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Evaluating the Effectiveness of Subtitling for the Deaf and Hard of Hearing Based on Analysis of Moroccan University Students' Translations from English into Arabic

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Abstract

With the growing need for accessible audiovisual content, Subtitling for the Deaf and Hard of Hearing (SDH) has become an important type of audiovisual translation. Although a considerable amount of research has been conducted on SDH in different parts of the world, few empirical studies have focused on the pedagogical training of future audiovisual translators in the Arabic-speaking countries. This study investigates the effectiveness of SDH training for Moroccan students at the university level by analyzing the quality of English-to-Arabic subtitling and identifying the linguistic and technical difficulties faced in the translation process. This study adopted a mixed-methods design to analyze twenty-eight SDH projects produced by undergraduate and master's students from three Moroccan universities. Translations were evaluated using Matamala's framework of audiovisual competence of translators across nine quality dimensions; quantitative data were analyzed by descriptive statistics and one-way ANOVA. The problems of translation of idiomatic expressions, acoustic information, segmentation of the subtitles, timing, and cultural adaptation were identified through qualitative analysis. The findings indicate that overall students' quality of subtitles improves as they advance in their studies, with the master's students in their final year of study scoring better than the undergraduate students, especially in the representation of information from non-verbal acoustic sources and in the production of better subtitles. However, there were some difficulties in the translation of idiomatic language, the preservation of sound effects, identification of the speaker, and adherence to subtitle segmentation and synchronization rules. These findings emphasize the importance of adopting explicit teaching methods in SDH conventions, the evaluation of subtitle quality and practical training in audiovisual accessibility for strengthening accessibility-related translator education. The study contributes to the existing body of research on SDH pedagogy in the Arab world and offers evidence-based ideas for improving the curricula of AVT in Moroccan higher education.

Keywords. Subtitling for the Deaf and Hard of Hearing; Audiovisual Translation; Translator Training; Subtitle Quality Assessment; Audiovisual Accessibility; Moroccan Higher Education.

Introduction

As a result of the development of digital media and global streaming platforms, the amount of audiovisual material created, disseminated and consumed is growing rapidly, which leaves a growing need for high-quality audiovisual translation. The field of AVT, which spans translation studies, linguistics, media studies and accessibility, is now an integral part of the contemporary process of intercultural communication. Subtitling is one of the most common types of audiovisual translation, as it helps reach linguistically and culturally diverse audiences and maintains the original soundtrack (Díaz Cintas & Remael, 2021).

The term 'subtitling' has been traditionally linked to interlingual translation, which involves the conversion of spoken language into written language in another language. Yet, audiovisual accessibility is more than the transfer of language. Audiovisual content for deaf and hard-of-hearing audiences must be provided with subtitles that carry not only audio information (verbal dialogue) but also meaningful audio information which helps with the understanding of the narrative. As a result, SDH has become a specific form of AVT that facilitates equal opportunities to access AV media. SDH not only produces the speech, but also provides additional paralinguistic elements such as identification of the speaker, sound effects, music cues, and so on, which help determine the speaker's emotion, atmosphere, and story progression that can be understood visually by the viewer but not acoustically by the listener (Neves, 2005; Szarkowska, 2020).

The development of SDH is part of a wider global trend to enhance access to media and social inclusion. As audiovisual content is increasingly made available via streaming platforms and digital broadcasting, accessibility has become a right and is now guaranteed by international and national legislation (Szarkowska, 2020). In the field of AVT studies, therefore, researchers have become more interested in the extent to which subtitles are accessible to viewers, how viewers receive and respond to them, and in the quality of the subtitles and the competence of the translator (Romero-Fresco, 2015). Empirical research has shown that good SDH is more than just accurate dialogue transcription. A range of factors can impact comprehension and viewing experience for Deaf and Hard of Hearing viewers, including subtitle segmentation, reading speed, synchronisation, and the representation of non-verbal sounds (Romero-Fresco, 2015; Burnham et al., 2008).

These advances have also had an impact on translator training and education. Models of AV competence in the 21st century acknowledge subtitling as a complex activity that involves linguistic, technical, strategic, and technological skills. Given the limited screen size and duration of subtitles, translators have to be constantly balancing the three factors of fidelity to the source text, readability of the translated text, and technical specifications of subtitling (Gottlieb, 1992; Díaz Cintas & Remael, 2021).

SDH research has witnessed substantial growth in the last 20 years. However, the majority of empirical studies have concentrated on European contexts, where accessibility policies and professional subtitling practices are well established (Romero-Fresco, 2015). There is relatively little research that has focused on SDH in Arabic-speaking countries and on the preparation of future audiovisual translators. In Morocco, AVT has gradually become one of the key elements of Translation Studies programs in universities. Students are taught both theory and practice of

subtitling to prepare them for the growing market for AVT. However, there is little empirical evidence on the effectiveness of SDH training in Moroccan higher education and on how efficiently the acquired professional competencies produce accessible subtitles for deaf and hard-of-hearing communities in accordance with the internationally recognized quality standards.

The present study addresses this gap by investigating the SDH translations produced by Moroccan university students from English to Arabic, in the context of a competency-based framework. The study draws on the theory of audiovisual translation (Díaz Cintas & Remael, 2021; Gottlieb, 1992), accessibility (Neves, 2005; Romero-Fresco, 2015), and translation quality assessment (House, 2015) to assess students' produced subtitles and to explore the linguistic and technical issues arising in the process of subtitling. Specifically, it aims to evaluate students' SDH translations in their entirety, explore the main difficulties they encounter when translating from English to Arabic, examine students' translation performance in relation to recognized models of audiovisual translation competence, and offer pedagogical recommendations to enhance SDH education in Moroccan universities.

Literature Review

SDH's goal is to make audiovisual content as accessible as possible. It is acknowledged as a specialized sub-discipline of audiovisual translation, and has been extensively studied by Matamala and Orero (2010), in the first monographic volume ever devoted to the subject of this typology of translation. They approach it from a multidisciplinary perspective, including works from the field of engineering, linguistics, translation studies, and accessibility research, and they share findings from a number of Spanish research projects on subtitle accessibility. Furthermore, they state that SDH should not be restricted to the transcriptions of spoken dialogue. It must also incorporate non-verbal auditory information such as sound effects, music, environmental sounds, emotions, and speaker identification. As Szarkowska (2020) points out, modern overviews of SDH share this emphasis on these special features as key elements of accessible subtitling. These studies also examine the technical modes of subtitle production (live, semi-live and pre-recorded subtitles), as well as the legislation and the European accessibility rules which have enabled SDH to extend to a wide range of countries.

Romero-Fresco (2015) presents the results of the DTV4ALL project, the largest multinational study on SDH in Europe so far. Three complementary research methods were used in this project: audience opinion surveys, comprehension tests using audiovisual excerpts with subtitles, and eye-tracking experiments with over 71,000 observations of subtitles. The mixed-method approach allowed them to study subjective user preferences as well as objective viewing behavior. The project's most significant contribution was the idea of using the concept of viewing speed in the consumption of audiovisual materials, which is adapted from the traditional concept of the speed of reading. One of the most significant conclusions is that the viewers seem to have a preference for full (verbatim) subtitle display, despite the relatively high rate of display. The verbatim subtitles at about 10-12 characters per second were an ideal choice for the Deaf participants, despite being aware that this would sometimes be too fast for them to read comfortably. They chose to accept the higher volume of reading because removing information from a subtitle

would mean loss of audiovisual content that they cannot hear. In contrast, hard-of-hearing viewers seemed to prefer showing subtitles at a slower speed because they have partial access to the soundtrack.

Similarly, Burnham et al. (2008) examined the impact of subtitle presentation speed (fast or slow) and text reduction (e.g., full or partially suppressed) on deaf and hard-of-hearing adults. Their results demonstrated that participants' reading ability was the strongest predictor of comprehension. Reducing subtitle speed or text density benefited the skilled readers, who performed better than the less skilled readers, in terms of comprehension.

Cambra et al. (2009) investigated the understanding of TV programs by deaf students in Spain. They found that many students struggled to fully understand the meaning of audiovisual text even when they received all of the subtitles. These restrictions were largely due to reading skills and to the speed at which the subtitles were presented, which most of the time exceeded the comfortable reading pace of the viewers.

Matamala and Orero (2021) have pointed out the core competencies that should be involved in the training of audiovisual accessibility professionals, especially in the areas of audio description and specialized subtitling. Based on their research, they propose that translator education should involve both theoretical training, such as accessibility legislation, international standards and professional style guides, and hands-on practice to make it possible for students to create subtitles that meet recognized accessibility requirements.

These studies indicate that accessibility should no longer be regarded as an optional specialization within audiovisual translation. Instead, it constitutes a fundamental professional competence that should be systematically incorporated into translator education to prepare graduates for the increasing demand for accessible audiovisual content.

Methods

This study employed a mixed-methods design to examine Moroccan university students' performance in SDH from English to Arabic. A cross-sectional approach was adopted to compare subtitle quality across different stages of translator training.

The study was conducted between November 2024 and January 2025 at three Moroccan institutions offering audiovisual translation training: Mohammed First University (Oujda), Abdelmalek Essaâdi University (Tetouan), and the King Fahd School of Translation (Tangier). The dataset comprised 28 English-to-Arabic SDH projects purposively selected from a corpus of 89 student submissions. Only complete individual coursework submitted for assessment was included. The sample consisted of third-year undergraduate students (32.1%), first-year master's students (32.1%), and final-year master's students (35.7%).

Translations were evaluated using Matamala's (2017) audiovisual translation competence framework, which assesses four dimensions relevant to SDH: acoustic information, emotional tone, speaker identification, and overall effectiveness. Each dimension was rated on a five-point scale ranging from 1 (inadequate) to 5 (excellent).

Quantitative data were analysed using IBM SPSS Statistics (Version 27). Descriptive statistics were calculated for all quality dimensions, and one-way ANOVA was performed to examine differences across academic levels ($\alpha = .05$).

The qualitative analysis adopted an inductive approach to identify recurring linguistic patterns and translation difficulties. Particular attention was given to idiomatic expressions, grammatical transfer, lexical choice, register, and culturally specific references. Selected excerpts from previous interviews with the same student cohort were also used to contextualise the translation choices and reported challenges.

All translations were anonymized prior to analysis, and the use of independent raters and an established assessment framework enhanced the credibility and consistency of the findings.

Results

A total of 28 student SDH translations were analysed, including 9 undergraduates, 9 first-year MA, 10 final-year MA. First, overall effectiveness, which is related to the average of all quality dimensions, differed significantly across academic levels; advanced students in second-year MA (MA2) had the highest mean ($M=3.9$, $SD=0.4$), followed by first-year MA (MA1) ($M=3.4$, $SD=0.5$) and undergraduates (UG) ($M=3.1$, $SD=0.6$). One-way ANOVA confirmed a significant effect of training level on overall quality, $F(2,25)=4.72$, $p<.05$. These results indicate that MA2 scores were significantly higher than undergraduate scores ($p=.015$), whereas the first-year MA group did not differ significantly, as shown in Table 1. Second, acoustic information representation also improved with training. Advanced students (MA2) scored higher ($M=3.6$, $SD=0.7$) than MA1 ($M=3.0$, $SD=0.8$) and UG ($M=2.8$, $SD=0.9$). ANOVA revealed that this difference was significant, $F(2,25)=5.12$, $p<.05$, indicating that only the most advanced translators consistently included sound effects and music cues. Third, emotional tone showed significant improvement; mean scores were 2.5 (UG), 2.9 (MA1), 3.3 (MA2), $F(2,25)=2.10$, $p=.14$. Fourth, speaker identification means were 3.0 (UG), 3.2 (MA1), 3.5 (MA2), $F(2,25)=2.45$, $p=.10$. Although MA2 averages were descriptively higher, the effects did not reach significance ($p>.10$ for both). This suggests that while advanced students tended to better capture tone and identify speakers, variability was high and group differences were not robust.

These quantitative outcomes are summarized in Table 1. The table reports group means, standard deviations and ANOVA statistics for the four key dimensions.

Table 1. SDH four dimensions

Dimension	UG	MA1	MA2	ANOVA F(df)	P value
Overall effectiveness	3.1 (0.6)	3.4 (0.5)	3.9 (0.4)	4.72 (2,25)	.018*
Acoustic information	2.8 (0.9)	3.0 (0.8)	3.6 (0.7)	5.12 (2,25)	.013*
Emotional tone	2.5 (0.8)	2.9 (0.9)	3.3 (0.9)	2.10 (2,25)	.140
Speaker identification	3.0 (1.0)	3.2 (0.8)	3.5 (0.7)	2.45 (2,25)	.102

As for the qualitative analysis, three main themes were identified:

1. Literal transfer and register mismatch.

Many students rendered English idioms and colloquialisms into very literal Modern Standard Arabic, resulting in inappropriate register. For example, students frequently relied on literal translation when rendering English idiomatic expressions, producing subtitles that were grammatically acceptable but pragmatically inappropriate. For example, the expression "He's pulling your leg" was translated as "إنه يسحب ساقيك", preserving the lexical meaning of the source text while failing to convey its idiomatic sense. A more natural SDH translation would be "إنه يمزح معك" (he is joking with you). Similar instances suggest that students

prioritized lexical equivalence over functional equivalence, a tendency previously documented in English–Arabic translation (Dickins et al., 2017).

2. Omission/under-description of acoustic cues

Students frequently omitted or minimally described background sounds and music. As one student confessed, "*I left out the [siren sound] in the subtitle because I wasn't sure how to phrase it*". Similarly, another commented, "*The music was mentioned in the script, but I didn't include it in the subtitle to avoid confusion*". This suggests many students were uncertain about how to integrate non-verbal sound information, as illustrated in Table 2:

Table 2. Omission and under-description of acoustic cues

Original audio	Student subtitle	Recommended SDH subtitle
[Door slams]	(omitted)	[يُغلق الباب بعنف] (The door slams violently)
[Thunder rumbling]	[رعد] (Thunder)	[دوي الرعد في الخلفية] (Thunder rumbles in the background)

Several students omitted speaker labels when the speaker was off-screen. For instance, an off-screen utterance, "Open the door!", was subtitled simply as "افتح الباب" without identifying the speaker. According to SDH conventions, a subtitle such as "الأم: افتح الباب" (Mother: Open the door) would enable deaf viewers to attribute the utterance correctly.

3. Segmentation and timing errors

Several translations showed misaligned timing or improper segmentation of subtitles. One participant explained, "*I combined two lines into one subtitle to fit the time, even though it breaks subtitle rules*." Another said, "*Sometimes the subtitle appeared too late; I struggled to sync it with the actor's lip movements*." These remarks highlight difficulties with pacing and subtitle-breaking strategies (see Díaz Cintas & Remael, 2021).

Discussion

The findings suggest that the training of translators significantly contributes to the improvement of SDH quality. The performance of MA students in their final year in producing effective SDH, including acoustic cues, was higher than that of the undergraduates. This corroborates the idea that AVT competence improves through training and that practical experience helps students to develop AVT market requirements. The highlighted difference in the performance of students of different academic levels is consistent with the findings showing that advanced training has a significant impact on the quality of the subtitling (Romero-Fresco, 2015; Matamala & Orero, 2010). The lower scores by undergraduates imply that they may not be ready to understand best practice for SDH yet.

The strong effect for acoustic information specifically indicates that advanced students were much better at conveying sound effects and music. Pedagogically, this is significant because Neves (2005) and Szarkowska (2020) have both stressed that environmental sounds and music play a vital role in the comprehension of narratives by deaf and hard-of-hearing audiences. The undergraduates' low acoustic scores indicate that their first training might not focus well on describing non-dialogue sounds. Targeted exercises to identify and translate sound cues, therefore, should be part of future curricula (Romero-Fresco,

2015). Yet, other factors, such as emotional tone and speaker identification, were statistically insignificant. Each student from MA2 was descriptively higher, but no statistical difference may be due to the small sample size and/or to inconsistent teaching of these skills. Considering the importance of tone and speaker labels as part of SDH (Matamala & Orero, 2010), their relatively poor gains suggest that more explicit teaching in this domain is needed.

The qualitative themes corroborate and enrich the quantitative patterns. The prevalence of literal and register-inappropriate translations aligns with the fact that the linguistic discrepancies between English and Arabic, as Dickins et al. (2017) note that literal renderings often result in overly formal or unnatural Arabic because English idiomaticity requires creative adaptation. This indicates that the students were more likely to use direct transfer, which may be attributed to the lack of practice in using Arabic idioms or loyalty to the original script. Likewise, the omissions match the low ratings (UG, M(2.8); SD(0.8)) in the acoustic dimension. Comments by students show that there is no total agreement on whether or not to use sounds; this suggests that students may miss some cues due to either lack of confidence or to reduce workload, which may cause loss of context for viewers (Neves, 2005). Last but not least, segmentation and timing errors were common subtitling issues. These errors may suggest that pacing may hamper comprehension (Romero-Fresco, 2015). This inadequacy may be attributed to a lack of practice in timing strategies.

The overall results indicate that there is room for targeted interventions to improve the current SDH training in Morocco. Following Matamala's framework (2021), we suggest using explicit SDH quality criteria in coursework and focusing more on transcreation of idioms than literal translation. Professors should incorporate non-verbal tasks (like the translation of sound effects from films), feedback on segmentation and pacing of subtitles (Díaz Cintas & Remael, 2021). It can also be important to include native deaf and hard-of-hearing viewers in the evaluation or peer-review process to make students aware of the significance of these features (Romero-Fresco, 2015).

Conclusion

The current study aimed to analyse the effectiveness of SDH training for Moroccan university students by assessing the quality of English-to-Arabic subtitle translations and determining the problems related to the process of translation. The research employed a mixed-methods approach that showed that students' SDH competence has improved with academic level. Final-year master's students produced significantly higher-quality subtitles than undergraduate students, particularly in representing acoustic information and achieving greater overall subtitle effectiveness. These findings suggest that sustained translator training positively contributes to the development of both linguistic and technical competencies required for accessible audiovisual translation.

Despite the significance of the findings, there were some consistent challenges identified in the analysis. Students often relied on literal translation for the translation of idiomatic expressions, omitted or failed to describe the non-verbal acoustic information, and had problems with subtitle segmentation, synchronisation and speaker identification. Students' learning of general competence in translation in their studies highlights that some conventions used in the SDH have not been sufficiently addressed in the training. The lack of these features could affect the effectiveness of subtitles and result in limited accessibility, especially for deaf and hard-of-hearing individuals.

The conclusions reached are of pedagogic interest for audiovisual translation programmes in Morocco and other Arabic-speaking contexts. Accessibility-focused translator training should be given greater importance, with a focus on practical exercises on translating sound effects, music cues, and speaker identification, as well as training on internationally recognized SDH guidelines, and systematic training on subtitle timing and segmentation, in the University curricula. Furthermore, authentic subtitling software, project-based learning, and quality assessment systems would enhance students' future preparation for the professional requirements of the AVT industry.

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