Are subtitles useful for language learners?

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Abstract
Despite the seemingly commonsensical view that captions or subtitles aid comprehension, empirical research is less certain about their recommendation for all language learners. This review article introduces some of the theoretical foundations of multimedia learning before examining recent studies investigating the facilitative effect of L2 captions, L1 subtitles and dual-language subtitles. Qualitative insights from research are then presented, with implications for both research and teaching practice further discussed. The article concludes by underlining the importance of learner perspectives due to the complexity of factors affecting the pedagogical value of captions and subtitles.

Keywords captions, subtitles, redundancy effect, foreign language listening anxiety, language learning, multimedia learning

1. Introduction
The popularity of applications such as Language Reactor, with over two million users, suggests a widely-held view that on-screen text whilst viewing video in a second language supports both comprehension and language learning (Language Reactor, n.d.). However, empirical evidence is less certain on whether watching videos with captions/subtitles enhances comprehension more than those without (Zhang & Zou, 2022). This article will begin by looking at the theoretical background to multimedia learning, before moving to analyse evidence examining the ways in which different types of on-screen text might interact with language proficiency to impact comprehension. Research on learner perceptions will then be explored before looking at potential research and pedagogical implications.

2. Theoretical Background & Definitions
Comprehension will be understood to be a cognitive construct in which a coherent mental representation or structure is built (Gernsbacher, 1996; Mayer, 2005). Gernsbacher’s Structure Building Framework posits that the basic building blocks of this foundational structure are memory nodes which are activated by incoming stimuli in the form of words, pictures or tones. This amodal conception is important in the context of the comprehension of video including both aural and visual, and verbal and non-verbal input. The ability to make inferences through global understanding or the use of contextual knowledge is also understood to play an important role in comprehension (Kintsch & Van Dijk, 1978). This conceptualisation is in line with Buck’s (2001) default listening construct used for the assessment of listening comprehension. Although modality of input to some extent impacts the type of information attended to (Lund, 1991), the potential for visual representation of auditory input, for example where a mental image might be built from narration (Mayer, 2005), and vice-versa, is presumed to point to the existence of an underlying comprehension construct.

Cognitive cross-channel representation of images and sounds is fundamental to the multimedia principle that learning is facilitated more by words and pictures, than words alone (Mayer, 2005). Importantly, this is only possible when comprehenders have sufficient cognitive resources available, with the redundancy principle arguing that the presentation of the same information, for example in the form of video, narration and text, may lead to cognitive overload, interfering with comprehension (Sweller, 2005). However, this negative competition for processing capacity may only apply to first language comprehenders, with second language (L2) learning a potential boundary condition (Lee & Mayer, 2018). For L2 comprehenders, a reverse redundancy effect might allow for on-screen text to compensate for the transient nature of spoken language (Mayer et al., 2020). However, the interaction between this potential reverse redundancy effect and L2 proficiency will be returned to throughout a review of research findings.

Before moving to an analysis of this evidence, it is necessary to define the terms to be used. Following Montero Perez (2022), captions will refer to transcribed on-screen text in the target language (L2), with subtitles used for those that translate audio into a learner’s first...
language (L1). Dual subtitles will refer to simultaneous presentation of both. However, where necessary, the terminology used within studies to refer to experimental conditions will be used. Terms such as lower/higher-proficiency and beginner/advanced learners will be used according to each study’s findings, although the issue of how these proficiency levels are determined will be further examined whilst identifying potential future research implications.

3. Captions

A number of studies have pointed to the positive contribution of captions to comprehension (e.g., Gass et al., 2019; Majuddin et al., 2021). In their meta-analysis, Montero Perez et al. (2013) found a significantly large effect (g = 0.99) of captioning on improved comprehension. Gernsbacher (2015) also argued for the relative benefit of captions, citing Yoshino et al. (2000), amongst others. However, in their study, though English captions were found to support comprehension, both L2 captions and L1 Japanese subtitles had limited impact with more difficult content and/or when participants’ proficiency was low.

Aldukhayel’s (2021) study also found a facilitative effect for both captions and subtitles, though this benefit was mediated by proficiency. Using a quasi-experimental design, intact classes were assigned to an L2 Captions Group (n = 35), an L1 Captions Group (n = 32), and a No Captions Group (n = 29), before watching a vlog twice. Within-class/group proficiency was measured using the Vocabulary Levels Test (VLT) (Schmitt et al., 2001). The use of the VLT is supported by the significant correlation between vocabulary knowledge (VK) and listening comprehension (Stehr, 2009), although aural VK is likely closer linked to listening comprehension (Milton et al., 2010). A 10-item multiple-choice test measuring detailed comprehension was administered immediately after viewing, though not included in the study. Results found high-proficiency learners produced better comprehension scores with L2 captions. Low-proficiency learners scored non-significantly higher with L1 subtitles. Qualitative survey findings showed the L2 Captions group in particular felt captions positively affected comprehension, whilst both caption groups believed their comprehension would be negatively affected without captions. Unfortunately, the qualitative data did not distinguish between proficiency levels.

Despite the positive impact suggested by some research, it is important to note that other research has found captions/subtitles to have no discernable impact on comprehension (e.g., Fuentes-Luque & Campbell, 2020; Mayer et al., 2014). However, both Fuentes-Luque & Campbell (2020) and Mayer et al. (2014) note that the speech rate of their materials may account for the lack of a facilitative effect, with pace of speech identified as a possible boundary condition for the benefit of captions (Mayer et al., 2020). These and above findings suggest that as well as a reverse redundancy effect potentially applying to L2 captions for higher-proficiency learners, other factors may further impact the efficacy of captions in aiding comprehension.

4. Subtitles and Dual Subtitles

In addition to evidence arguing for the benefit of captions for more proficient learners, findings with lower-proficiency participants point to the relatively higher facilitative effects of L1 subtitles. Indeed, Hsieh (2020) found that though captions supported vocabulary learning, they had no statistically significant impact on listening comprehension for beginner learners. In contrast, beginner participants allocated to the subtitled condition in Bianchi & Ciabattoni’s (2008) study scored higher on comprehension tests than captioned and control groups, whilst similar results were found for the beginner to low-intermediate participants in Pujadas & Muñoz’s (2020) extensive viewing intervention. Wang (2019) found both freshman classes in their study benefited from the presence of onscreen Chinese (L1) subtitles, though results for other classes were mixed.

In Dizon & Thanyawatpokin’s (2021) study, as well as L1 subtitles supporting comprehension more than English captions, their dual subtitle group achieved the highest comprehension scores. Their quasi-experimental design recruited participants (n = 96) from 9 intact classes at two private universities in Japan, who were quasi-randomly allocated to English captions, Japanese subtitles or dual subtitles groups to watch a sitcom episode. Proficiency of around A1-A2 level on the Common European Framework of Reference for Languages (CEFR) was determined using reported Jitsuyou Eigo Gino Kentei (Test in Practical English Proficiency) (EIKEN) and Test of English as a Foreign Language (TOEFL) scores. Vocabulary form recognition and meaning recall pretests and posttests were administered to measure vocabulary learning. A comprehension posttest of English true/false questions and open-ended questions in Japanese assessed global and detailed understanding, although these were not included in the study. As dual subtitles and L1 Japanese subtitles groups performed statistically significantly better on comprehension tests, it was concluded that L1 subtitles, either with or without the presence of L2 captions, were essential to support comprehension.

In addition to the above evidence supporting the use of L1 subtitles for beginner learners, other research suggests L2 captions may negatively affect knowledge comprehension for lower-proficiency learners. Chen et al. (2022) found L2 captions hindered the comprehension of their lower-proficiency participants (n = 98) during an “AR-enhanced theme-based contextualized learning” intervention (p. 381). Proficiency was determined by the standardised Basic Competence Test for Junior High School Students, with an achievement test of 24 multiple-choice questions (MCQ) administered after learning activities. The authors noted the lack of control group as a limitation, though their use of a single response method for assessment was not. Results were hypothesised to be due to the influence of the redundancy effect for lower-proficiency learners using L2 captions, though this was not found for lower-proficiency participants in the L1 subtitles or no captions conditions, or for their higher-proficiency learners. The boundary condition for the reverse redundancy effect then appears to be related to both caption/subtitle type and proficiency, with cognitive
overload potentially resulting from an interaction between lower-proficiency and L2 captions.

As well as L2 captions possibly causing a degree of cognitive overload, vocabulary knowledge must also be taken into account. Research has suggested that for relatively good comprehension of a listening text, 95% lexical coverage is necessary, roughly equivalent to knowing between the 2,000 and 3,000 most common word families (van Zeeland & Schmitt, 2013). For comparison, Li (2023) found that most participants in their study of Taiwanese university students had a proficiency level lower than B1, equating to a knowledge of at most 2,000 families, and likely less. As such, lower-proficiency learners are unlikely to achieve adequate lexical coverage of a listening text, even with the support of L2 captions. In Li’s study, all participants who had mastered knowledge of the 3,000 word families obtained a B1 level or higher in the Test of English for International Communication (TOEIC) listening test. This suggests more proficient learners are likely closer to the requisite lexical coverage for adequate comprehension. Given the highly variable nature of spoken language (Field, 2019), it can be presumed that L2 captions for higher-proficiency learners facilitate connections between written knowledge of vocabulary and aural input, thereby mitigating extraneous cognitive load (Lee & Mayer, 2018).

5. Qualitative Findings

Given the complex picture that has been painted so far regarding the relationships between proficiency, caption type and other factors, it is particularly important to note the views of learners themselves. Although evidence recommends L2 captions be employed cautiously, qualitative findings suggest that rather than perceiving L2 captions as distracting, some lower-proficiency learners find the experience of using L2 captions relaxing (Pujadas & Muñoz, 2019). This is important given the potential tension and worry caused by listening activities (Ji et al., 2022), and in light of the role that digital media and social practices might play in contributing to self-directed learning outside of the classroom (Dizon, 2021).

Nevertheless, other qualitative research does seem to support the empirical conclusions detailed above regarding caption and subtitle use. For example, Shintaku (2022) found a general preference for Japanese audio with English L1 subtitles among their lower-proficiency learners. Higher-proficiency students preferred to use Japanese captions, as they noted subtitles lost some sociolinguistic information related to character relationships due to an inability to accurately convey the subtleties of the Japanese honorific system in translation. Dizon (2021) also found that lower-proficiency learners showed a preference towards the use of L1 subtitles or dual subtitles. Despite the potential for overuse, subtitles contributed positively to learning by facilitating comprehension and enjoyment. Alrefai & Bataineh’s (2019) study of 25 Jordanian police officers also reported participants benefited from the use of captions and subtitles, though in this study it was the experience of using English captions (L2) and Arabic subtitles (L1) consecutively after watching a TED video. These positive feelings resulted in participants developing further self-confidence and listening practice enjoyment, findings echoed in other contexts, such as among English as a Foreign Language business learners (Hsu, 2018).

6. Research and Pedagogical Implications

From the studies examined so far, it might be possible to state that L1 subtitles support the understanding of lower-proficiency learners, whilst L2 captions facilitate the comprehension of more advanced learners. However, more detailed recommendations are difficult to make due to issues with much of the research literature. In attempting to synthesise the studies presented, this article has taken reported proficiency levels at ‘face value’. Yet this is one area where consistency is sorely lacking. For example, Aldukhayel (2021), Dizon & Thanyawatpokin (2021) and Chen et al. (2022) all employed very different proficiency assessments. Although quasi-experimental designs are something of a necessary evil, steps to mitigate their shortcomings, such as thick descriptions of participants and proficiency, were largely not taken (Ballance, 2023). There are also issues with comprehension assessments. For example, though assessments were included in their reporting, the sole use of MCQ in Chen et al. (2022) and Aldukhayel (2021) may have led to construct underrepresentation (He & Jiang, 2020). Although Dizon & Thanyawatpokin (2021) assessed both global and detailed understanding using a variety of response methods, these tests were not included in reporting. Despite a longstanding recognition of the vital importance of experimental replication (Collins, 1985), this lack of transparency severely hinders replicability (Marsden, 2019).

As to whether use of on-screen text should be recommended to learners, it must first be noted that its use has potential value beyond enhancing comprehension. Although captions/subtitles may mean learners have fewer opportunities to develop important listening strategies (Vandergrift, 2004), some research has suggested that L2 captions may in fact support the development of speech segmentation and bottom-up listening skills, particularly amongst advanced learners (Charles & Trenkic, 2015; Yeldham, 2018). Montero Perez’s (2022) state-of-the-art review found captioned video useful for a range of vocabulary learning benefits, with other findings suggesting captions may even promote pronunciation gains (Wisniewska & Mora, 2020). Other evidence points to the importance of individual differences and content type when making pedagogical decisions. For example, Winke et al. (2016) suggest that orthographic distance between L1 and L2 has an impact on the efficacy of showing captions during a first or second viewing. Rodgers & Webb (2017) found L2 captions facilitated their pre-intermediate learners’ comprehension during the first and more difficult episodes of a TV series. Kruger et al. (2014) and Pannatier & Béntrancourt (2024) hypothesised that the presence of a speaker’s face may draw learner attention away from captions/subtitles, limiting their effect.
Recommend L1 subtitles for lower-proficiency learners and L2 captions for more advanced students might be a good starting point, but individual circumstances and learning goals must also be taken into account.

7. Conclusion

The studies briefly examined here suggest that the use of captions or subtitles in improving comprehension may be proficiency-dependent. However, given a number of methodological issues with these findings, it would appear the best pedagogical suggestions are those that take into account the particular contexts in which these recommendations will play out. Learners should be advised as to the potential pedagogical benefits that captions and subtitles might offer for language learning, with priority given to how learners themselves might view the use of on-screen text, and its contribution to feelings of learner efficacy and enjoyment.

As with most issues related to educational decisions, the use of captions and subtitles has excited considerable academic debate. However, the findings of the empirical evidence presented here have hopefully pointed to the extraordinarily intricate interplay of a myriad of factors that might impact the pedagogical value of on-screen text. This complexity highlights the need for learners and teachers to have access to more methodologically rigorous research so as to make the best decisions in their own contexts.

Calum To graduated from St Hilda’s College, University of Oxford in 2012 with a BA (Hons) in History before completing the Cambridge CELTA and moving to Vietnam as a fledgling teacher and heritage language learner. Having taught across a range of educational contexts in Vietnam, China and Japan, he decided to pursue an MSc in Applied Linguistics for Language Teaching at St Anne’s College, University of Oxford. His research interests, drawn from his own background and teaching experience, are related to Global Englishes, listening instruction pedagogy, sociolinguistics and accent varieties.

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**Conflict of Interest**

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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