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The Impact of Audiovisual Elements on Learning Outcomes - Focusing on MOOC -

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Abstract

As digital education progresses, MOOC (Massive Open Online Courses) are increasingly utilized by learners, making research on MOOC learning outcomes a necessary endeavor. In this study, we systematically investigated the impact of audiovisual elements on learning outcomes in MOOC, highlighting the nuanced role these components play in enhancing educational effectiveness. Through a comprehensive survey and rigorous analysis involving descriptive statistics, reliability metrics, and regression techniques, we quantified the influence of text, graphics, color, teacher images, sound effects, background music, and teacher's voice on learner attention, cognitive load, and satisfaction. We discovered that background music and text layout significantly improve engagement and reduce cognitive burden, underscoring their pivotal role in the instructional design of MOOC. We findings contribute new insights to the field of digital education, emphasizing the critical importance of integrating audiovisual elements thoughtfully to foster better learning environments and outcomes. Not only advances academic understanding of multimedia learning impacts but also offers practical guidance for educators and course designers seeking to enhance the efficacy of MOOC.

Keywords: *MOOC, Visual Elements, Auditory Elements, Learning Outcomes*

1. Introduction

1.1 Background and purpose of the study

As internet technology advances, digital education, particularly MOOC (Massive Open Online Courses), is reshaping educational models worldwide. The openness and flexibility of MOOC allow learners to freely choose courses that suit them, transcending time and geographical constraints. According to data from China's Ministry of Education, as of November 2022, MOOC platforms have reached 402 million registered users, with 979 million learning instances [1]. Despite the large user base, MOOC face challenges in enhancing teaching effectiveness, particularly in the application of audiovisual elements. This study aims to explore the

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use of audiovisual elements in MOOC and their impact on learners' attention, cognitive load, and satisfaction, with the goal of enhancing teaching quality and learning experiences through optimized audiovisual design.

1.2 Scope and methods of the study

This research explores the impact of audiovisual elements on learning outcomes in MOOC videos, by extracting and deeply analyzing the audiovisual components such as text, images, colors, teacher's image, teacher's voice, sound effects, and background music, and their effects on learners' attention, cognitive load, and satisfaction.

The research methodology is divided into three stages: First, by utilizing a literature review method, summarize and categorize the visual and auditory elements in MOOC videos. Define learning outcomes, analyzing them from the perspectives of attention, cognitive load, and satisfaction. Analyze and explain the importance of audiovisual elements and their relationship with learning outcomes. Second, research design. Based on the theoretical framework of the relationship between audiovisual elements and learning outcomes, design and create a survey questionnaire. Conduct a survey among MOOC learners to collect data on the impact of audiovisual elements on learners' attention, cognitive load, and satisfaction. Third, data analysis. Perform descriptive statistics, correlation analysis, and regression analysis on the collected survey data to quantify the specific impact of different audiovisual elements on the various dimensions of learning outcomes.

2. Theoretical Background

2.1 Concept and constituent elements of MOOC

MOOC is a type of internet-based large-scale open online course that originally stemmed from the YouTube platform in the United States, aimed at providing high-quality educational resources globally [2]. There is no unified standard definition of a MOOC. Researchers Mohamed and Wosnitza believe its core to be the instructional videos themselves. Hu Tie-Sheng defines MOOC as scenario-based and lively teaching tools conducted through video. In summary, MOOC deliver learning materials to learners through videos, utilizing digital media and visual communication languages.

As shown in Table 1, the elements constituting a MOOC video are defined diversely by different researchers. Organize the different definitions and extract common elements.

Table 1. Constituent elements of MOOC videos

Researchers	Video components
Tian Ye	Lighting, color, composition, focus, time, volume, editing, and sound.
Zou Yun	Color, form, composition, motion.
Kim Jong-guk	Light and lighting, color, composition, visual force, depth perception in images, concept, visualization, time and motion, editing, sound, combination of image and sound.
Bang Yoon-kyung	Screen, narration, sound effects, music effects.
Bruce Block	Space, line, form, tone, color, motion, rhythm.
Zhao Yi-Gen	Text, images, graphics, teacher's image, sound, navigation, buttons, background UI.
Yang Jiu-Min	Teacher's image, teacher's voice, teacher's position, proportion of the teacher in the

video frame.

Various researchers outline different elements essential to the composition and effectiveness of video in educational settings. These elements include lighting, color, composition, focus, time, depth of field, volume, editing, and sound [3]. Other classifications highlight the importance of form, motion, visual force, interaction of visual elements, depth perception in images, concept, visualization, and the integration of video and sound [4]. Some suggest that videos fundamentally consist of imagery, voice-over, sound effects, and musical effects. Another distinction includes space, line, form, tone, color, motion, and rhythm. Additionally, components such as text, graphics, teacher image, video, sound, menu, navigation, buttons, and background UI are included as vital elements of instructional videos [5]. The role of the teacher is also emphasized, including the teacher's image, voice, position, and proportion in the video frame.

2.2 Classification of constituent elements

Anthropologist Edward Twitchell Hall Jr. noted in his research that during the process of perception formation, the sensory systems coordinate and are divided hierarchically. Vision predominates, with other senses acting as auxiliary in a progressively decreasing order: vision 83%, hearing 11%, smell 3.5%, touch 1.5%, and taste 1% [6]. In MOOC videos, based on whether learners receive information through visual or auditory senses, the elements from Table 1 are categorized into two main groups: visual and auditory.

2.2.1 Visual elements

As shown in Table 2, according to the definitions of MOOC components by different researchers, the common visual elements extracted are graphics and images, text, color, teacher image.

Table 2. MOOC visual elements

Visual element	Description
Graphics and Images	Static images, charts, infographics, etc., explain concepts, display data, and enhance visual appeal.
Text	Provides explanations and emphasis on key information, aiding understanding and memory.
Color	Enhances key emphasis, assists in information categorization, and increases visual appeal.
Teacher image	The teacher's presentation method (actual appearance or virtual image) enhances learners' attention and learning experience.

Text significantly impacts the visual experience, with its layout and density affecting the video’s aesthetics, rhythm, and intent. In MOOC videos, text serves two purposes. First, it visually represents auditory information. Second, it summarizes the information conveyed in the video. Text should be used correctly; the choice of font size, style, and layout can impact readability and learners' understanding.

Graphics and images use dynamic effects such as shapes, symbols, and icons, interacting based on the

content of the video. When video content is difficult to comprehend, graphics and images are used to intuitively display data, processes, or concepts. Clear images are essential for precise information delivery and add visual interest [7].

Color, with its attributes of brightness and warm or cool tones, sets the tone of video content, evoking specific emotional responses and psychological states, and attracting learners' attention. The choice and use of colors significantly affect learners' cognition.

From the learners' perspective, the presenter in a MOOC video, akin to a teacher's role, can guide and interact with learners, facilitating their reception of video information and forming cognition. The teacher's image and presentation method (positioning) in the video can influence learners' attention and receptivity to the teaching content.

2.2.2 Auditory elements

As shown in Table 3, according to the definitions of MOOC components by different researchers, the common auditory elements extracted are sound effects, background music, teacher's voice.

Table 3. MOOC auditory elements

Auditory Element	Description
Sound Effects	Emphasizes key information.
Background Music	Creates a specific learning atmosphere, influencing engagement and attention.
Teacher's Voice	Impacts learners' attention and understanding.

Sound effects in videos refer to those sound elements added to enhance the audiovisual experience, also known as effect sounds. Proper use of sound effects in videos can enhance learners' attention, strengthen memory retention of video information, and provide a richer auditory experience.

Background music in MOOC videos refers to music that plays continuously during the video, serving to regulate the learning atmosphere and enhance the expressiveness of the video content. The application of background music in videos is a carefully considered process. It can be songs, musical compositions, synthesized music, or other musical elements, aimed at emphasizing the importance of course information, enhancing learner engagement and satisfaction.

The teacher's voice in videos refers to the vocal expression of the teacher during video recording, which is one of the key elements in conveying information and knowledge [8]. The teacher's voice not only carries the instructional content but also affects learners' attention and understanding of the information.

2.2.3 The importance of audiovisual elements

Visual elements provide direct and clear visual expression, supporting learners and facilitating a better understanding of complex concepts. Images, charts, and animations can concretize abstract concepts. By improving the visual design of learning materials, the receptivity of these materials can be enhanced. Richard E. Mayer's theory of multimedia learning suggests that combining visual and auditory information, a multisensory learning approach, helps better capture learners' attention and improve the reception of learning

information [9]. Visual and auditory elements enhance learners' attention and memory by providing a multisensory experience. In summary, the proper use of audiovisual elements in MOOC videos can significantly increase learner engagement and satisfaction, playing a crucial role in enhancing learning outcomes.

2.3 Concept and characteristics of learning outcomes

As shown in Table 4, the definition of learning outcomes has been proposed by various researchers. Researchers conducted in-depth explorations from the following perspectives.

Table 4. Definition of learning outcomes

Researchers	Definition of learning outcomes
Fulks J	Outcomes related to learned skills.
Kim	Satisfaction level with learning results.
Frye	objectives, skills, and academics, learning experience and satisfaction.
Liu Qi-Yue	Visual attention and cognitive effects.
Sun Ying-fei	Attention and learning performance.
Song Jin-Yu	Learning satisfaction and cognitive load theory.

Some scholars analyze learning outcomes from different perspectives. Learning outcomes are considered to be the results in terms of skills by some, while others view them through a psychological lens, regarding them as the degree of satisfaction perceived from the learning results [10]. From a student-centered perspective, it is argued that learning outcomes should encompass not only objectives and academic achievements but also the learners' experience and feedback on their satisfaction. In the context of educational videos, learning outcomes are examined from dimensions such as visual attention and cognitive effects. Furthermore, assessments of learning outcomes also involve measuring learners' attention and overall learning performance. It is noted that in addition to cognitive effects, learning satisfaction and cognitive load theories are crucial for quantifying learners' psychological experiences to validate learning outcome measurements.

From the learner's perspective, based on previous interpretations of learning outcomes and theoretical research on educational videos, a common definition of learning outcomes is extracted, including dimensions of attention, cognitive load theory, and satisfaction.

2.3.1 Attention

A general interpretation of attention is the capacity of a person's mental activities to be purposefully directed and focused. Researchers have summarized various long-standing studies to identify the characteristics of attention, which are used to measure a person’s level of attention.Characteristics of directionality and selectivity [11]. Directionality is shown when the subject focuses on one target and does not pay attention to others. Characteristics of concentration. Concentration is shown by the subject’s ability to focus on the same target for an extended period. Once the focus is selected, all energy is concentrated on that target, reflecting the durability of a person’s attention to stimulus. The strength of attention is mainly manifested in the duration

of sustained focus. Transferability characteristic. It refers to the subject's ability to shift their focus and concentration from one object to another object related to the initial one.

2.3.2 Cognitive load

Cognitive load refers to the stress or burden borne by a person's cognitive system while performing cognitive tasks, such as learning new information. Intrinsic cognitive load. This is determined by the inherent complexity of the learning material and depends on the difficulty of the task itself, which designers cannot directly influence. In MOOC videos, once the information included is determined, the intrinsic cognitive load is also established, but designers cannot affect it.Extraneous cognitive load. This refers to the additional load that is over and above the intrinsic cognitive load, related to the manner in which learning materials are presented. Poor design increases unnecessary cognitive load. Inappropriate presentation of information can cause learners to expend additional cognitive effort to integrate this information, thereby increasing the extraneous load and affecting learning outcomes.

2.3.3 Satisfaction

Learner satisfaction refers to the degree of engagement and involvement of learners in the learning process. It encompasses learners' enthusiasm, participation, and effort in learning activities and is expressed in several ways. Learner satisfaction is assessed through assignments, projects, or exams, measuring the extent to which learners engage in and complete learning tasks. Learners provide proactive feedback, reflecting on and evaluating the learning process [12]. Learner satisfaction is the subjective evaluation of the educational experience by learners, a definitive response evaluation of whether the provided learning content or methods meet their learning expectations. Satisfaction is considered a factor that positively influences learners' continued education and is typically assessed through structured satisfaction survey questionnaires.

2.4 Relationship between audiovisual elements and learning outcomes

Multimedia learning theory, proposed by renowned researcher Richard E. Mayer after a series of experiments, analysis, and synthesis, primarily explores how the combination of visual and auditory elements can enhance learning outcomes. This theory is founded on two core assumptions: 1）Dual-channel assumption. Humans have two separate information processing channels, one for visual information and another for auditory information. 2）Limited capacity assumption. The processing capacity of each information channel is limited [13].

Based on the understanding of multimedia learning theory, in MOOC videos, learners receive video information through both visual and auditory elements, but the amount they can simultaneously process is limited. When designing MOOC videos, designers should carefully consider how to effectively design visual and auditory elements. By controlling the quantity, they can facilitate learners in acquiring more course information within the limits of their cognitive capacities, thereby enhancing learning outcomes.

3. Research design

3.1 Research model

As shown in Figure 1, this study classifies the components of MOOC videos based on the sensory way people receive information, and divides them into two categories: visual and auditory elements.

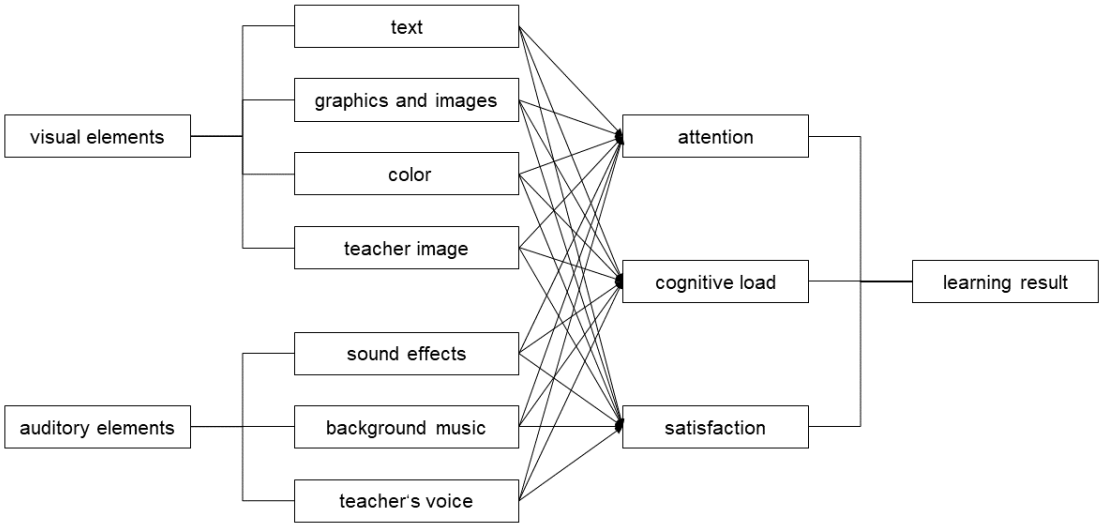

Figure 1. Research model

Drawing on commonalities in previous research, four visual elements were identified: text, color, graphics, and teacher image; and three auditory elements were identified: sound effects, teacher's voice, and background music. The concept of learning outcomes was defined, and this study selected three dimensions—attention, cognitive load theory, and satisfaction—to analyze their impact on learning outcomes. Thus, connecting their relationships, the study analyzes how different audiovisual elements affect learning outcomes, establishing the following research model.

3.2 Development of the Survey Questionnaire

As shown in Table 5 Questionnaire items, based on the research model, the questions of the questionnaire were formulated.

Table 5. Questionnaire items

Element type	Element name	Learning outcome dimension	Question content
Visual elements	Text	Attention	Does the size of the text help maintain focus on the course content?

		Cognitive load	Does the layout of the text help simplify understanding of the course content?
		Satisfaction	Does the style of the text help improve reading comfort?
	Graphics and images	Attention	Does the use of images and graphics help maintain focus on the course content?
		Cognitive load	Does the use of images and graphics help simplify understanding of the course content?
		Satisfaction	Does the use of images and graphics help enhance the interest of the course content?
	Color	Attention	Does the use of color help differentiate various parts of the course?
		Cognitive load	Does the use of color help ease the understanding of instructional content?
		Satisfaction	Does the color scheme help enhance the appeal of the course content?
	Teacher image	Attention	Does the presentation of the teacher's image help sustain attention on the course content?
		Cognitive load	Does the presentation of the teacher's image help enhance understanding of the course content?
		Satisfaction	Does the positioning of the teacher's image help enhance the appeal of the course content?
Auditory elements	Sound effects	Attention	Does the use of sound effects help enhance attention to the course content?
		Cognitive load	Does the use of sound effects help enhance understanding of the course content?
		Satisfaction	Does the use of sound effects help enhance the appeal of the course content?
	Background music	Attention	Does the use of background music help sustain attention on the course content?
		Cognitive load	Does the use of background music help enhance understanding of the course content?
		Satisfaction	Does the use of background music help enhance the appeal of the course content?
	Teacher's	Attention	Does the clarity of the teacher's voice help sustain

	voice		attention on the course content?
		Cognitive load	Does the clarity of the teacher's voice help enhance understanding of the course content?
		Satisfaction	Does the clarity of the teacher's voice help enhance the appeal of the course content?

As shown in Table 6, additionally, the questionnaire includes basic demographic information of the respondents, consisting of four questions regarding gender, age group, occupation, and educational level. The structure of the questionnaire is as follows.

Table 6. Questionnaire composition

Section	Number of questions	Scale
Visual Elements	12	Likert scale
Auditory Elements	9	Likert scale
Respondent Demographic Information	4	Nominal

Apart from the demographic responses, questions regarding the impact of audiovisual elements on learning outcomes are measured using a 5-point Likert scale. The response options range from 1 for "Strongly Disagree," 2 for "Disagree," 3 for "Neutral," 4 for "Agree," to 5 for "Strongly Agree."

3.3 Analysis Methods

The analysis methods are structured as follows. First, to examine general demographic characteristics, frequency analysis of respondent demographics is conducted. Second, to assess the reliability of the questionnaire items concerning audiovisual elements and learning outcomes, Cronbach's alpha coefficient is used. This evaluates the reliability of seven audiovisual elements and three learning outcomes items, observing if there are variables that significantly reduce the overall reliability coefficient. Third, validity is tested using the Kaiser-Meyer-Olkin (KMO) and Bartlett's test. This confirms the validity of the questionnaire structure relating to audiovisual elements and learning outcomes. Fourth, Pearson correlation analysis is used to explore the relationships between each audiovisual element and learning outcomes. Fifth, to verify the hypotheses of the study, i.e., the impact of audiovisual elements on learning outcomes, linear regression analysis is performed. This method analyzes the dependency relationships between variables, accurately identifying the extent to which one variable is influenced by another.

4. Research Results

As shown in Table 7, in terms of gender distribution, males account for 53.05% and females for 46.95%, nearly splitting the demographic evenly.

Table 7. Basic information frequency analysis

Question	Option	Frequency	percentage (%)	Cumulative percentage (%)
Q1	Male	113	53.05	53.05
	Female	100	46.95	100.00
Q2	18-21 years old	16	7.51	7.51
	22-25 years old	51	23.94	31.46
	26-29 years old	74	34.74	66.20
	30-34 years old	49	23.00	89.20
	35 years and older	23	10.80	100.00
Q3	Student	62	29.11	29.11
	Corporate employee	44	20.66	49.77
	Public servant	50	23.47	73.24
	Business (self-employed)	57	26.76	100.00
Q4	High school	9	4.23	4.23
	College	184	86.38	90.61
	Master's degree	10	4.69	95.30
	PhD	9	4.23	99.53
	Other	1	0.47	100.00
Total		213	100.0	100.0

The age distribution shows that the 26-29 age group is the largest at 34.74%, followed by the 22-25 age group at 23.94%. Among the professional categories, students represent the highest percentage at 29.11%, followed by self-employed business individuals at 26.76%. Regarding educational levels, those with a college degree represent the highest proportion at 86.38%, followed by those with a master's degree at 4.69%. Overall, the survey participants are slightly more male than female, predominantly aged between 26-29 years, with professions primarily among students and self-employed individuals, and educational levels mostly at the college undergraduate level.

As shown in Table 8, when analyzing the reliability of a survey questionnaire, a Cronbach's alpha value above 0.7 indicates that the multiple variables constructed for the scale have good internal consistency.

Table 8. Questionnaire reliability analysis.

Category	Cronbach's alpha
Text	0.818
Graphics and images	0.830

Color	0.817
Teacher image	0.811
Sound effects	0.809
Background music	0.836
Teacher's voice	0.812
Attention	0.901
Cognitive load	0.892
Satisfaction	0.908

According to the Cronbach's Alpha results for each dimension, the ten dimensions designed in this study have Cronbach's Alpha values ranging from 0.809 to 0.908, all above 0.7, indicating good internal consistency for each dimension of the questionnaire. Therefore, the reliability of this survey's results is considered good, and the data have passed the reliability test.

As shown in Table 9, using the Principal Component Analysis method, factors with eigenvalues greater than 1 are extracted from the scale. The results of the total variance explained by each dimension of the questionnaire show that there are 10 factors with eigenvalues greater than 1.

Table 9. Total variance interpretation

Component	Initial eigenvalues	Sum of squared loadings	Rotated sum of Squared loadings
Total	Percentage of variance	Cumulative %	Total
1	11.434	27.224	27.224
2	3.856	9.181	36.404
3	3.206	7.634	44.039
4	1.910	4.548	48.587
5	1.766	4.206	52.792
6	1.665	3.964	56.756
7	1.566	3.729	60.486
8	1.525	3.632	64.117
9	1.377	3.278	67.396
10	1.142	2.720	70.115

Extraction Method: Principal Component Analysis.

The percentage of variance explained by these rotated factors is respectively 11.562%, 11.257%, 10.874%, 5.366%, 5.250%, 5.231%, 5.207%, 5.145%, 5.143%, and 5.081%, with a cumulative total variance explanation rate of 70.115%, which is greater than 60%. Therefore, it can be concluded that the validity of the questionnaire is high. The questionnaire is effective and suitable for conducting subsequent research analyses.

As shown in Table 10, the Pearson correlation coefficient, quantifies the linear relationship between two continuous variables. It ranges from -1 (perfect negative correlation) to +1 (perfect positive correlation), with 0 indicating no correlation. This statistic is commonly used to determine the strength and direction of a linear relationship between two variables.

Table 10. Pearson correlations

	Attention	Cognitive Load	Satisfaction	Text	Graphics and Images	Color	Teacher Image	Sound Effects	Background Music	Teacher's Voice
Attention	1									
Cognitive Load	0.222	1								
Satisfaction	0.19*	0.317	1							
Text	0.388	0.365	0.292	1						
Graphics and Images	0.360	0.166	0.360	0.420	1					
Color	0.355	0.257	0.390	0.318	0.352	1				
Teacher Image	0.210	0.341	0.379	0.241	0.210	0.213	1			
Sound Effects	0.356	0.310	0.366	0.254	0.282	0.351	0.254	1		
Background Music	0.36*	0.399	0.358	0.254	0.360	0.347	0.325	0.330	1	
Teacher's Voice	0.340	0.303	0.369	0.304	0.325	0.256	0.271	0.285	0.331	1

* $p<0.05$ ** $p<0.01$

Text has a strong positive correlation with attention (r=0.388), a strong correlation with cognitive load (r=0.365), and a moderate positive correlation with satisfaction (r=0.292). Graphics and images have a strong positive correlation with attention (r=0.360), a moderate correlation with cognitive load (r=0.166), and a strong positive correlation with satisfaction (r=0.360). Additionally, there is a very strong correlation with text (r=0.420). Color has strong positive correlations with attention (r=0.355), cognitive load (r=0.257), and particularly strong with satisfaction (r=0.390). Teacher image has moderate positive correlations with attention (r=0.210), cognitive load (r=0.341), and satisfaction (r=0.379). Sound effects have strong positive correlations with attention (r=0.356), cognitive load (r=0.310), and satisfaction (r=0.366). Background music shows very strong positive correlations with attention (r=0.364), cognitive load (r=0.399), and satisfaction (r=0.358), particularly strongest with cognitive load. Teacher's voice also has strong positive correlations with attention (r=0.340), cognitive load (r=0.303), and satisfaction (r=0.369).

In summary, these data demonstrate significant positive correlations between attention, cognitive load, and

satisfaction with multiple factors in the educational environment such as text, graphics and images, color, teacher image, sound effects, background music, and teacher's voice. Notably, color and background music have a particularly significant impact on satisfaction, which indicate their importance in instructional design.

As shown in Table 11, conduct Pearson correlation coefficient on the extracted visual and auditory elements with respect to learning outcomes.

Table 11. Elements pearson correlations

Elements	Learning outcomes
Text	0.494**
Graphics and Images	0.424**
Color	0.477**
Teacher Image	0.440**
Sound Effects	0.489**
Background Music	0.529**
Teacher's Voice	0.480**

* $p<0.05$ ** $p<0.01$

The correlation coefficient between learning outcomes and text is 0.494, showing significance at the 0.01 level. The correlation coefficient between learning outcomes and graphics and images is 0.424, also significant at the 0.01 level. The correlation coefficient between learning outcomes and color is 0.477, significant at the 0.01 level. The correlation coefficient between learning outcomes and teacher image is 0.440, significant at the 0.01 level. The correlation coefficient between learning outcomes and sound effects is 0.489, significant at the 0.01 level. The correlation coefficient between learning outcomes and background music is 0.529, showing significance at the 0.01 level. Lastly, the correlation coefficient between learning outcomes and teacher's voice is 0.480, significant at the 0.01 level. These results indicate significant positive correlations between learning outcomes and text, graphics and images, color, teacher image, sound effects, background music, teacher's voice.

As shown in Table 12, conducting a linear regression analysis with text, graphics and images, color, teacher image, sound effects, background music, and teacher's voice as independent variables, and learning outcomes as the dependent variable.

Table 12. Linear regression analysis results (n=213)

	Unstandardized coefficients		Standardized coefficients	t	p	Collinearity diagnostics	
	B	Standard Error	Beta			VIF	Tolerance
constant	0.778	0.145	-	5.376	0.000**	-	-
Text	0.135	0.032	0.221	4.247	0.000**	1.325	0.755

	Unstandardized coefficients		Standardized coefficients	t	p	Collinearity diagnostics	
	B	Standard Error	Beta			VIF	Tolerance
Graphics and Images	0.028	0.034	0.044	0.815	0.416	1.408	0.710
Color	0.100	0.032	0.163	3.125	0.002**	1.323	0.756
Teacher Image	0.111	0.032	0.172	3.471	0.001**	1.196	0.836
Sound Effects	0.126	0.033	0.196	3.831	0.000**	1.273	0.786
Background Music	0.135	0.033	0.221	4.160	0.000**	1.373	0.728
Teacher's Voice	0.115	0.032	0.182	3.561	0.000**	1.272	0.786
R2			0.580				
Adjusted R2			0.566				
F			F (7,205) =40.511, p=0.000				
D-W			2.069				
Dependent variable: Learning outcomes							
* p<0.05 ** p<0.01							

The model formula is Learning Outcomes = 0.778 + 0.135Text + 0.028Graphics and Images + 0.100Color + 0.111Teacher Image + 0.126Sound Effects + 0.135Background Music + 0.115*Teacher's Voice. The R-squared value of the model is 0.580, which means that these variables explain 58.0% of the variance in learning outcomes. The model passes the F-test ($F = 40.511$, $p = 0.000 < 0.05$), indicating that at least one of the variables significantly impacts learning outcomes. Additionally, the multicollinearity diagnostics reveal that all VIF values are less than 5, indicating no multicollinearity issues; and the Durbin-Watson value is around 2, suggesting that there is no autocorrelation in the model, indicating that the sample data are independent.

5. Conclusion

In this study, we meticulously examined the role of various audiovisual elements on learning outcomes within MOOC environments. Our research method involved a thorough analysis employing frequency statistics, reliability measures, and regression techniques to evaluate how specific elements—namely text, graphics, color, teacher images, sound effects, background music, and the teacher's voice—affect learners' attention, cognitive load, and overall satisfaction. We findings indicate a significant enhancement in learning effectiveness when these elements are optimally designed and integrated. Particularly, background music and text layout demonstrated the most profound impact on learning outcomes, highlighting their importance in educational content creation. This underscores the necessity for educational designers to employ a strategic approach in incorporating both visual and auditory cues to facilitate a more engaging and effective learning experience. The results encourage ongoing refinement of audiovisual components in MOOC to maximize both learner engagement and educational achievement, ultimately contributing to better learning outcomes.

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