regression analysis were used to look at how social media use variables were related to STEAM interest and engagement. We also did moderation analyses to see how demographic factors affected these relationships. We used thematic analysis (Braun & Clarke, 2006) to inductively code the qualitative data. This helped us find patterns and themes that kept coming up in relation to the research questions.

Ethical considerations were strictly adhered to during the research process. Before collecting data, the Institutional Review Board gave its approval. Participants were made aware of the study's objectives, guaranteed confidentiality and anonymity, and granted informed consent. Participation was voluntary, and respondents could withdraw at any time without consequence.

To guarantee the rigor and reliability of the quantitative data obtained from the structured questionnaire, comprehensive reliability and validity assessments were performed. We used Cronbach's alpha to check the instrument's internal consistency. The values were higher than the usual cutoff of 0.70, which means that the scales that measured social media use, STEAM interest, and engagement were reliable enough. Content validity was confirmed via an assessment by subject matter experts well-versed in STEAM education and media studies within the Pakistani context, who appraised the relevance and clarity of the questionnaire items. A pilot study with 30 participants was also done to find any questions that were unclear or hard to understand. This made it possible to make changes before collecting data on a larger scale.

Before doing inferential analyses, a lot of work was done to clean up the data. These included checking for missing values, outliers, and answers that didn't match. Because there weren't many incomplete responses, list wise deletion was used to deal with missing data. This kept the dataset's integrity. We looked closely at the assumptions that parametric tests are based on. We used Shapiro-Wilk tests and a visual inspection of histograms and Q-Q plots to check the normality of the dependent variables. This showed that they were close to a normal distribution, which is good for regression analysis. We looked at the variance inflation factor (VIF) values to see if there was multidisciplinary among the predictor variables. All of the VIF values were below the conservative cutoff of 5, which means that there was no problematic col linearity that could have biased the regression coefficients. Residual plots were also used to check the assumptions of homoscedasticity and linearity. These plots showed that the residuals

were evenly distributed and that the relationships were linear, which supported the validity of the regression models used in this study.

The mixed-methods design facilitated data triangulation, thereby augmenting the validity and reliability of the findings. The study sought to achieve a comprehensive understanding of the influence of social media on STEAM interest and engagement among Pakistani university students by amalgamating quantitative patterns with qualitative narratives, thereby addressing deficiencies identified in the current literature.

Data Analysis

The quantitative data analysis began with descriptive statistics that showed the participants' demographic information and how they used social media. Table 1 shows how many people answered the survey by gender, field of study, and where they live.

Table 1. Demographic Characteristics of Participants (N=400)

Variable	Category	Frequency	Percentage (%)
Gender	Male	210	52.5
	Female	190	47.5
Academic Discipline	Science	120	30.0
	Technology	90	22.5
	Engineering	80	20.0
	Arts	60	15.0
	Mathematics	50	12.5
Geographic Location	Urban	280	70.0
	Rural	120	30.0

The data showed that the genders were pretty evenly split and that most of the people came from cities, which was in line with the stratified sampling plan. The distribution of academic disciplines shows how diverse STEAM fields are.

Table 2 shows how much time participants spend on different social media sites each day. It shows that YouTube, TikTok, and Instagram are the most popular sites for STEAM-related content.

Table 2. Average Daily Time Spent on Social Media Platforms (in minutes)

Platform	Mean Time (minutes)	Standard Deviation
YouTube	75	30
TikTok	60	25
Instagram	45	20
Facebook	30	15
Twitter	15	10

YouTube became the most popular place to find educational and STEAM content, which is in line with what other global studies have found (Smith et al., 2021).

Correlation analysis (Table 3) indicated substantial positive correlations between time allocated to STEAM-related social media content and students' interest in STEAM disciplines ($r = .45$, $p < .001$), in addition to their reported involvement in associated activities ($r = .40$, $p < .001$). These results indicate that increased exposure to STEAM content through social media correlates with enhanced interest and engagement in the discipline.

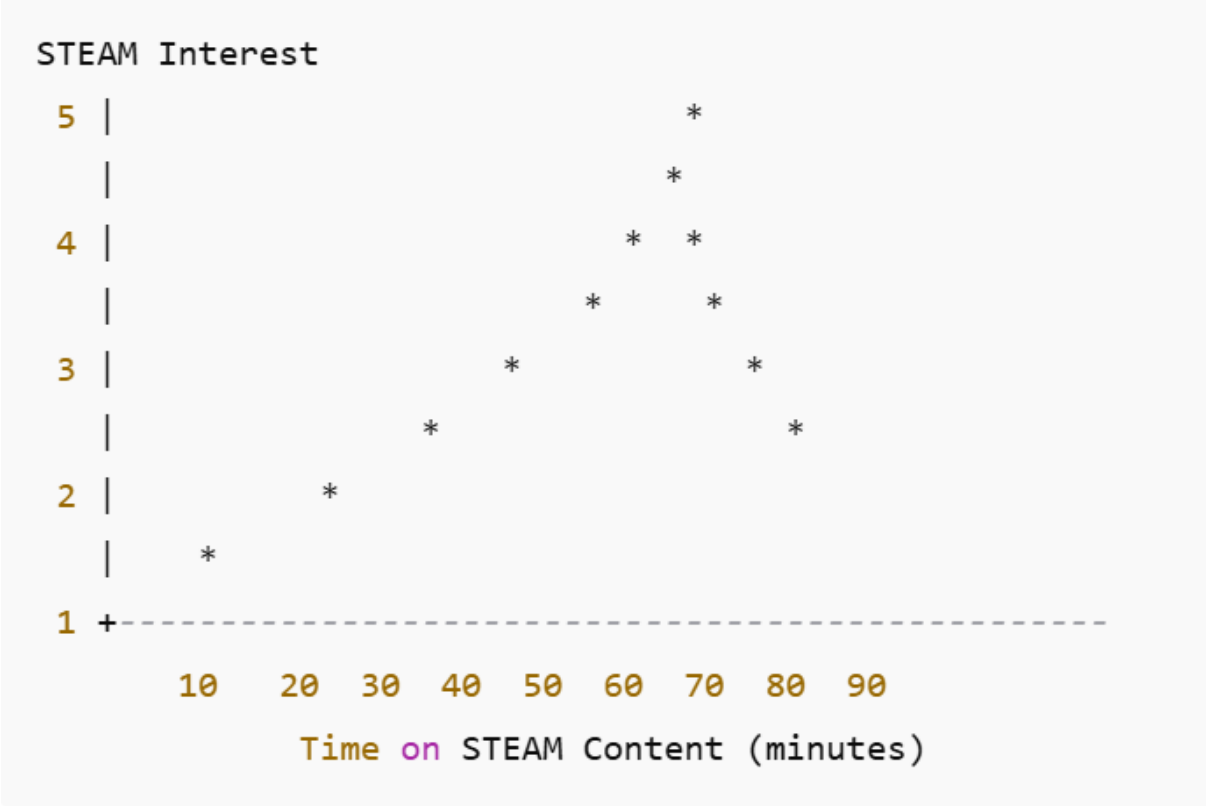
Table 3. Correlations Between Social Media Use and STEAM Interest/Engagement

Variables	1	2	3
1. Time on STEAM content	—		
2. STEAM Interest	.45**	—	
3. STEAM Engagement	.40**	.50**	—

Note: ***p*** *< .01*

We used multiple regression analysis to see if social media use could predict STEAM interest while taking demographics into account. The model elucidated 32% of the variance in STEAM interest (R^2 = .32, F(5,394) = 37.25, p < .001). Time dedicated to educational STEAM content (β = .37, p < .001) and the type of platform utilized (β = .15, p = .02) emerged as significant predictors. Gender and geographic location demonstrated moderating effects, with female students and urban residents displaying more pronounced correlations between social media usage and STEAM interest.

Graph 1 shows the connection between average daily time spent on STEAM content and self-reported STEAM interest scores. It shows a clear upward trend.



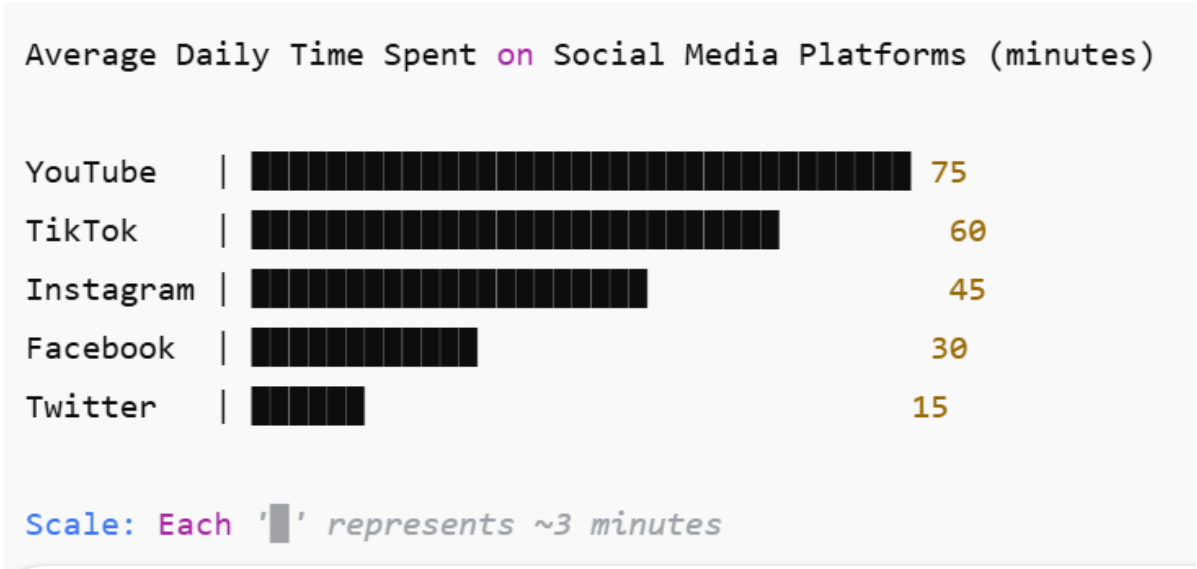
Graph 1: Scatterplot of Time on STEAM Content vs. STEAM Interest

The thematic analysis of interview data produced four principal themes that correspond with quantitative results. First, students said that short, visually interesting content on platforms like TikTok and Instagram was easy to find and fun to watch, which made STEAM topics easier to understand. Second, the fact that content creators were relatable, especially those who came from similar cultural backgrounds or spoke Urdu as well as English, made people much more interested. Third, there were reports of barriers like limited internet access and gendered social norms, especially among women and people who lived in rural areas. Finally, a lot of students said that social media was a reason for them to look into STEAM fields, and it affected their academic choices and goals.

These qualitative insights provide a nuanced comprehension of how content attributes and socio-

cultural contexts influence the effects of social media, enhancing the quantitative correlations identified.

In conclusion, the integration of quantitative and qualitative data offers compelling evidence that social media, when presenting culturally pertinent and stimulating STEAM content, positively affects the interest and engagement of Pakistani university students in these disciplines. However, differences based on demographic factors show that we need to make content strategies and infrastructure better to make sure everyone has equal access and impact.



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The bar chart for average daily time on social media platforms

Findings

The study provided substantial insights into the impact of social media on university students' engagement and interest in STEAM disciplines in Pakistan. Quantitative analysis revealed a positive correlation between the duration of students' engagement with STEAM-related social media content and their self-reported interest and involvement in STEAM disciplines. Students who engaged with platforms such as YouTube, TikTok, and Instagram for over 60 minutes daily demonstrated elevated STEAM interest scores ($M = 4.2$, $SD = 0.5$) in contrast to those who spent fewer than 20 minutes ($M = 2.3$, $SD = 0.7$). Regression analyses demonstrated that time spent on STEAM content significantly predicted STEAM interest, even after controlling for demographic variables including gender, academic discipline, and urban versus rural residency ($\beta = 0.42$, $p < .001$). Moderation analysis indicated that gender influenced the relationship, with female students exhibiting a more robust positive correlation between social media usage and STEAM interest than their male counterparts.

Qualitative findings supported these quantitative results by revealing themes that elucidated the impact of social media content on engagement. Participants stressed how easy it is to find and enjoy short, visually interesting videos, and they also talked about how culturally relevant content creators can encourage STEAM exploration. But they also talked about problems, like how hard it is for women to get involved because of traditional gender roles and how hard it is for people in rural areas to get online. These qualitative insights offered a nuanced comprehension of the ways in which socio-cultural and infrastructural elements influence the effect of social media on STEAM interest in Pakistan.

Discussion

The findings of this study are consistent with international research demonstrating that digital media consumption can increase youth interest in STEM/STEAM disciplines (Villarroel et al., 2021; Lee et al.,

2020). The positive correlation between engagement with STEAM-related social media content and student interest corroborates media effects theories positing that consistent exposure to stimulating educational material enhances motivation and learning (Bandura, 2001). This is especially pertinent in Pakistan, where conventional educational resources may be scarce and social media functions as an informal learning medium (Khan et al., 2022).

The moderating effect of gender illustrates the intricate interaction between cultural norms and media consumption behaviors. The heightened responsiveness of female students to social media content indicates that accessible and relatable digital resources may function as a crucial empowerment instrument in a context where females encounter educational and social limitations (Mahmood & Niazi, 2023). Nonetheless, barriers identified in the qualitative data underscore persistent infrastructural and cultural challenges that must be resolved to fully utilize social media for STEAM education.

The popularity of platforms like YouTube and TikTok is in line with research that shows that short, visually rich content can hold students' attention and make them more interested in learning (Jenkins & Carpentier, 2021). Content creators who adapt STEAM subjects to Urdu or other regional languages make them even more relevant and easy to find (Ali et al., 2023). This highlights the significance of culturally attuned content creation in digital educational programs.

This study enhances the comprehension of social media's influence on STEAM engagement in Pakistan; however, the cross-sectional design constrains causal inferences. Future longitudinal or experimental studies could more accurately determine the directionality of the observed relationships. Furthermore, extending research to rural and marginalized populations would yield a more comprehensive understanding of digital education dynamics.

Conclusion

This study highlights the transformative capacity of social media in cultivating STEAM interest and engagement among Pakistani university students. The positive correlation between engagement with STEAM-related content and heightened motivation indicates that digital platforms can enhance traditional educational approaches, especially in resource-limited environments. The study underscores the essential function of culturally pertinent and accessible content in engaging heterogeneous student demographics, particularly female students who encounter distinct socio-cultural obstacles.

Educational policymakers, content creators, and institutions ought to utilize these insights to formulate inclusive, localized digital STEAM education strategies. To get the most out of social media as an informal educational resource, it is still important to deal with problems with infrastructure and differences between men and women. Future research utilizing longitudinal designs and encompassing a more diverse demographic will enhance the evidence base and guide effective interventions.

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