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The Role of Multimedia Design in Enhancing Information Retention: Al Jazeera Video Fact Checks as a Case Study

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A program launched by Al Jazeera Media Institute which aims to encourage academic research as well as to provide journalists and researchers with an opportunity to gain practical experiences and learn about applied practices in an in-depth way that contributes to the improvement of the profession of journalism, with the help of many Arab and international institutions.

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Abstract

Fact checks have grown in importance as information disorder continues to plague today's society. Audiences need to remember fact checks to refrain from sharing false information, especially on social media. This study seeks to address a gap in previous studies on how video fact checks can be designed in a way that helps audiences remember the debunks longer. For this study, a selection of video fact checks produced by the Al Jazeera Media Network were critically analysed for their multimedia design using the cognitive theory of multimedia learning (CTML) by Mayer et al. (1996). Interviews with Al Jazeera journalists were also conducted to understand the rationale behind existing multimedia designs and to identify the challenges of applying theoretical design principles in practice. Overall, the multimedia design of Al Jazeera's video fact checks was partially consistent with the CTML. This study offers recommendations to improve the multimedia design of Al Jazeera's video fact checks while navigating the practical challenges of implementing the CTML principles.

Keywords

Al Jazeera, cognitive theory of multimedia learning, fact checking, information retention, video fact checks

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Introduction

Fact checking, which commonly refers to the verification of information, has been recognised as a distinct practice in the United States since the early 20th century. In 1913, The New York World newspaper set up the Bureau of Accuracy and Fair Play to investigate reader complaints about errors in published material and issue corrections afterwards (Nemeth, 2010). Only a decade later, Time magazine was founded in 1923 with a research department to verify content before publication (Dickey, 2019). This shows how fact checking began as an internal editorial process focused on verifying content before publication, rather than a service that directly engages the public.

Today, fact checks are more important than ever as social media has grown in popularity and turned into a breeding ground for false information (Vosoughi et al., 2018; Talwar et al., 2020). False information have consistently made the rounds on mainstream media, in public figures' statements and on social media regarding a plethora of issues, including those that have caught the world's attention, such as health emergencies and presidential elections (Lee et al., 2023), or the ongoing wars between Russia and Ukraine, and Israel and Palestine (Hameleers, 2024). The severity of this phenomenon is such that, for instance, in 2021, sister platforms Facebook and Instagram announced they had taken down more than 20 million posts that reportedly contained misinformation about the COVID-19 pandemic (Rosen, 2021).

False information shared with or without malicious intent has the dangerous potential to contribute to and reinforce false narratives (Wardle & Derakhshan, 2017). This underscores the need to develop fact checks that are effective at counteracting false claims (Van Erkel et al., 2024). To that end, media outlets and NGOs have set up dedicated units to verify the accuracy of information circulating in the public domain (Al Jazeera, 2020; Jackson, 2017; AFP, 2020), in addition to initiatives launched to carry out fact checking. For instance, the Al Jazeera Media Network, the largest disseminator of English news to an international audience from the Arab world (Usher, 2013; Bridges, 2017; Allagui, 2020), had set up an agency called Sanad in 2019 to specifically deal with news monitoring and verification (Al Jazeera, 2020), making it a suitable candidate for a case study on fact checks.

The significance of fact checks has grown to an extent where modern-day fact checkers "want people to both read and remember their misinformation debunks" (Collier et al., 2023, p. 1). Researchers have found that video fact checks are more effective at debunking misinformation and reducing false perceptions in society compared with other formats such as written articles or chatbots (Young et al., 2017; Bor et al., 2020; Lu & Shen, 2023; Zhao et al., 2022; Dan & Coleman, 2024). A review of existing literature shows a need to investigate how multimedia design can be used to help people understand and remember video fact checks longer.

Multimedia design refers to the creative process of combining "text, images, audio, video, animation, and interactivity to com-

municate ideas, tell stories, or share information effectively" (Vishakha & Devi, 2025, p. 396). According to the cognitive theory of multimedia learning (CTML), multimedia design is directly correlated with how much information in a video can be processed and stored in a person's long-term memory (Mayer, 2021). This means poor multimedia design can make it difficult for audiences to process, understand and remember the material, defeating the purpose of producing video fact checks.

In an attempt to contribute to the study of video fact checks and how long people remember them, this research uses the video fact checks of the Al Jazeera Media Network as a case study with the CTML as its theoretical base. By adopting a two-tiered, qualitative approach involving content analysis and semi-structured interviews, this paper aims to answer the following research questions:

RQ1: How is multimedia design used in Al Jazeera's video fact checks?

RQ2: To what extent do the multimedia designs of Al Jazeera's video fact checks conform with the cognitive theory of multimedia learning (CTML)?

RQ3: What are the challenges of applying the CTML's instructional design principles to video fact checks?

RQ4: What improvements can be made to the multimedia design of Al Jazeera's video fact checks to enhance information retention among audiences?

In addition to the Introduction, the present study includes six sections: Literature Review, Theoretical Framework, Methodology, Findings, Discussion and Conclusion as well as References.

Literature Review

The tendency for false information to spread faster than the truth through online platforms (Vosoughi, et al., 2018) has made fact checks more important than ever today. Fact checking is vital in combatting information disorder, a term coined by Wardle and Derakhshan (2017) which refers to "the sharing or developing of false information with or without the intent of harming" (Durodolu et al., 2021, p. 160).

Fact checking, as a distinct practice, is vital to journalism and has been recognised by media outlets worldwide. As false information continues to spread rapidly, especially online, fact checks need to be presented in a way that people understand easily and remember longer to discourage them from sharing false news (Collier et al., 2023). Although technological advancements have allowed us tools like chatbots to correct misinformation (Zhao et al., 2022), videos and written articles are currently the most commonly used formats for fact checks (Dan & Coleman, 2024). Of the two, video fact checks are better at tackling misinformation (Bor et al., 2020; Dan & Coleman, 2024) and reducing misperceptions (Young et al., 2017), making them the best format for producing fact checks.

Although research has found that fact checks perform better when produced as videos rather than written articles, there is still a need to study what makes a video fact check effective. A recurring observation in previous studies is that the effectiveness of video fact checks has been judged on their ability to debunk misinformation (Bor et al., 2020; Dan & Coleman, 2024) and reduce misperceptions in the short-term (Young et al., 2017), but not on the basis of how well people remember them for longer, which would also inherently enhance their effectiveness.

Young et al. (2017) conducted the first study that identified video fact checks as more effective than written fact-check articles at reducing misperceptions. Their findings were consistent with those of Mayer and Moreno (2003) and Herron et al. (2013) who concluded that videos were better for learning in academic settings. Although Young et al. (2017) have established that videos are better at reducing misperceptions, their study does not examine which features distinguish an effective video from one that is not.

The same gap is also evident from a study by Dan and Coleman (2024), who found that video fact checks were better than textual fact checks at correcting misinformation, especially among those with pre-existing false or uncertain beliefs. Their primary finding was that people who watched video fact checks found it easier to mentally process the information compared with those who were shown a textual fact check, which in this case was "almost a transcript of the videos, altered only to conform to news writing style" (Dan and Coleman, 2024, p. 787). However, this research did not cover which features resulted in videos having a better impact on audiences.

Bor et al. (2020) had found that people who watched video fact checks had shared better-quality news on the social media platform X, formerly known as Twitter, for a few weeks. However, the researchers acknowledged a need to study what makes a video effective.

Despite the growing popularity of videos, which studies have found to be the best format for fact checks, most research associated with the memorability of fact checks is based on written articles. Past studies have examined how including the sources of the information and of the fact check (Van Erkel et al., 2024), logos of news outlets (Fazio et al., 2023), or summary snippets, subheadings and a final verdict (Hettiachchi et al., 2023) can affect how people remember written fact-check articles. The literature review points to only one paper, authored by Lu and Shen (2023), that focuses on the audiovisual features that influence the effectiveness of a video fact check. But in this study, the multimedia design involved the use of visual features such as brightness, entropy, colours and presence of faces, along with audio features such as tempo and loudness, while the effectiveness was measured in terms of audience engagement, i.e. likes, comments and reshares, and not in terms of how long a person might remember the information. Even so, the researchers acknowledge that they could not establish a correlation between audiovisual features and online engagement.

Past research indicates that videos are the best format to relay fact checks. However, previous studies have not explored how video fact checks can be designed in a way that helps people remember the information for longer, as research along these lines has been focused on written fact-check articles. This highlights a need for further studies to identify multimedia designs that work best for memorable video fact checks.

Theoretical Framework

Human Memory

According to the Atkinson-Shiffrin memory model (also known as the multi-store or modal model of memory), when information is presented to a person, the contents are first stored in the sensory memory from where they are sent to the working memory and eventually to the long-term memory (Atkinson & Shiffrin, 1968; Mayer, 2021g). Information gathered by a person's five sensory organs is held briefly in the sensory memory for a period ranging between milliseconds and seconds before being processed by the working memory (Sperling, 1960; Atkinson & Shiffrin, 1968; Cowan et al., 1990).

The working memory uses two separate channels to process visual and auditory information (Paivio, 1978; Baddeley, 1986). The visual channel processes incoming visual material such as photos, videos, graphics, animation and written text, while the auditory channel processes aural material like narration and music (Mayer & Moreno, 2003). A key assumption in the study of cognitive psychology is that the working memory has a limited capacity to process information (Miller, 1956), and this capacity needs to be managed effectively for information to be processed as much as possible and then stored in long-term memory (Mayer & Moreno, 2003).

Multimedia Design and Information Retention

Multimedia design refers to the combination of multimedia elements like text, audio, video and animation (Vishakha & Devi, 2025) in materials such as videos, tutorials and presentations and has a direct correlation with how much information a person can remember (Mayer, 2021, 2024).

Three types of mental processing occur in a person's working memory: essential processing, generative processing and extraneous processing (Mayer, 2021, 2024). According to Mayer, essential processing (forming a mental representation of incoming information) and generative processing (making sense of the information) are beneficial for learning, while extraneous processing (processing irrelevant multimedia designs in the material) is a waste of mental effort.

To effectively utilise the limited processing capacity of a person's working memory and support the storage of information in long-term memory, the multimedia design of a video must "minimize extraneous processing, manage essential processing, and foster generative processing" (Mayer, 2024, p. 18). The cognitive theory of multimedia learning (CTML) introduced by Mayer et al. (1996) and developed over the years, proposes 15 principles of multimedia instructional design, out of which five are for "reducing extraneous processing", three for "managing essential processing" and seven for "fostering generative processing" (Mayer, 2021a, p. 397). The scope of this research is limited to the five principles concerned with reducing extraneous processing:

1. Coherence. This principle discourages the use of extra elements, such as words, pictures and sounds that are not essential to deliver the message through a video. According to Mayer's (2021b) theory, when a person's working memory uses its limited capacity to process unnecessary multimedia elements, it reduces the capacity to process essential information, although such elements can make a video seem more interesting and incite interest towards learning (Fiorella & Mayer, 2021). Such unnecessary but attractive elements are called "seductive details" (Fiorella & Mayer, 2021, p. 185). Of the many elements that qualify as seductive details, background music has been studied extensively by academics over the years. Their experiments, however, have produced mixed outcomes. While some studies have found that music affects learning (Hallam et al., 2002; Moreno & Mayer, 2000), others claim it enhances learning (Azmi et al., 2023; De Groot, 2006) or has no impact (Jäncke & Sandmann, 2010; Lehmann & Seufert, 2017). According to Thompson et al. (2011), these varied results can be attributed to the changes in the tempo and intensity of music. An experiment by Moreno and Mayer (2000) found that music affects learning even when mixed at a low volume.

2. Signaling. Studies have found that highlighting essential words and graphics, using arrows, distinctive colours, flashing, pointing gestures or greying out non-essential areas (Mayer, 2021d), makes it easier for a person to learn new information (Mayer, 2021d; Van Gog, 2021). This multimedia design principle is more applicable when a video is too complex and disorganised (Jeung et al., 1997). The CTML states that the use of signaling cues in a video helps guide a person's attention towards what is necessary to make sense of the incoming information (Mayer, 2021d; Van Gog, 2021). However, Stull and Mayer (2007) have highlighted that signaling cues need to be used sparingly and that overusing them can lead to extraneous processing.

3. Redundancy. This principle states that the use of subtitles in a video containing audio narration and graphics is a deterrent to learning and makes it difficult to remember information for long periods (Mayer, 2021c). The theoretical position is that when subtitles are used to replicate the audio narration in a video, a person would have to use the limited capacity in working memory to process the same information twice (Mayer & Johnson, 2008; Mayer, 2021c) and this would result in insufficient capacity to process the remaining essential bits of information. Mayer (2021c) describes three cases where the redundancy principle is less applicable: when (a) the text is short and placed next to a graphic; (b) the audio narration precedes the text appearing on screen; and (c) the video contains no graphics and uses short audio narration.

4. Spatial contiguity. Corresponding words and images must be placed near each other in a video as it enhances learning (Mayer, 2021e). According to Mayer, such placement saves a person the trouble of having to find and connect both pieces of information, which eventually makes it easier to hold them in the working memory at the same time. Ayres and Sweller (2005) found that this principle is applicable when a diagram cannot be understood on its own without labels or words, the material presented is complex, or when a person does not have much prior knowledge on the topic.

5. Temporal contiguity. According to this principle, presenting a narration simultaneously with complementing visuals can enhance learning as a person can process both elements of information at the same time (Mayer, 2021f). However, the theory states that the temporal contiguity principle may be less applicable to short video segments or when a person can control the pace of the multimedia material.

The five design principles – coherence, signaling, redundancy, spatial contiguity and temporal contiguity – aim to reduce extraneous processing, and therefore, make up a theoretical framework suitable for studies on designing memorable fact checks.

Methodology

This paper used an Al Jazeera digital series as a case study in an attempt to contribute to the niche research area of video fact checks and their retention in long-term memory.

Al Jazeera, a Qatar-based media network established in 1996, was selected for the present study due to its wide, global reach (Al-Shami, 2025; Nogueira Sanca, 2025) and its decision to set up a dedicated fact-checking agency. In 2019, the network established the Sanad agency for news monitoring and verification (Al Jazeera, 2020), which helps produce Al Jazeera's video fact checks by researching and analysing open-source intelligence (OSINT) data, including satellite imagery.

A two-tiered, qualitative approach was followed to understand how Al Jazeera used multimedia design in the video fact checks constituting the sample. Through content analysis and semi-structured interviews, the present study explored how design can help audiences retain information longer with the aim of offering recommendations towards improving video fact checks.

The sample was selected from Fact Check, an Al Jazeera digital series of video fact checks posted on its English social media pages on Facebook, X, YouTube, Instagram and TikTok. The present study analysed all 31 episodes published during the first year of Fact Check, between October 1, 2023 and October 1, 2024. All episodes were published on the Facebook page of Al Jazeera English, which, at the time of the study, had 18.9 million followers (Al Jazeera English, n.d.), the highest following the media outlet has amassed across all its social media pages. The combined duration of the series totaled 140 minutes, with each episode averaging 4.5 minutes.

The multimedia design of the Fact Check episodes was analysed based on three main dimensions: visuals (visual overlays and graphics), audio (background music and narration), and text (subtitles). The analysis rested on five principles of the cognitive theory of multimedia learning (CTML) – namely coherence, redundancy, signaling, spatial contiguity and temporal contiguity – which aim at reducing extraneous processing. The episodes were analysed according to the coding framework described in Table 1.

Table 1

Coding Framework for Multimedia Content Analysis

ID	Video link	Duration	Main dimension	Sub-dimension	Time code	Remarks
			Visuals	Visual Overlay Graphics		
			Audio	Background Music		
				Narration		
			Text	Subtitles		

Based on the findings of the content analysis, semi-structured interviews were conducted with three Al Jazeera journalists involved in producing the Fact Check series on April 30 and May 1, 2025 (see Table 2). Two interviews were conducted in person at the Al Jazeera Media Network headquarters in Doha, Qatar, while the third one was conducted online via the videoconferencing software Zoom. Each interview lasted for about 30 minutes. The interviews contributed towards understanding the thought processes associated with existing multimedia designs in the Fact Check episodes and the practical challenges of implementing the CTML's design principles to video fact checks.

Table 2

Details of Semi-Structured Interviews with Al Jazeera Journalists

Respondent ID	Designation	Date	Method
Interviewee 1	Executive Producer (Digital Special Projects)	April 30, 2025	In person
Interviewee 2	Head of Creative and Design	May 1, 2025	Online via Zoom
Interviewee 3	Producer	May 1, 2025	In person

Findings

The findings of the present study, based on the qualitative content analysis and semi-structured interviews, appear under four headings – background music, narration and visual overlays, subtitles, and signaling cues. While evaluating to what extent these multimedia elements complied with the five principles of the cognitive theory of multimedia learning (CTML) that are aimed at reducing extraneous processing, this section also highlights the practical challenges of applying theoretical multimedia design concepts when producing video fact checks.

Background Music

Background music had been used throughout all 31 episodes constituting the sample. Soundtracks were used to set the mood and enhance the appeal of the video to the viewer. Interviewee 1 explains that "if you've got something for five minutes, and if you don't have any music or any kind of sound in the background, it feels flat".

According to Interviewee 2, since they were producing a fact-check series, a soundtrack that could evoke a sense of seriousness among viewers was chosen from a music library to "match the [tone of the] show 100 percent". The same track has been used for all episodes. The production team had paid special attention to ensure that "the music and its beats match the pace of the speaker and graphics [as] they need to go hand in hand".

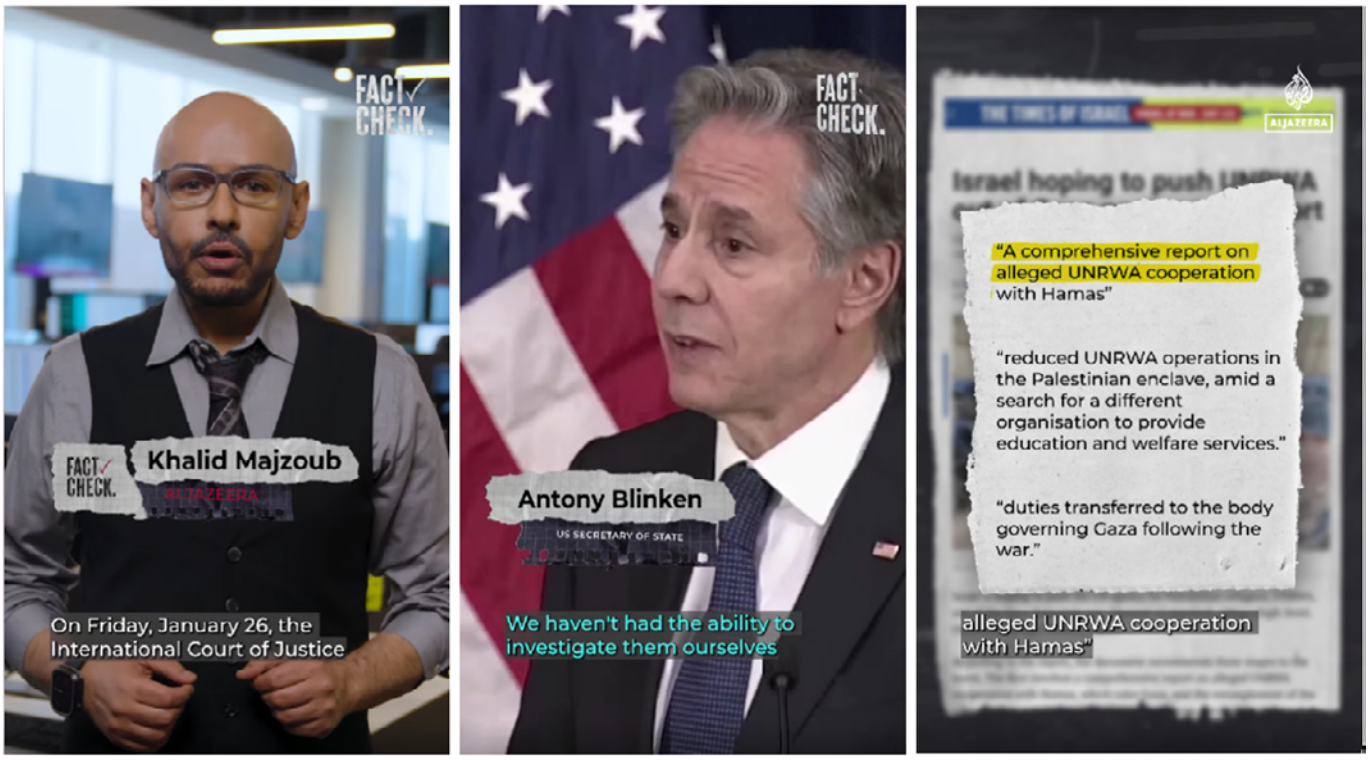
The interviewee's assumption that background music helps enhance the appeal of a video is consistent with the findings of previous studies that have found that music to be a "seductive detail" (Fiorella & Mayer, 2021, p. 185) that can spark interest towards learning despite failing to effectively facilitate learning (Hallam et al., 2002; Moreno & Mayer, 2000).

The background music, however, did not interfere with the presenter's narration or the soundbites as it was mixed at a low volume. Interviewee 1 explained that the music was mixed at a lower volume so that "it's the narrator's voice which would be the more dominant one" and also because it could eliminate confusion for a listener as to "where do you listen, where do you look?" Moreno and Mayer (2000) had tested the idea of mixing music at a lower volume and their findings suggest that music affects learning negatively.

Subtitles

For the most part, all episodes contained same-language captions that duplicated the narration, soundbite and/or the text in visual overlays (see Figure 2). Since the captions were open, viewers did not have the option to turn them off.

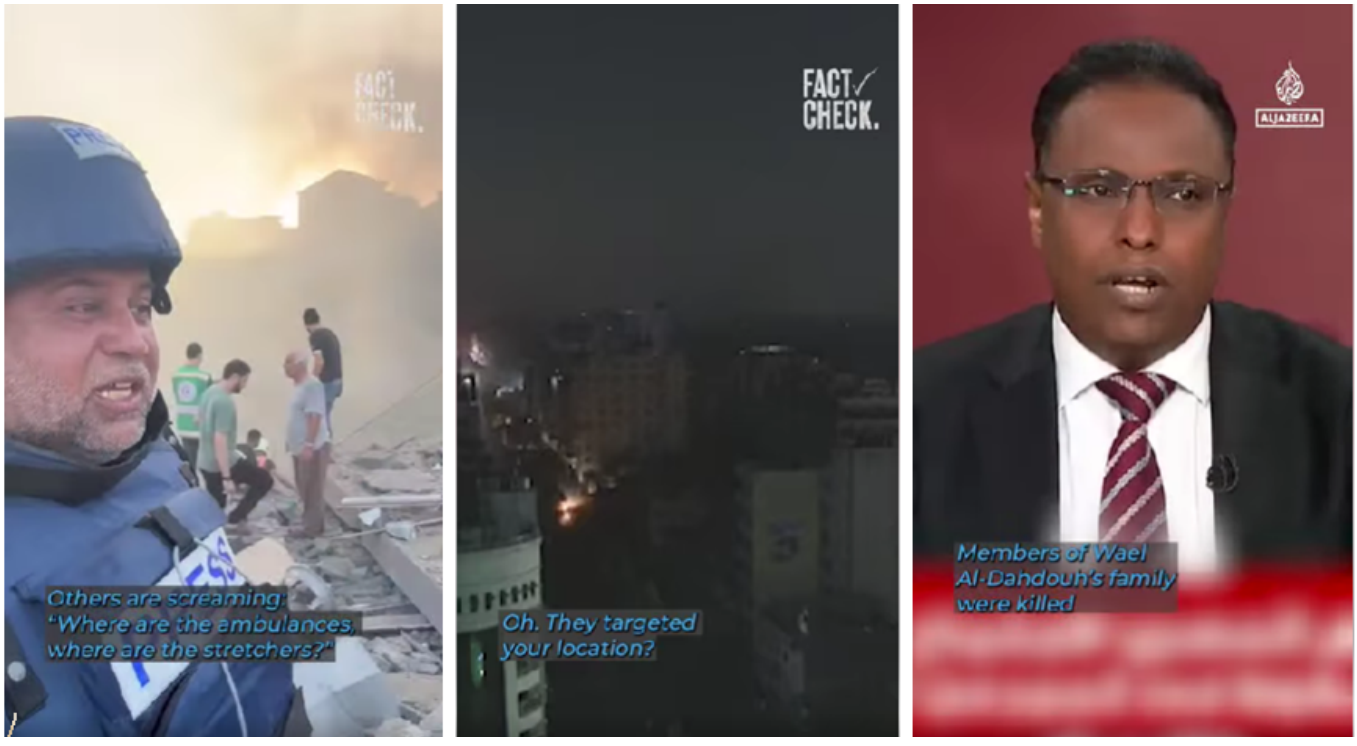
Figure 2 Subtitles Duplicating Narration, Soundbites and Text in Visual Overlays



Note. *The three screenshots were taken by the author from the same Fact Check episode (Al Jazeera English, 2024a, 0:03; 2:30, 5:00).*

However, there were instances where subtitles were used to translate a soundbite from Arabic to English. The first instance where such subtitles were used was in the episode titled "Why was Wael's family killed in a so-called safe area" (see Figure 3).

Figure 3 English Subtitles Used to Translate Arabic Speech



Note. *The three screenshots were taken by the author from a single Fact Check episode (Al Jazeera English, 2023c, 0:14; 0:30; 0:46).*

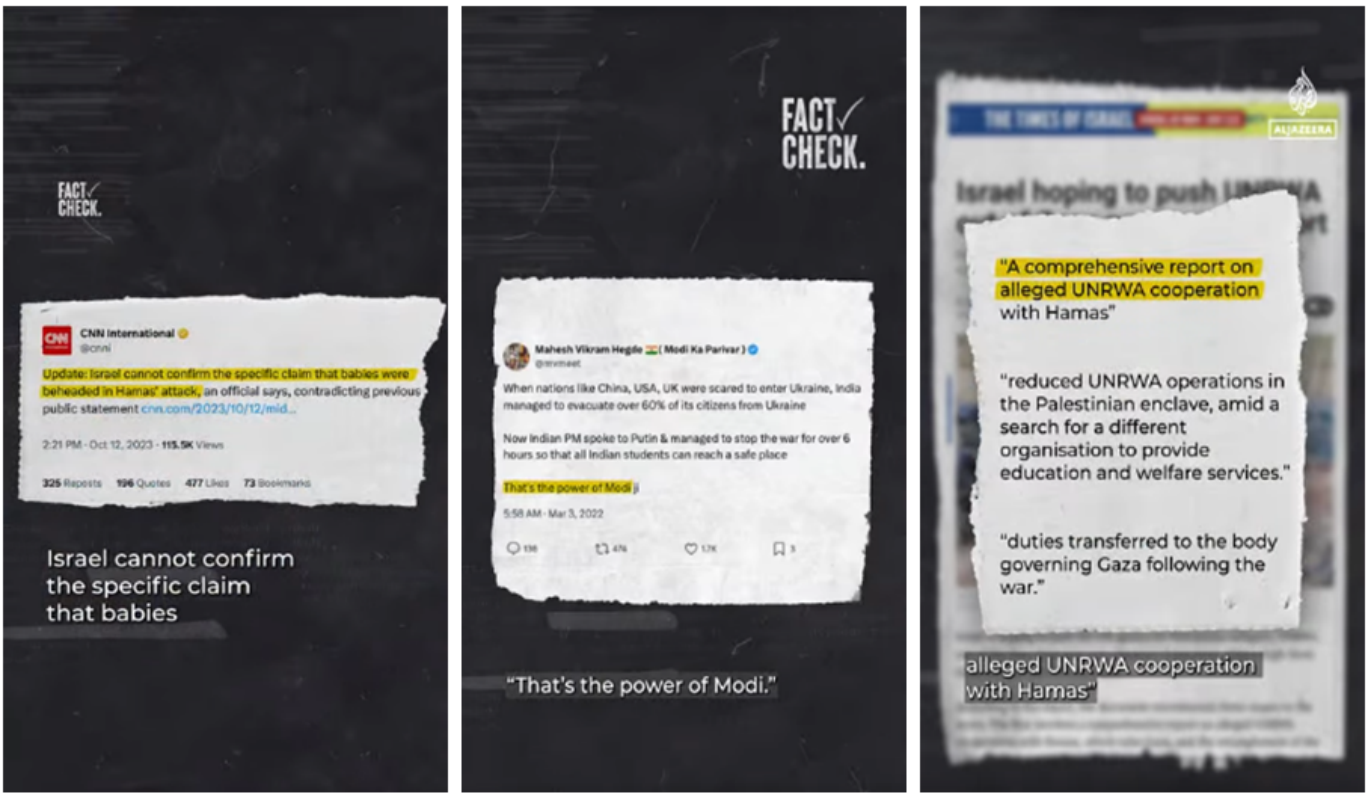
As explained by Interviewee 2, Al Jazeera's decision to use subtitles for video fact checks is due to two factors: (a) the preference of smartphone users to watch videos without headphones, and (b) the need to address issues in understanding the language or accent. Interviewee 2 said "our target audience may also not be very proficient with English, so sometimes it's good for them to pause and understand what they [presenter] are saying". According to Interviewee 1, "even if they [the audience] watch with the sound on, people appreciate subtitles."

The use of subtitles is understandable from a practical perspective as informed by surveys, where a study conducted by Verizon Media and Publicis Media on 5616 adults in the United States suggests that 69 percent of people watch videos on mute in public spaces (McCue, 2019). Another survey, by the ad exchange company Sharethrough, suggests that 72 percent of people prefer to watch videos with captions (Maguire, 2021).

In the Fact Check episodes analysed, a lack of consistency was observed in how often the subtitles were retained while the narrator repeated the text in screen captures. As shown in Figure 4, there were instances where the same text was visible in the subtitles and the visual overlay simultaneously. When the narration duplicated the text in visual overlays, there were three identical text layers within a frame at a time – two written (visual overlay and subtitle) and one spoken (narration).

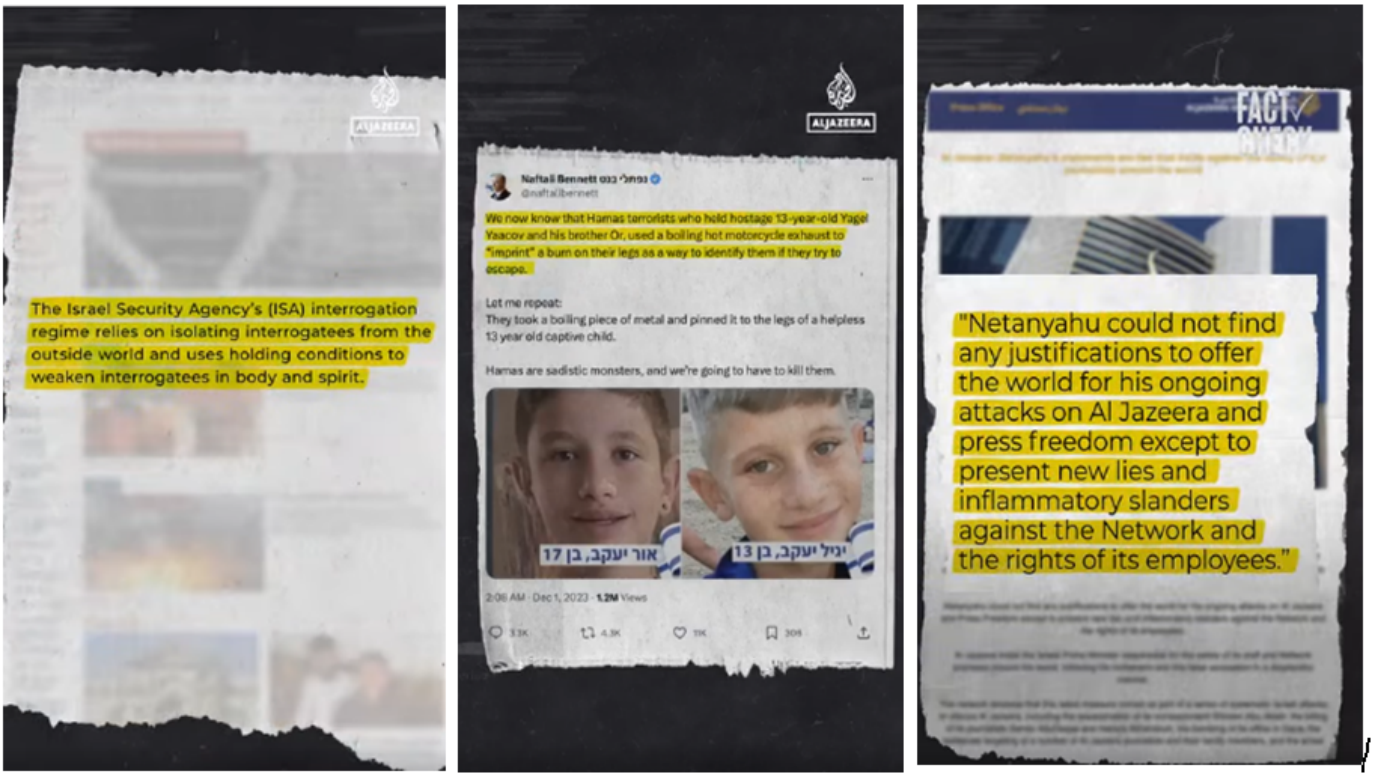
However, there were instances where subtitles were removed while the narration repeated the text in a visual overlay, as shown in Figure 5. Even then, there were two identical text layers in a single frame – one written (visual overlay) and the other spoken (narration). Subtitles could be removed "if the highlighted text matches 100% of what the speaker is saying", according to Interviewee 2.

Figure 4 Double Redundancy with Subtitles Duplicating Visual Overlays



Note. *The screenshots were taken by the author from three Fact Check episodes (Al Jazeera English, 2023a, 1:18; 2024d, 1:37; 2024a, 4:49).*

Figure 5 Subtitles Removed When Narration Duplicated Text in Visual Overlay



Note. *The screenshots were taken by the author from three Fact Check episodes (Al Jazeera English, 2023d, 3:31; 2023e, 2:41; 2024c, 4:08).*

Narration and Visual Overlays

In all 31 episodes, visual overlays, such as file footage, screen captures, screen recordings and graphics, had been used to match the narration. The use of suitable visuals to complement the narration adheres to the temporal contiguity principle of the cognitive theory of multimedia learning (CTML). According to Interviewee 3, the script is “written to the visuals”. Explaining the process, Interviewee 1 said that “we gather all the intelligence, all the information, and then start scripting. On one side of the screen, we've got our script. On the right, we add in all of our visuals”.

Maps were among the visuals used in three episodes, with location labels placed directly beside each corresponding site, as shown in Figure 6. This complies with the spatial contiguity principle which encourages the placement of corresponding text and images near each other to make it easier to hold them in working memory (Mayer, 2021e). Also in compliance with the spatial contiguity principle, was the placement of name labels at the bottom of a screen to identify a speaker, as shown in Figure 6.

A general observation is that the narration quoted text in screen captures, creating identical layers of text - one spoken, the other written. The duplication violates the redundancy principle of the CTML. However, according to Interviewee 1, the use of quotes is important since “we have to show exactly what that claim is … so that we can then prove where it's false”. This justification is reasonable since presenting the context of a claim together with documentary evidence in a fact check helps enhance trust and credibility (Krueger, 2016).

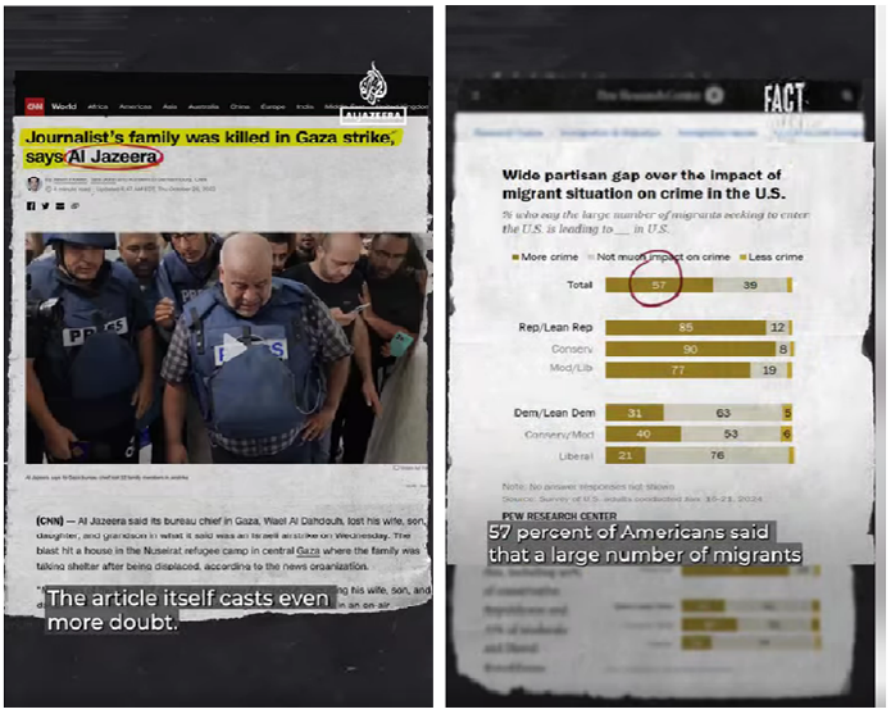
Figure 6 Labeling of Visuals

Note. *The screenshots were taken by the author from three Fact Check episodes (Al Jazeera English, 2023b, 0:07; 2024d, 0:21; 2024a, 2:30).*

Graphics

Important text in visual overlays had been highlighted in yellow or circled in red, as seen in Figure 7.

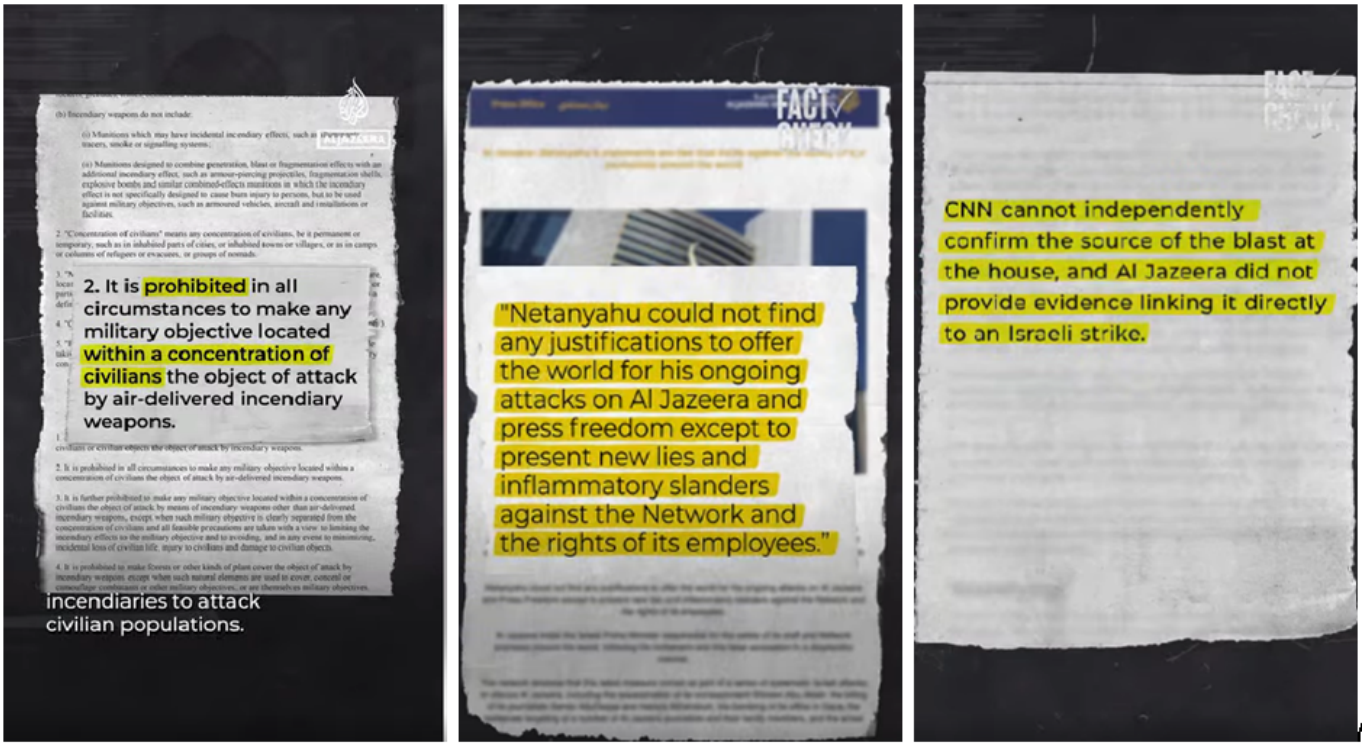
Figure 7 Important Text in Visual Overlays Highlighted in Yellow or Circled in Red



Note. *The screenshots were taken by the author from two Fact Check episodes (Al Jazeera English, 2023c, 2:07; 2024e, 3:49).*

In some cases, as seen in Figure 8, important text had been highlighted after pulling it out using a zoom-in animation. As explained by Interviewee 1, "sometimes we quote organisations…that have really long articles that will go on their own tangents. So we select specific bits that are pertinent to this fact check and pull them out. Visually, you can see where it's coming from".

Figure 8 Inconsistencies in Amount of Highlighted Text



Note. *The screenshots taken by the author from three Fact Check episodes (Al Jazeera English, 2024b, 2:03; 2024c, 4:08; 2023a, 2:12).*

However, there was an inconsistency in terms of the amount of words highlighted in yellow across episodes. While a few keywords had been highlighted in some visual overlays, there were instances where an entire paragraph had been highlighted. For example, as shown in Figure 8, in one episode, the word “prohibited” had been highlighted in a paragraph along with the phrase “within a concentration of civilians”. However, in other episodes, entire paragraphs had been highlighted as pull quotes.

Discussion and Conclusion

The present study critically examined how multimedia design had been used in Al Jazeera's video fact checks, to what extent the designs conformed with five principles of the cognitive theory of multimedia learning, and the challenges of applying theoretical multimedia design principles in practice. The video series Fact Check was chosen as a case study given Al Jazeera's global reach (Usher, 2013; Bridges, 2017; Allagui, 2020) and its decision to set up a dedicated fact-checking agency (Al Jazeera, 2020). The study attempted to explore effective multimedia designs for video fact checks given the gap in this niche research area. The paper also contributes to the fields of multimedia design and information retention.

RQ1: How is multimedia design used in Al Jazeera's video fact checks?

The multimedia design of Al Jazeera's video fact checks is primarily built around a combination of elements such as background music, subtitles, highlighted text and visual overlays that complement the narration. As the interviewees explained, Al Jazeera's existing design is primarily aimed at enhancing the visual and aural appeal of a Fact Check episode for a social media user. While the production team used background music throughout all episodes as well as suitable visuals to complement the narration, there were inconsistencies in when subtitles were retained and how much text was highlighted in visual overlays by way of emphasis.

RQ2: To what extent do the multimedia designs of Al Jazeera's video fact checks conform with the cognitive theory of multimedia learning (CTML)?

The multimedia design of Al Jazeera's video fact checks is partially consistent with the five principles of CTML aimed at reducing extraneous processing.

While the design did not conform with the coherence principle, it partly conformed with the signaling and redundancy principles and completely conformed with the spatial and temporal contiguity principles:

1. Coherence. Background music had been used throughout all 31 episodes to make them more appealing to an online user. This practice contravenes the coherence principle of CTML (Mayer, 2021b) and has been criticised by researchers who characterise background music as a deterrent to learning, as it can prove distracting and detrimental to the mental processing of information (Mayer, 2021b). However, a case can still be made for using music that would help some users remember the content (Azmi et al., 2023; De Groot, 2006).

2. Signaling. In line with the signaling principle, important text in visual overlays had been highlighted in yellow or circled in red, or pulled using a zoom-in animation. At times, text had been highlighted in a paragraph after being pulled from a screen capture. From a fact-checking perspective, this was done to document the claim presented

as evidence. Creating a pull quote using a zoom-in animation and highlighting text are two examples of signaling cues (Van Gog, 2021). It is unclear if using the two cues together would offer the user an added advantage in processing information. A key observation in this study was a lack of consistency in how many words were highlighted in yellow. While only keywords were highlighted at times, there were instances where an entire paragraph was yellowed out. According to Stull and Mayer (2007), highlighting too much text could be counterproductive.

3. Temporal contiguity. Appropriate visual overlays have been used to complement the narration, in line with the temporal contiguity principle which recommends the use of corresponding words and pictures simultaneously (Mayer, 2021f). Images of documents, websites and X posts, together with screen recordings make up the majority of the visual overlays in Fact Check episodes. Using visual overlays to present evidence is crucial in a video fact check given its purpose of verifying claims, and also because reporting the claim clearly is an essential step in fact checking (Nanhekhan et al., 2025).

However, it was observed that adhering to the temporal contiguity principle, by using visual overlays to complement the narration, can violate the redundancy principle, which discourages the use of a written layer of text to duplicate the narration (Mayer, 2021c). This can happen when the narration quotes verbatim from the text in a visual overlay. In such cases, there would be two duplicate layers of text – one written, the other spoken.

In a fact check, the presentation of evidence is key. While screen captures and recordings can serve as evidence in a video fact check, it is also important that the narrator quotes text from a visual overlay to indicate the part being used as evidence. This poses a practical challenge in following the redundancy principle.

4. Redundancy. Subtitles have been used throughout the videos to duplicate the narration and soundbites under the assumption that users would watch the video on mute. This goes against the redundancy principle of CTML (Mayer, 2021c). At times, subtitles have been used simultaneously as the narration quoted text in a visual overlay, resulting in double redundancy. This meant that in a single frame, there were three identical text layers - the narration, the text in the visual overlay and the subtitle.

5. Spatial contiguity. Location labels had been positioned close to the corresponding sites on maps in adherence to the spatial contiguity principle. This makes it easier for a viewer to link the position of a specific location with its name in their working memory, which helps store the information in their long-term memory. Name labels had been used to identify a speaker by placing them at the bottom of the screen, making it easier for the audience to remember a person and their name.

RQ3: What are the challenges of applying CTML's multimedia instructional design principles to video fact checks?

This study has identified two practical challenges of applying CTML's multimedia design principles to video fact checks:

1. The coherence principle considers background music an unnecessary element that affects learning (Mayer, 2021b). However, Al Jazeera has decided to use background music to attract viewers who prefer to watch the video with the sound on, but also considers those who watch it on mute as discussed later (see 2a under RQ3). Research has found that background music is important to grab the attention of a social media user, although it can affect their mental processing of information (Fraser & Bradford, 2012). This is tricky to navigate at a time when news media outlets are competing for the attention of social media audiences (Kadian, 2023).

2. The redundancy principle discourages the use of written text to duplicate spoken narration (Mayer, 2021c). The present study finds that the redundancy principle has been violated in two ways due to practical reasons:

(a) Subtitles duplicate the narration

Al Jazeera justifies using subtitles by claiming that a significant proportion of its audience watches videos on mute. There is no redundancy when subtitles are consumed in lieu of audio narration. However, there are some users who watch the videos with the sound on. According to CTML, the subtitles duplicating the narration can affect their ability to remember the information.

(b) Narration duplicates the text in visual overlays

Al Jazeera used screen captures in its fact-check videos as supporting evidence to debunk claims. At times, the text in these visual overlays is quoted verbatim in the narration. It would be difficult to avoid using screen captures in a video fact check since direct quotes are evidence (Meir, 2017).

RQ4: What improvements can be made to the multimedia design of Al Jazeera's video fact checks to enhance information retention among audiences?

Considering that paragraphs are pulled from visual overlays using a zoom-in animation for emphasis, this study recommends that only keywords be highlighted in such overlays, as people watching the video would not necessarily have time to read an entire passage. It is reasonable to expect those who wish to read it whole to do so by pausing the video, in which case they would read the passage regardless of whether it is highlighted or not. It is, therefore, recommended to discontinue the practice of highlighting entire paragraphs pulled using a zoom-in animation.

It is also recommended that subtitles be removed when the text in the visual overlay is short and quoted by the presenter, since there is an existing layer of text duplicating the narration. This practice has already been observed in some videos in the sample, but there is a lack of consistency in its use. If the text in the highlighted visual is too long, it is recommended to paraphrase the narration, as already done in certain instances, as this would preclude subtitles becoming redundant.

To navigate uncertainties around the use of subtitles, and to ensure that as many people as possible benefit from the video fact check, it is recommended Al Jazeera utilise the feature on Facebook that allows uploading custom captions as SubRip (.srt) files to

the videos. Similar features are available on YouTube and X as well. It would offer users on any of the three social media platforms the option of enabling captions at will. The use of automated captions is discouraged, however, due to concerns related to accuracy (Romero-Fresco & Fresno, 2023).

Limitations and Future Research

The present study is the first of its kind in the research niche area of video fact checks' memorability and as such subject to limitations. It analysed the content using only five principles of the cognitive theory of multimedia learning (CTML), which total 15 according to the theory's most recent version (Mayer, 2021). Future research can analyse video fact checks in relation to other CTML principles or other theories of multimedia design. To explore the effectiveness of multimedia designs, tests would be necessary to identify how much information relayed in video fact checks can audiences remember. These tests can be carried out right after and within a few weeks of watching a video fact check to evaluate immediate and delayed recall. Considering that the average watch duration is declining among online audiences (Dodds, 2024), further studies can help determine whether multimedia design principles are applicable for longer videos. Future research can also investigate whether multimedia design theories remain relevant in today's era of digital media where information overload is a common phenomenon.

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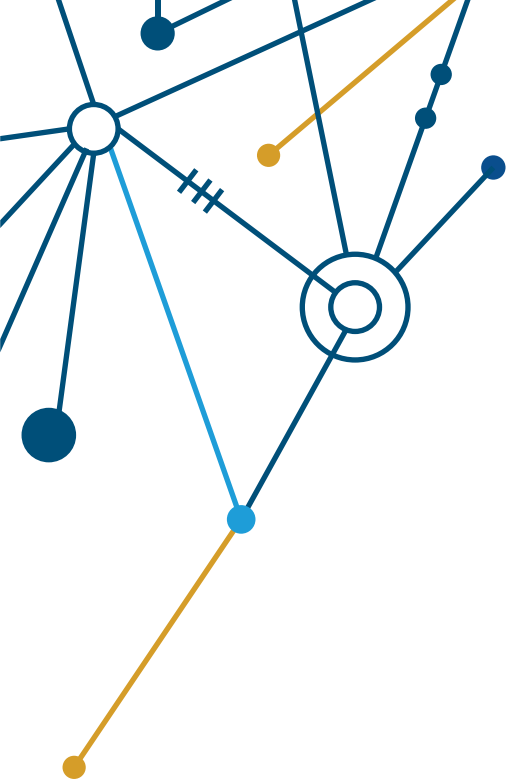

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