

Unraveling the Relationship between Content Quality, Design, and User Engagement in Douyin's Adolescent Mode

Zhiyu Li¹, Chuqi Wang¹

¹Faculty of Humanities and Arts, Macau University of Science and Technology, Macau

Correspondence: Zhiyu Li, Faculty of Humanities and Arts, Macau University of Science and Technology, Macau, ON., 999078, Macau.

Received: September 12, 2023

Accepted: October 20, 2023

Online Published: October 29, 2023

doi:10.11114/smc.v11i7.6401

URL: <https://doi.org/10.11114/smc.v11i7.6401>

Abstract

In recent years, short video social platforms have garnered widespread attention, with Douyin (the Chinese version of TikTok) being a typical representative. The daily active users of the teen segment in Douyin are estimated to exceed 42 million. However, there still exists a certain blind spot in the research of Douyin's teen-specific content. This study conducts a content analysis of 360 short videos in Douyin's adolescent mode, and employs a Structural Equation Model (SEM) to analyze the relationships between the content quality, design features, learning objectives, age appropriateness, and user engagement. The results reveal that age appropriateness and learning objectives have a significant positive impact on content quality, and content quality and design features significantly positively impact user engagement. Further discussions point out that Douyin's adolescent mode faces challenges in dealing with issues like gender bias and algorithm bias, which may have adverse effects on the holistic development of teen users. The research findings provide empirical evidence for short video creators and platform optimization, and put forward targeted suggestions for the design of short video content in adolescent mode.

Keywords: Douyin, adolescent mode, structural equation model, content analysis

1. Introduction

Douyin, China's counterpart to TikTok, has emerged as a premier short video platform within the nation. As of January 2023, its user base in the Chinese market has reached an impressive 700 million, with adolescents accounting for an estimated 42 million daily active users. Technological advancements have precipitated a significant shift in the viewing habits and preferred platforms among younger demographics, with short videos increasingly superseding traditional television (Izci et al., 2019). As a form of screen media, short videos bear potential to exert considerable influence on adolescent behavior, who often assimilate and replicate on-screen actions, resulting in a spectrum of impacts ranging from beneficial to detrimental. If harnessed appropriately, technology and digital media can effectively bolster adolescent learning (Children et al., 2012).

However, the prevalence of crude and explicit content within short videos poses substantial challenges for adolescents and their guardians, adversely affecting adolescents' cognition, habits, and overall development. According to cultivation theory, media portrayals of individuals and societal dynamics can shape adolescents' worldview, potentially fostering biases, misconceptions, or distorted perceptions of reality (Gerbner et al., 2002).

In response to the adverse impacts of short videos, Chinese authorities in 2019 advocated for the creation of a "Teenager Anti-Addiction System," piloting the initiative on short video live-streaming platforms. In April 2021, Douyin officially introduced a protective mode specifically tailored for adolescents. This mode provides a more filtered experience than the standard mode, excluding features such as payments, live streaming, posting, and commenting, and eliminating certain themes and content.

Despite these advancements, research into the content characteristics and quality of videos within Douyin's youth mode remains insufficient. Thus, this study embarked on a content analysis of 360 short videos within Douyin's youth mode, culminating in the establishment of a Structural Equation Model (SEM) to scrutinize the associations among content quality, design features, and user engagement.

In the context of short-video platforms, video recommendation mechanisms and thematic suggestions typically exhibit

dynamic changes over time, contingent upon user-specific characteristics and evolving personal interests (Davidson et al., 2010). Recommendations encompass videos related to a user's viewing history and the video they are currently viewing (Matamoros-Fernandez et al., 2021). These videos often attract high viewership and extended average viewing durations, with their popularity primarily evaluated through audience satisfaction metrics such as "likes" or "dislikes" (Covington et al., 2016). Moreover, platforms and applications often categorize users based on gender and demographic traits during usage, with users' online gender and identity typically represented in the platform backend (Nakamura, 2013).

Research has unveiled gender-specific characteristics of music platform recommendation algorithms, organizing music based on genre and audience gender similarity (Werner, 2020). Other researchers, exploring anxiety-related content on Douyin, found that video content varies depending on the gender of the user (Zheluk et al., 2022). Among adolescents, males tend to favor content related to gaming tutorials, whereas females' digital behavior inclines more towards personal experiences, life events, fashion interests, and content sharing (Fernández-de-Arroyabe-Olaortua et al., 2018). Based on these studies, we hypothesize that short-video platforms may incorporate user-specific traits into their algorithmic computations, thereby recommending personalized thematic content.

Consequently, we propose the following research questions and hypotheses:

RQ1: What are the primary themes of the videos recommended to adolescents on Douyin?

RQ2: Who are the main characters in the videos recommended to adolescents on Douyin?

Short-video platforms proffer a rich and diverse array of content, offering children a unique platform experience. Videos aimed at adolescents distinguish themselves through production and content tailored to the specific needs and capabilities of this age group. Consequently, these videos can potentially stimulate appropriate psychological and cognitive development in adolescents, while also fostering their imagination (Messenger-Davies, 2001). Furthermore, video media can serve as an extensive reference resource from which adolescents can glean habits, values, and behavioral patterns (Bandura, 2001). Adolescents can learn normative behaviors about themselves and others (including racial groups), influencing societal behavior and the treatment of others.

However, adolescents constitute a particularly vulnerable demographic. Despite their frequent internet use, they often lack awareness of the inherent risks and the ability to assess these dangers, particularly given their perception of social media as a safe haven. Studies have shown that a significant number of adolescents have been exposed to distressing audiovisual content, typically encompassing violence, pornography, and cyberbullying threats (Livingstone et al., 2014). Such videos can disrupt adolescents' normal development and may even incite them to mimic behaviors such as smoking and self-harm (Ahern et al., 2015). Videos exert varying impacts on adolescents and children of different ages. Age-appropriate educational television proves beneficial for preschool children; for adolescents, the content plays a pivotal role in mediating the video's effects on cognitive skills and academic performance. Pure entertainment, particularly violent content, is correlated with adolescent cognitive development and academic performance (Kirkorian et al., 2008). If the group is similar in terms of age or educational level, the educational function of videos will be more effective (Allgaier, 2019).

Currently, short-video platforms are employing algorithms and personalized recommendations to curate video content for adolescents. Research suggests that developing and implementing a suite of design principles specifically for adolescents and children can significantly influence learning and educational outcomes when creating video content (Veblen et al., 2018). The platform provides content for adolescents and children by observing their habits and preferred content types when watching short videos. While the importance of age-appropriate and engaging content for adolescents on short-video platforms such as Douyin is evident, it is equally imperative to ensure that the content they consume is safe, educational, and fosters their development constructively. This prompts the following research questions and hypotheses:

RQ3: How does the age appropriateness of videos under the Douyin adolescent mode affect the content quality of the video?

RQ4: How does the age appropriateness of videos under the Douyin adolescent mode affect the level of participation of children or their parents in the video?

2. Method

2.1 Data Source

The age range of adolescents, as defined by the World Health Organization, falls between 10 and 19 years old (WHO, 2017). On the Douyin platform (Chinese version of TikTok), the adolescent mode is identified as a mode that provides video viewing services for children and adolescents, premised on the protection of their mental and physical health.

Consequently, in this study, "adolescent short videos" are defined as video content, typically not exceeding 5 minutes in length, primarily targeting adolescents (generally minors between the ages of 10 and 18). These types of videos are categorized and labeled on the platform as suitable for adolescent viewing and are designed to align with adolescents' cognitive, psychological, and social developmental characteristics. They generally embody the following key features:

2.1.1 Content Appropriateness

The content encompassed within adolescent-oriented short videos ought to conform to pertinent regulations and guidelines, thereby precluding any material unsuitable for an adolescent audience, inclusive of violence, sexually explicit material, and contentious topics. Concurrently, the presented content should endeavor to guide adolescents towards the establishment of constructive values and commendable behavioral patterns.

2.1.2 Educational Value

Short videos crafted for an adolescent audience frequently exhibit considerable educational value. They aim to facilitate the acquisition of new knowledge, foster the development of new abilities, or aid in the comprehension of intricate concepts. The range of topics these videos encompass is broad, extending from science and history to art and social skills.

2.1.3 Age Adaptability

Adolescent short videos ought to be tailored to accommodate the developmental stages of adolescents, encapsulating their cognitive capabilities, psychological growth, and socio-cultural backgrounds. This might involve considerations such as the language used in the video, the visual design, and the complexity of the content.

In this study, we leveraged the adolescent mode on Douyin to gather our research sample. Utilizing a Python script, we scraped videos under the adolescent mode on Douyin in February 2023. To acquire videos under the adolescent mode, which is inaccessible via Douyin's web version, we integrated our Python script with the mtmdump interface of mitmproxy. The short videos on Douyin were manually paginated by two coders.

We scraped 40 videos for each age group, evenly distributing 20 videos for each gender (male and female), totaling 360 short videos. To minimize the influence of algorithmic recommendations, we disabled all non-essential permissions. After completing the scraping for each age group, the mobile application was reset, including all user data and other preference information.

This study adopted a content analysis approach, treating individual short videos as units of analysis. The primary indicators included the theme of the short video, the characteristics of the main character, the type of music used, and content indicators such as age appropriateness, content quality, learning objectives, and design features. In addition, the number of likes, saves, and forwards for each video was also recorded for subsequent analysis.

2.2 Coding Scheme

We derived our coding strategy from existing literature and categories provided by Douyin's adolescent mode, applying these codes to the short videos in our sample. Recognizing that many extant scales were conceived for traditional video platforms, we made necessary modifications to accommodate the unique characteristics of short video platforms. Cohen's Kappa was employed to evaluate the reliability of intercoder agreement. All items surpassed a score of 0.75, satisfying the criteria for subsequent analysis.

2.2.1 Theme

Our coding schema incorporated 13 distinct themes related to short videos, namely entertainment, characters & blogs, poetry & writing, games, comedy, travel & activities, education, music, pets & animals, technology, movies & animations, style, and dance. The central theme was primarily identified by leveraging video tags, Douyin's own categories, and the profile characteristics of the video uploader. Additionally, we considered the video's introduction and principal content to further refine the coding process.

2.2.2 Main Characters

In terms of the main characters, our coding scheme aimed to identify the most prominent character as either an adult male, adult female, male adolescent, female adolescent, animal, cartoon character, unidentified character, or a character falling under an 'other' category. The prominence of these characters was assessed considering factors such as their screen time, central position and role within the narrative, quantity of spoken lines, and on-screen location, amongst other aspects.

2.2.3 Video Evaluation Indicators

In order to evaluate short videos, we employed a collection of evaluation indicators largely inspired by Neumann's 2020 study of children's videos on YouTube, though we made certain adaptations based on earlier research. Our evaluative

criteria constituted four scales: age appropriateness, content quality, design features, and learning objectives. Together, these scales comprised a total of 17 items (Neumann et al., 2020).

2.3 Variable Selection

2.3.1 Dependent Variable

Engagement metrics were utilized as the dependent variable in this study. A plausible approach to gauging the level of engagement with short video content involves the examination of an array of metrics, primarily encompassing the number of likes, saves, and forwards. In the context of this study, the engagement level for each video was quantified employing the count of "likes," "saves," and "forwards" each video garnered as pivotal indicators (Hong et al., 2021; Hung et al., 2022).

2.3.2 Independent Variables

The independent variables in this study were the content features of the short videos, including video theme, main character, and evaluation indicators. The video theme and main character were coded as categorical variables. For evaluation indicators, each item was evaluated on a 3-point Likert scale. (0-No 1-Partial evidence 2-Yes)

2.4 Data Analysis

In order to understand the characteristics of short videos under the adolescent mode on Douyin, we employed descriptive statistics to analyze the frequency distribution of video themes, main characters, and evaluation indicators.

To examine the impact of content features on user engagement, a Structural Equation Modeling (SEM) approach was utilized. The dependent variable in this model was user engagement, quantified by the number of likes, saves, and forwards each video received. The independent variables comprised the content features, which included the theme, main character, and evaluation indicators of the short videos. Additionally, the control variables encompassed the duration of the video, the time elapsed since the video was uploaded, and the number of followers the uploader had.

3. Results

3.1 Descriptive Analysis and Chi-Square Results

RQ1 aimed to study the main themes of short videos under the adolescent mode of Douyin. Table 1 displays the percentages of main types, showing the highest percentage for education, followed by dance, poetry & writing, entertainment, and music.

Table 1. Main Video Types of Douyin Short Videos Under Adolescent Mode.

Theme	Proportion
Education	32.78%
Dance	15.00%
Poetry and Writing	11.67%
Entertainment	11.11%
Music	9.17%
Science and Technology	6.94%
Pets and Animals	5.83%
Travel and Activities	3.89%
Comedy	1.11%
Characters and Vlogs	0.83%
Games and Sports	0.83%
Movies	0.56%
Style	0.28%

RQ2 studied the main types of characters in short videos under the adolescent mode of Douyin. According to Table 2, adult females are the most common character type, accounting for 35%. In contrast, the proportions of boys and girls are relatively lower, possibly due to Douyin's restrictions on underage appearances.

To test H1-H4, we performed a chi-square test. The results show that there are significant differences in the themes of videos received by users of different genders under the adolescent mode ($\chi^2 = 70.819$, $df = 12$, $p < 0.001$), and there are significant differences in the main types of characters in the videos ($\chi^2 = 38.822$, $df = 6$, $p < 0.001$). There are significant differences in the main types of characters appearing in the videos ($\chi^2 = 130.261$, $df = 102$, $p < 0.05$). However, there is no substantive difference in the themes of videos received by users of different age groups ($\chi^2 = 213.047$, $df = 204$, $p = 0.3176$). Therefore, H1, H2, and H4 are supported, while H3 is not supported.

Table 2. Main Character Types of Douyin Short Videos Under Adolescent Mode.

Theme	Proportion
Adult Female	35.00%
Cartoon Characters	20.00%
Adult Male	15.56%
No Characters	13.33%
Animals	7.22%
Girls	5.83%
Boys	3.06%

3.2 Structural Equation Model Results

To verify hypotheses H5-H11, a structural equation model was established in Amos. It was found that the model did not fit, with $p > 0.05$ for H6, H7, H10, hence they did not pass the test.

After deleting hypotheses H6, H7, H10, all paths are significant. In terms of model fit, chi-square = 452.926, AGFI = 0.847 (> 0.8), meeting the basic requirements. At the same time, the standardized factor loadings are all greater than 0.7 and less than 0.95, and the SMC values are all greater than 0.36 and less than 0.9. Considering all these indicators, and in conjunction with the structural equation model diagram, it can be seen that the structural equation model of this study is basically acceptable and the model fits well.

According to the results of the structural equation model, age adaptability has a significant positive impact on content quality, with $\beta = 0.145$, $P < 0.05$, thus establishing Hypothesis 5 (H5). The learning objectives have a significant positive impact on content quality, $\beta = 0.836$, $P < 0.001$, thus establishing Hypothesis 8 (H8). Additionally, learning objectives have a significant positive effect on design features, $\beta = 0.892$, $P < 0.001$, establishing Hypothesis 9 (H9). These design features significantly positively impact user engagement, $\beta = 0.273$, $P < 0.001$, leading to the creation of Hypothesis 10 (H10). Likewise, content quality has a significant positive effect on user engagement, $\beta = 0.693$, $P < 0.001$, forming Hypothesis 12 (H12). The final model is shown in Figure 1.

Chi-square=452.926 DF=164 Chi/DF=2.762 GFI=.880 AGFI=.847 RMSEA=.070

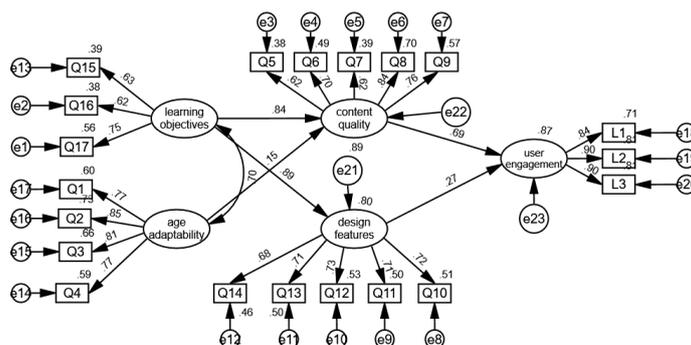


Figure 1. Structural equation modeling of video features and user engagement

4. Discussion

In the course of this investigation, a selection of 360 short videos procured from the adolescent mode of the Douyin platform constituted the research samples. Through meticulous content analysis, these videos were examined in detail, and a Structural Equation Model (SEM) was subsequently formulated. Deriving from the model's results, the ensuing discourse is centered around the characteristic attributes of the short videos showcased within Douyin's adolescent mode:

4.1 Unconscious Algorithmic Bias

Algorithmic gender bias is pervasive, largely attributable to training on historical data that may embody inherent gender prejudices. This issue manifests in the recommendation of Douyin short videos, wherein different video genres are suggested to adolescents according to their gender. For example, the platform tends to recommend fewer dance and craft-themed videos to male users, whereas female users infrequently receive videos related to classical poetry and calligraphy. This overlooks the necessity for diverse development and constitutes a recommendation mechanism imbued with "gender temperament" bias.

This bias is intrinsically tied to the operations of the recommendation mechanism. The algorithm categorizes users into specific gender groups, subsequently selecting videos based on the preferences and interests attributed to these categories. Gender becomes a pivotal characteristic within this classification and recommendation process, leading to an overrepresentation of certain fields or themes of interest to specific genders and an underrepresentation of others.

Such an algorithmic mechanism, which neglects the diverse developmental needs of adolescents, may exert an influence on their psychological growth and interests. As a consequence, the platform could inadvertently encourage gender stereotyping and limit the breadth of content exposure for adolescents, potentially impeding their holistic development.

4.2 Blurring of Learning and Entertainment Boundaries

In the adolescent mode of Douyin, the demarcation between learning and entertainment becomes increasingly blurred. Short videos have emerged as a popular medium for adolescents to concurrently derive entertainment and learning experiences. However, the content of these videos presents certain challenges. Predominantly, educational videos with a single theme, primarily featuring hosts delivering knowledge and explicating content to the camera, hold sway. Such straightforward educational videos may engender boredom and fatigue among adolescents. Meanwhile, the adolescent mode conspicuously lacks engaging, fun-themed video content, such as those related to movies, games, travel, and fashion. While the platform should ideally amalgamate education and entertainment to offer a comprehensive adolescent activity platform, an overemphasis on "educational value" at the expense of "fun" could precipitate content fatigue and resistance among adolescents. This may potentially deter them from the platform or circumnavigate the adolescent mode.

To rectify this situation, platform operators and content creators need to reevaluate the design and presentation of short video content in the adolescent mode. Firstly, the equilibrium between learning and entertainment must be acknowledged, ensuring that content is not merely educational, but also fun and entertaining. This can be actualized by diversifying content themes and innovating content expression techniques, such as employing entertaining teaching methods, incorporating animation, gamification elements, or storylines to offer a more appealing and enjoyable learning experience.

Secondly, platforms and content creators need to delve more deeply into understanding the interests and needs of adolescents, heeding their feedback and perspectives, and adjusting and updating content accordingly. This ensures that content aligns more closely with adolescent interests, stimulating their enthusiasm for learning and participation.

4.3 Age Appropriateness of Short Video Content

In Douyin's adolescent mode, the platform stringently safeguards the mental health of minors, ensuring that no video content induces psychological or physical discomfort — a practice that is laudable. However, the results of our analysis refute the influence of age on the themes of push notifications, with no discernible variance in the themes of short video content across different age groups. This appears counterintuitive: adolescence is marked by substantial developmental changes, with a generational chasm occurring every two to three years. Adolescents of varying ages exhibit significant differences in cognitive levels and focal points, and Douyin employs a collaborative filtering recommendation mechanism.

The only conceivable explanation for this "no significant difference" phenomenon is that the platform's content pool resources are inadequate, forcing a single theme to cater to multiple age groups. Fortunately, many short video platforms, including Douyin itself, have started to address this issue. Douyin is bolstering the construction of its adolescent content pool and has recently entered into a co-construction agreement for an adolescent content pool with content production institutions such as Science China. This move signals a positive step towards curating content that is more attuned to the cognitive development and interests of adolescents across the entire age spectrum.

4.4 Dual Impact of Learning Objectives

The task of seamlessly integrating learning objectives into video design is indeed formidable. Firstly, it necessitates a profound understanding of adolescents' learning requisites, which may entail delving into research in domains such as educational psychology, learning science, and cognitive science. Secondly, it calls for research on how to transpose these learning objectives into distinctive design features. For instance, determining what visual elements, audio effects, or story structures can be employed to pique adolescents' learning interests. This may require the application of theories and methodologies from disciplines such as multimedia learning, human-computer interaction, and user experience design.

By adopting a multidisciplinary approach, platforms and content creators can craft content that not only engages adolescents but also supports their cognitive development and learning objectives. This, in turn, will help to cultivate a more effective and engaging learning environment within platforms like Douyin, enhancing the educational value of their content while maintaining the entertainment aspect that attracts adolescents to these platforms in the first place.

5. Conclusion

This study undertakes a content analysis of 360 short videos featured in Douyin's Adolescent Mode, and employs a Structural Equation Model (SEM) to scrutinize the interrelationships among content quality, design features, learning objectives, age appropriateness, and user engagement. The research findings illuminate that age appropriateness and learning objectives exert a significant positive influence on content quality, similarly, content quality and design features also render a significant positive impact on user engagement.

Moreover, this study also identifies the presence of gender bias, algorithm bias, and inadequacies in age appropriateness within Douyin's Adolescent Mode. Based on these findings, we offer a series of targeted recommendations for short video platforms and content creators. These suggestions aim to assist them in better understanding and addressing these issues, thereby fostering a more conducive social media environment for teens.

6. Implications and Limitations

This research underscores significant implications for both Douyin and creators of adolescent content, potentially serving as a valuable guide for refining their strategies and offerings. In our study, we have identified multiple areas of interest that may furnish insights for the adolescent mode on Douyin and for creators of short videos targeted at teenagers. For the Douyin platform, we advise diversifying its content offerings. While educational content currently holds a dominant position in the adolescent mode and significantly contributes to the development of teenagers, it would be beneficial for Douyin to consider providing a broader variety of content. Adolescents, being a rapidly developing and curious demographic, may demonstrate interest in diverse types of content. As for content creators, they should prioritize content depth while considering video design and aesthetic appeal. Based on our findings, user engagement is primarily driven by the quality of the content and its design features. Therefore, ensuring content depth in conjunction with appealing aesthetics can enhance user engagement.

However, our study is not without limitations. The research sample size is somewhat limited, with only 360 videos selected in total, and merely 20 videos per age group. This may not fully represent the vast range of content available in Douyin's adolescent mode. Moreover, engagement metrics on Douyin, such as likes and favorites, could potentially be manipulated, which might impact the authenticity of our findings. Lastly, we only examined a fraction of the content characteristics, leaving elements like music, strategy use, and visual characteristics unexplored. These areas offer potential avenues for future research.

In summary, while our research provides some insightful observations on the characteristics of short videos in Douyin's adolescent mode, there remains a substantial scope for further exploration. Future research could build upon this study by examining a larger sample size, investigating more content characteristics, and developing a more nuanced understanding of how adolescents interact with and are influenced by these videos.

Acknowledgments

We greatly appreciate the encouragement and support from all members of the "DaMa club" group.

Authors contributions

Zhiyu Li and Chuqi Wang have provided significant contributions to the research, encompassing the formulation of the study design, the process of data collection, and the subsequent analysis. Jointly, they composed the initial manuscript, with Zhiyu Li primarily responsible for the revisions. All authors actively participated in the manuscript review process and have collectively given their wholehearted approval to the final version of the manuscript.

Funding

Not applicable.

Competing interests

Not applicable.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Redfame Publishing.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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