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Exposure to English as a foreign language  
through subtitled videos: The impact of  
subtitles and modality on cognitive load,  
comprehension, and vocabulary  
acquisition

Ekspozycja na język angielski jako język  
obcy poprzez materiały wideo z napisami:  
wpływ napisów oraz modalności na  
wysiłek poznawczy, zrozumienie oraz  
przyswajanie słownictwa

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na Wydziale Anglistyki

Uniwersytetu im. Adama Mickiewicza w Poznaniu

pod kierunkiem prof. UAM dr hab. Pawła Schefflera

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## OŚWIADCZENIE

Ja, niżej podpisany/a

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### przedkładam rozprawę doktorską

pt. Exposure to English as a foreign language through subtitled videos: The impact of subtitles and modality on cognitive load, comprehension, and vocabulary acquisition

(Ekspozycja na język angielski jako język obcy poprzez materiały wideo z napisami: wpływ napisów oraz modalności na wysiłek poznawczy, zrozumienie oraz przyswajanie słownictwa)

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na Uniwersytecie im. Adama Mickiewicza w Poznaniu

i oświadczam,

że napisałem/am ją samodzielnie.

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Jednocześnie przyjmuję do wiadomości, że gdyby powyższe oświadczenie okazało się nieprawdziwe, decyzja o wydaniu mi dyplomu zostanie cofnięta.

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## List of abbreviations and symbols

CEFR	The Common European Framework of Reference for Languages
CL	cognitive load
CTML	Cognitive Theory of Multimedia Learning
DCT	Dual Coding Theory
EFL	English as a Foreign Language
ELLiE	Early Language Learning in Europe project
ELT	English Language Teaching
ESL	English as a Second Language
FL	foreign language
L1	native language
L2	second/foreign language
LLN	Language Learning with Netflix
RVKS	Revised Vocabulary Knowledge Scale (test)
SLA	Second Language Acquisition
TL	target language
VOD	Video On Demand

Experimental groups – symbols:

AUD	audio only (no subtitles, no video)
AUDENG	audio, English subtitles, no video
AUDPL	audio, Polish subtitles, no video
VID	video only (no subtitles, no audio)

VIDENG	video, English subtitles, no audio
VIDPL	video, Polish subtitles, no audio
FULL	audio, video, no subtitles
FULLENG	audio, video, and English subtitles
FULLPL	audio, video, and Polish subtitles

## Introduction

Watching movies, television programmes and series now is very different from what it is used to be ten or fifteen years ago. Technological advancement has made access to foreign language videos remarkably easy: one can watch them by means of all sorts of (mobile) electronic devices in all sorts of viewing modes: with the original soundtrack, dubbing, native or foreign language subtitles. The availability of such audiovisual materials has not only increased the number of entertainment options at our disposal, but it has also opened up new avenues for foreign language learning. Currently, many foreign language (FL) learners all over the world engage in this form of learning which is not only enjoyable, but also, as experimental research says, generally effective.

Needless to say, this increased interest in the use of FL videos in and outside English as a Foreign Language (EFL) and English as a Second Language (ESL) classrooms spurred researchers to examine the effects of exposure to foreign language audiovisual materials on various aspects of language learning. What is frequently addressed in research is the question of which subtitling condition has most facilitative effects on language learning since the results of previous studies indicate that both native language and foreign language subtitles can be conducive to comprehension and learning under certain circumstances. Of particular interest is also the role of modality in learning as, on the one hand, dual-modality input may potentially strain our processing capacity and impair comprehension, but, on the other hand, it may bolster comprehension by sending the same information via different channels.

The present dissertation ties in with these current trends as it aims to investigate the impact of exposure to subtitled videos and the impact of modality on comprehension, vo-

cabulary learning, and cognitive load. The thesis is divided into five chapters. The first chapter includes an extensive overview of studies that address the role of exposure to media and foreign language movies in developing different language skills. The chapter also contains a theoretical discussion of the benefits and potentially negative aspects of watching FL movies with and without subtitles, and a discussion on the differences between various subtitling conditions. Chapter 2 focuses on the notion of cognitive load, its types and measurements, as well as Cognitive Load Theory with its practical implications on learning. The third chapter delves into modality, comprehension and vocabulary, and it contains a review of studies that take a closer look at the impact of modality on comprehension and vocabulary acquisition. Chapter 4 is a description of my own experimental study in which Polish upper-intermediate learners of English were randomly assigned to one of 9 experimental groups that differed in terms of subtitling and modality conditions, and watched a video clip in the assigned viewing condition. The results of the study are discussed in Chapter 5, and they offer some practical implications for FL learners and teachers, as well as shed some light on the gaps in the previous literature in the field.

# **Chapter 1: The use of foreign language movies and subtitles in ELT**

## **1.1. Introduction**

Technology has for a long time been an important pillar of foreign language education. As Richards (2015: 638) says, “From Sumerian clay tablets over 5,000 years ago, to printed books in the middle ages, to tape recorders, projectors with filmstrips, photocopiers and the language laboratory with audio recorders in the 1960s, language teachers have always made use of technology available to them”. Today, many educators around the world champion the use of new technologies in English Language Teaching (henceforth ELT) believing that such tools have multiplied the opportunities for both teaching and learning foreign languages. In particular, the use of foreign language videos is becoming increasingly popular in and outside EFL and ESL classrooms. As Trinder (2017: 410) points out, “finding out more about how students use available media and juxtaposing their preferences/strategies with available research (that focuses, for example, on the effects of subtitling on the uptake of vocabulary) is a first step towards making classrooms more relevant and private learning environments more effective for learners”. This is, after all, a primary goal of foreign language education.

The present chapter starts with a review of the literature on the use of media in ELT, including large-scale international projects investigating, inter alia, the use of foreign language media (films, radio, TV etc.) for foreign language learning purposes in different European countries. This review is followed by sections focusing specifically on FL videos. First, on the basis of previous literature, the advantages, potential disadvantages, and the impact of FL films on the development of different language skills are described. Since FL

videos may be viewed in different screening modes, subsequent sections focus on the use of subtitles. After a short discussion of potential problems associated with watching subtitled movies, the benefits of exposure to subtitles and experimental evidence on how they influence the development of foreign language proficiency are described. The final section deals with the differences between L1 and L2 subtitles and their impact on language learning.

## **1.2. The importance of using media in FL learning: large-scale projects**

Success in foreign language learning has been of interest not only to teachers, parents and learners themselves, but also to educational policy makers. “Language Policy in Europe” (Kutyłowska 2013) is a report which aims to outline the main European trends in education and language policy, and to present how the solutions adopted in Poland fit in with these tendencies. Since the number of hours devoted to formal language education is limited, the role of informal language learning in Europe is becoming increasingly important as it may complement formal language education as well as be a starting point in the process of learning another foreign language (Kutyłowska 2013: 91). Among other things, the report presents concrete ideas for exploiting the potential of media in foreign language learning, which include arousing interest in foreign languages (social campaigns, documentaries about other cultures, etc.), motivating people to learn foreign languages and teachers to teach creatively (e.g. promoting the use of authentic materials, online resources, encouraging teachers to exchange experiences via the Internet, etc.), or ensuring constant contact with languages other than the native (e.g. access to foreign language movies with subtitles) (Kutyłowska 2013 :92). The report also shows that learning foreign languages with the use of FL movies and radio is a common practice among Europeans (Kutyłowska 2013: 101). It is most popular in Sweden (52%), Denmark (47%) and Malta (47%), that is countries which broadcast FL movies with subtitles. Interestingly, exposure to FL movies and radio is considered to be useful in Latvia (33%) and Lithuania (30%), despite the fact that in these countries, like in Poland, voice-over is the predominant screening mode, at least in public television. In Poland, only 11% regarded exposure to FL movies and radio as a way to learn a foreign language (Kutyłowska 2013: 101-102).

In terms of free-time activities and exposure to a FL outside the classroom, watching FL television and movies has come to eclipse reading books in L2. For example, Peters

(2018) investigated out-of-class exposure to English and its correlation with vocabulary knowledge in the case of Flemish EFL learners from secondary schools and first-year university students. Seventy-nine participants filled out a multiple-choice vocabulary test measuring their overall vocabulary knowledge, and a questionnaire adapted from the European Survey of Language Competences (European Commission 2012). In general, the results demonstrate that L2 learners in Belgium much more frequently engage in watching FL movies and television or listening to songs than reading FL books. For example, over 90% of the respondents reported listening to songs a few times a week, over 40% declared watching subtitled TV programs a few times a week, around 40% watched subtitled movies a few times a week or a few times a month. In contrast, around 50% of the respondents reported reading books only a few times a year and over 30% reported to have never read a book in English. As for reading FL magazines, nearly 60% of 16-year-olds, and nearly 40% of 19-year-olds reported never reading a FL magazine, and over 20% of 16-year-olds and around 30% of 19-year-olds reported reading magazines only a few times a year. Moreover, Peters (2018) found significant positive correlations between exposure to FL movies and TV-programs without subtitles and learners' vocabulary knowledge, although such positive correlations were also found between exposure to books, magazines and websites and vocabulary knowledge. With regard to factors affecting vocabulary knowledge, out-of-class exposure to English turned out to have a larger effect on vocabulary knowledge than length of instruction, even though both factors positively affected vocabulary knowledge.

Numerous large-scale projects investigating students' achievement have been undertaken in different countries in order to find the reasons behind the differences in the learning outcomes of students from different countries as well as to find the most useful practices and to popularize them. The following sections present selected international projects in this area.

### **1.2.1. “In the presence of English: Media and European Youth” 1995-2000**

In their international project, Berns et al. (2007) set out to explore, inter alia, the role of English in young people's lives, and the consequences it has for language teaching. The participants of the study were 2 248 students aged 12-18 from four countries: Belgium, France, Germany and the Netherlands. The students attended different types of schools:

secondary, vocational, extended elementary, university preparatory schools; there were monolingual as well as bilingual schools. The researchers administered a standardized survey which consisted of questions pertaining to four different aspects: general background information, language contact in and outside school, attitudes towards languages, and language proficiency. The students' proficiency was determined by means of self-assessment "can-do" scales, and a vocabulary test in which the students had to distinguish real words from non-existing words.

The results show that school is far from being the only place of contact with the target language. Of particular interest are the respondents' reports on their contact with English through watching English TV programs and listening to English radio programs. In total, 72.2% of the respondents declared that they watched TV programs, and only 12.5% listened to the radio. When broken down by groups from different countries, the results indicate that the number of students who watch English programs is greater in Dutch and Belgian groups than in German and French groups. The researchers claim that the differences stem from different national broadcasting policies:

Dutch and Belgian networks often subtitle rather than dub English language programs, thereby offering students in these countries more opportunities for contact with English through TV (Berns et al.2007: 60)

Moreover, most students who declared watching English programs did it at least once a week, which suggests that the exposure to authentic programs in the target language was quite frequent. Hence, the use of media constitutes an integral part of young people's lives, which may exert a significant impact on learning English. As the researchers conclude:

our findings clearly demonstrate that young people selectively choose the media which then build their media environment, which may differ quite substantially from group to group. These differences correspond to differences in English proficiency and underscore that proficiency may not be conceptualized as a one-dimensional construct. Instead, young people develop very specific and differentiated patterns of English proficiency (Berns et al. 2007: 109)

### **1.2.2. "The assessment of pupils' skills in English in eight European countries" 2002**

"The assessment of pupils' skills in English in eight European countries" project from 2002 (Bonnet 2002) aimed to assess students' attainment in English as a foreign language and to

provide implications for practitioners and policy makers from different European countries to help them enhance teaching and learning English. In each of the seven countries taking part in the project, a representative sample of around 1500 students per country was selected, with a total of 11 511 participants. Assessment was based on the results of a test covering linguistic knowledge, written comprehension, written expression, and listening comprehension. The results of the test were supplemented by a self-assessment instrument which consisted of “can-do statements” based on level B1 (CEFR). In addition, there was a pupil questionnaire which contained questions covering four areas: English language contact through the media and in personal contacts, attitudes towards the English language, socio-economic background of pupils, and language proficiency. Finally, a teacher questionnaire was administered to obtain data on teachers’ qualifications, professional experience, teaching practice, the use of resources (e.g. how often they used video materials), and the teachers’ opinions on the difficulty of the assessment test used in the study.

The results of the pupil questionnaire indicate that students take advantage of the media to learn English. The data on general media use show that 82.5% of the pupils from the Netherlands, 78.7% from Denmark, 78.4% from Sweden, and 82.5% from Norway have contact with English through various media (videos, TV, games, the Internet). Moreover, the vast majority of students from all surveyed countries declared watching English language TV programs, either with or without subtitles. The students were also asked to estimate in percentages how much they learned at school, through the media, and other resources. While still most learning occurs in the classroom, the students’ responses indicate that for them media constitute an important part of foreign language learning as well:

Overall, school seems to contribute between 52% and 64% with a mean of 57%. There is a wider range for the role for media as a source: while in Spain it was estimated to be about 15%, it was close to 35% for Norway (Bonnet 2002: 96).

The teacher questionnaire showed that 96% of the teachers surveyed used a textbook to teach English. Most of them also used some additional resources, though not very often. For example, when it comes to video cassettes designed for teaching/learning English, only 1% of the teachers used them very often, 10% often, 56% sometimes, and 33% very rarely. Similarly, video cassettes with varied content were used very often by only 1% of the teachers, and often by 14% of the teachers. In general, it was found that exposure to media is considered an important aspect of language teaching and learning. The researchers came to the conclusion that in Denmark “the pupils who have contact with the English language

via CD/tapes, cinema, magazines, books or the Internet very often, often or sometimes obtain higher test results than the pupils who never have such contact” (Bonnet 2002: 115). Similarly, in Germany, the researchers observed that exposure to media goes together with higher achievements in learning English:

Considering single items, to attend English TV programs appears to be correlated positively with all the test results. Listening to English radio programs is positive for linguistic knowledge test results (Bonnet 2002: 133).

Further, media can boost motivation for learning. In Norway, Sweden, or the Netherlands for example, students declared that the willingness to understand FL movies made them more motivated to learn English. The juxtaposition of the test results from different countries and the amount of exposure to media demonstrates that students benefit from for example watching films and listening to music in the target language in terms of foreign language attainment. Pupils from France and Spain obtained the lowest mean scores for all components of the assessment test. At the same time, French and Spanish students declared not having much contact with English through the media. Moreover, they did not see the use of various media as a valuable resource for learning. Thus, in the light of the above-mentioned correlations, one of the most important implications for educators to emerge from the survey seems to be the necessity to increase the amount of exposure to media and the promotion of the use of audiovisual and authentic learning materials.

### **1.2.3. “Early Language Learning in Europe project” 2007-2010**

The “Early Language Learning in Europe”(ELLiE) project (Enever 2011) explored the influence of different factors on primary school learners’ foreign language proficiency from a range of European countries. In total, c.1400 children (170-200 per country) took part in the study. The research instruments included a variety of questionnaires and interviews (school principal interviews, class teacher and foreign language teacher interviews, class questionnaires on attitudes, focal learners’ interviews, and parents’ interviews), as well as class observations and class listening, reading, speaking and vocabulary tasks. In terms of out-of-school contact with the target language, the researchers found that there were substantial differences between the countries. For example, students from England did not have many opportunities for contact with French or Spanish, but students from the Netherlands or

Sweden had a fair amount of exposure to English. Moreover, there were differences in terms of access to FL films and TV-series. To take one example, in Poland, Italy, and Spain, the access to undubbed films was limited, which resulted in limited exposure to the target language. Overall, the results indicate that out-of-school exposure to a foreign language plays a significant role in FL learning and is conducive to young learners' FL proficiency, especially in terms of developing reading and listening comprehension. On the basis of these findings, the following recommendations have been made to enhance foreign language learning:

To ensure progress at the level of the immediate learning environment, teachers and parents need to work together to provide a supportive and friendly atmosphere by acknowledging the significance of language learning and appreciating children's efforts, while also providing frequent opportunities for contact with the target language. At the country level, policy-makers and educators could contribute to richer exposure to the target language/s by promoting language learning using the media, encouraging TV programmes and films for children in original language versions (Enever 2011: 142)

Lindgren and Muñoz (2013) conducted a sub-study of the ELLiE project which focused specifically on the role of parental influence, exposure to English outside the classroom, interaction with FL-speaking persons, and cognate linguistic distance in the development of FL listening and reading skills. The participants of the study were 865 children from seven countries: Poland, Croatia, Italy, Sweden, the Netherlands, Spain, and England. Data collection instruments included reading and listening tests, and a questionnaire on parents' education and use of the FL, children's exposure to FL media, speaking, listening reading in the FL, as well as interactions with FL-speaking persons. Additionally, cognate linguistic distance was determined using the measurement introduced by Dyen et al. (1992). Lindgren and Muñoz (2013) found that cognate linguistic difference was the strongest predictor for reading and listening, however, the second best predictor was out-of-school exposure to English. Among different forms of out-of-class contact with English, watching subtitled movies had the strongest impact on the development of listening and reading skills.

#### **1.2.4. "First European Survey on Language Competences" 2011**

The "First European Survey on Language Competences" project (Jones et al. 2012) aimed to investigate the foreign language proficiency of 53 000 secondary school students from 16 educational systems in Europe. In each educational systems, the researchers tested the

two most commonly taught foreign languages. The research instruments included questionnaires and language tests on listening, reading, and writing. The results regarding the use of media as a tool for learning a foreign language are coterminous with findings from earlier large- scale projects:

In general, a very large positive effect appears of students' target language exposure and use through traditional and new media on language test scores; this means that more exposure and use goes together with higher test scores. This holds for all skills and almost every educational system and language (Jones et al. 2012: 78)

### **1.2.5. Special Eurobarometer: “Europeans and their languages” 2012**

The Eurobarometer survey, “Europeans and their languages”(European Commission 2012), conducted in 2012 in twenty- seven EU countries (c. 26 751 respondents), investigated the exposure to and the use of foreign languages in Europe. As the survey shows, the most common way of learning a foreign language is through formal education at school. For example, 68% of Europeans reported having learnt a foreign language in this way, while only 11% reported having learnt another language through watching television, films or listening to the radio (European Commission 2012: 100).

The survey also investigated the regular use of foreign languages in different situations/contexts. For example, the use of a FL while watching TV/films or listening to the radio received most mentions by respondents in Malta (82%), Luxembourg (73%), and Sweden (72%), and fewest mentions by respondents from Italy (15%), Austria (22%), Hungary (23%) and Poland (24%). The survey reveals that in Poland, contact with foreign languages is quite limited since in five areas (communicating with friends, conversations at work, reading books, communicating with family members, and studying something else that the foreign language) Poland had the lowest percentage of all the countries. The most common area of FL use was going on holiday abroad, but still, it was only 32%. By contrast, respondents from Luxembourg reported the most frequent use of foreign languages of all the countries in six areas (communicating with friends, conversations at work, reading books, communicating with family members, writing e-mails at work, and reading at work) (European Commission 2012: 52).

As for watching foreign language movies, 44% of all respondents preferred subtitles to dubbing. When broken down by country, the results show that the respondents from

Sweden (96%), Finland (95%), Denmark (93%), and the Netherlands (93%) reported a strong preference for subtitles. In contrast, the Czech Republic (79%), Germany (78%), Spain (76%) and Slovakia (75%) expressed a preference for dubbing (European Commission 2012: 119).

Summing up, all of the aforementioned projects corroborated the benefits of out-of-school contact with the target language by means of various types of media. It can therefore be concluded that exposure to FL media, including movies and TV-series, is to be recommended to language teachers and learners, but it should also be promoted by parents and policy makers to facilitate the process of foreign language learning in the case of learners at different levels of proficiency.

### **1.3. The use of films in ELT**

The previous section focused on describing FL students' learning practices from different countries, the role of out-of-school contact with foreign languages, and students' exposure to media as a form of informal learning of foreign languages. One of the areas of interest that were addressed in the abovementioned large-scale studies was the use of FL videos for language learning. The advent of streaming, video on demand (VOD) services such as Netflix, Disney +, or HBO Max contributed to increased exposure to FL movies. In 2015, Nielsen, a global management company, conducted a survey in 61 countries around the globe concerning the use of VOD. In total, over 30 000 online consumers participated in the study. A report from the survey (Nielsen 2016) shows that nearly two-thirds of all the respondents use VOD, and most of them watch it a few times a week or daily.

Of particular importance is the fact that VOD is not used solely for entertainment, but also for foreign language learning. For example, learners using Netflix may make use of various online resources and tools supporting their learning process, e.g. the Chrome extension "Language Learning with Netflix" (LLN), or "Lingvo", a subtitling app (Alm 2021: 260). Still, many FL learners do not take advantage of the affordances granted by technological advancement ignoring the benefits that exposure to FL videos may bring to their target language development. For example, Alm (2021) investigated FL learners' viewing habits while watching FL series on Netflix. It turned out that the students reported watching FL movies mostly for entertainment, usually with L1 subtitles, without paying

attention to language input. However, after the treatment in which the participants had to watch at least 2 episodes per week over seven weeks, the participants were made aware of the availability of LLN offering dual subtitles, and at the end of the project over 95% of the participants reported that they found watching movies with LLN a good way to immerse oneself in L2. The study demonstrates that the advantages of watching FL movies and series as a means of out-of-class informal learning should be popularized among students, since they may not be fully aware of the benefits that FL movies, especially with subtitles, may offer.

The following sections delve into the role of FL video materials, their advantages and disadvantages in terms of language learning, as well as their impact on the development of particular language skills. In addition, there is a short review of studies on learners' perceptions of the usefulness of FL films in FL learning.

### **1.3.1. Potential disadvantages of watching foreign language films**

Foreign language videos were introduced into EFL classrooms in the 1970s as a tool for assisting learners in developing their foreign language proficiency (Brown 2010: 45). Even though since then there has been ample research corroborating the advantages of technology-enhanced exposure to English, the positive impact of FL videos has not been unanimously acknowledged by researchers and educators, and there is some criticism of incorporating FL videos into the learning process.

Watching films has been traditionally perceived as a form of entertainment. It is, therefore, hardly surprising that there are those who espouse the belief that films are “trivial entertainment, a peripheral audio-visual aid, not part of serious study”(Braddock 1996: 4). Because students are not engaged in any pedagogically-sound activities, they may be tempted to “switch off” in class. This may lead students to become only “passive viewers” (Braddock 1996), which makes films appropriate solely for entertainment. Even if it seems to be a thing of the past, despite overall technological advancement, there are still teachers who are not particularly tech-savvy and avoid the use of media in the classroom. This avoidance may also stem from practical reasons as teachers “have a curriculum to follow and limited time to allocate” (King 2002: 511). Being pressurized into following the curriculum and the coursebook, they simply do not have time to incorporate authentic language

materials into a lesson and instead opt for ready-made materials (Gebhard 1996: 89-109). Another aspect of FL videos which may pose a problem is authenticity. Exposure to real-life language input may be overwhelming, especially for students at lower levels of proficiency in the target language. In addition, the lack of experience in watching FL movies may cause problems in using appropriate processing strategies required for comprehension of the video material (Bacon and Finneman 1990). The inability to understand the content of a video due to limited linguistic competence, especially limited vocabulary knowledge, may be strongly discouraging and demotivating for students (Widdowson 1996). Moreover, vocabulary used in an authentic movie may be irrelevant to learners and their current needs (Martinez 2002). Accordingly, teachers may opt for materials adjusted to their learners rather than authentic ones (e.g. Morley and Lawrence 1972).

Apart from authentic videos, there are also the ones specifically designed for learners and for classroom use. However, as King (2002: 509-510) says:

Such classroom-styled videos were intended to maintain student engagement by eliciting specific responses or answers from them based on the viewing material. This was done in ways that required students to “analyze” a multitude of specific linguistic details in a self-conscious manner rather than “absorb” the living language and get a general gist of what was being said

As a result, watching inauthentic videos may be regarded by learners as boring and demotivating (King 2002).

FL vocabulary learning through exposure to FL movies can be also mediated by individual differences among learners that cannot be easily overcome. As Suárez and Gesa (2019: 511) say:

If video content is demanding (relative to the students’ proficiency), novel vocabulary learning is less likely, but higher aptitude could play a role here. If video content is easier (relative to one’s proficiency), novel vocabulary learning is more likely, and aptitude may not be a factor in whether a learner can use the video input to enhance their vocabulary learning. Thus, four factors – the video content difficulty, the amount of novel vocabulary in the video, the proficiency level of the learners, and their language learning aptitude – may interact, counterbalancing or counter-acting each other. When the four factors are aligned at optimum level, there is strong potential for successful new vocabulary learning

Achieving such optimal alignment is, however, no mean feat, and this is why not all learners may at the same time benefit from watching FL movies in terms of vocabulary development.

### **1.3.2. The advantages of watching foreign language films**

Although some potential drawbacks of watching FL films can be found, research evidence abundantly supports the usefulness of exposing learners to FL videos and demonstrates that while watching videos, learners are not passive viewers and they can benefit greatly in terms of overall language improvement. The most prominent features of FL movies which make them such valuable learning tools are: providing input developing multimodal literacy, authenticity, motivation, autonomy, and cultural background.

#### **1.3.2.1. Multimodal literacy**

As we live in a world driven by technology, the concept of literacy has evolved and it no longer pertains only to the ability to decode linguistic elements in print-based texts. The term “multimodal literacy” has emerged in recent years to denote “meaning-making that occurs at different levels through reading, viewing, understanding, responding to, producing and interacting with multimedia and digital texts”(Walsh 2010: 213). In order to respond to the changing reality, educators attempt to intertwine existing curricula with digital technologies (Walsh 2010: 211). Therefore, contemporary schools aim to develop not only literacy but also multimodal literacy to equip learners with skills they need outside the school. One way to address the issue is to incorporate films in the learning process, which allows learners to interact with multimedia, become more effective viewers, and simply work on their multimodal literacy skills.

#### **1.3.2.2. Authenticity**

FL movies have prominently featured in ELT literature as a valuable source of input due to their authenticity. As defined by Harmer (1983: 146), “authentic texts (either written or spoken) are those which are designed for native speakers: they are real texts designed not for language students, but for the speakers of the language in question”. When exposed to authentic movies rather than the ones specifically tailored for their level and needs, learners are afforded the opportunity to experience the target language in real communication (Nunan 1999, Gilmore 2007). Sometimes students may perceive language learning in EFL

classrooms as something artificial, especially if a teacher solely relies on materials made specifically for students. Authentic materials, on the other hand, “can reinforce for students the direct relation between the language classroom and the outside world”(Gebhard 1996: 89-109). In general, research shows that learners tend to watch the type of videos they would watch in their native language as native speakers, for example authentic TV-series or movies (Webb 2014). The language used in authentic movies reflects the language used by native speakers (Taylor 1994) with speech forms that do not occur frequently in regular classroom practice (Stoller 1988: 2), such as colloquialisms or slang expressions. As pointed out by Schander et al. (2013: 411), films “present real life contexts, an opportunity to be exposed to different voices, degrees of formality, reduced speeches, stress, accents, and dialects”. Through watching authentic videos, students are exposed to communicative situations from real life so that they can acquire the language useful for real conversations with native speakers (Talaván 2007), not just the language used for artificial classroom tasks. Although authentic language may be above their current level of proficiency, through frequent exposure learners can enhance the ability to infer the meaning of unfamiliar words (Bacon and Finneman 1990).

### **1.3.2.3. Motivation**

Overall, learners’ motivation affects success in learning. As Mayer (2014: 171) says, it is “the internal state that initiates, maintains, and energises the learner’s effort to engage in the learning process”. Within the framework of self-determination theory (Dörnyei and Ushioda 2011), two types of motivation are distinguished: extrinsic and intrinsic. While the former is linked to practical reasons for studying, such as receiving a reward or avoiding a punishment, the latter is about mental satisfaction from studying where engaging in an activity is its own reward. Even though both types of motivation are the driving force in the learning process, intrinsic motivation is coveted. As Harpine (2015: 84) says:

A prize, an award, and even money, which are all extrinsic, may bribe someone into performing a certain action, but compliance is not true motivation. Even fear may push someone to act, but it is not real long-term motivation. It does not last. It does not bring about long-term change. True motivation must come from within—intrinsic”.

It is hardly surprising that many language learners strive to achieve high levels of proficiency in the target language. As it is usually an arduous process, motivation is crucial in mastering a foreign language. One of the main incentives to learn a foreign language is the ability to understand native speakers. Watching FL films may be a source of intrinsic motivation for students as it results in a “special experience of real feelings of accomplishment when [students] understand what is going on in a situation where native speakers use English” (Rammal 2005: 5). This intrinsic motivation can be also fuelled by the fact that English is perceived as a “cool” language since it is the language of popular foreign language movies and music, which naturally drives the younger generation to study this language (Koolstra and Beentjes 1999: 53). Authentic materials such as FL films help learners notice the link between classroom learning and the “real” use of language outside the classroom, which also boosts motivation towards learning (Melvin and Stout 1987, Nunan 1999, Gilmore 2007). Above all, authentic films are often meant to be entertaining as they are made for native speakers who do not need to focus on any particular language structures. As Edasawa et al. (1990: 21) said, films “can entertain students more and immerse them more without strain in a real situation where the target language is used, compared to video materials made with so many educational purposes that they become boring”. Besides, learners can feel that they are treated like native speakers for whom a FL video was made, which encourages them to achieve native-like proficiency in the target language. Another important benefit of using films in EFL is that they can lower anxiety. As Lin (2002: 43) points out:

Students find themselves in a more relaxed atmosphere in which they can forget about themselves- their egos and their fears about how they appear in the eyes of others- and simply enjoy the viewing experience. These students can better attain the state of enhanced language acquisition, because they are in a state of total comfort.

The unlimited repertoire of authentic films ensures variety, which in turn boosts interest in learning. What can be demotivating for FL students is the difficulty of the learning material, however, FL videos facilitate comprehension by providing visual support, which makes the authentic language used there more student-friendly. As Çakir (2006: 68) points out, “Video makes meaning clearer by illustrating relationships in a way that is not possible with words, which proves a well-known saying that a picture is worth a thousand words”.

#### **1.3.2.4. Autonomy**

Autonomy as defined by Holec (1981: 3) is the “ability to take charge of one’s own learning”, which includes the selection of learning materials and learning techniques to be used. Due to their availability and affordability, foreign language films can help foster learner autonomy (Lin 2002: 47-48). According to Lin (2002: 48), watching FL films encourages learners to undertake more self-learning activities; as he says, “the enjoyment and contentment derived from a good viewing experience may actually drive students toward greater self-directed learning experiences”. Hence, FL films promote learner-centeredness, which in turn fuels motivation towards learning since students do not feel hard-pressed; instead they feel the power to monitor and influence their learning process. In Lin’s (1999) study, students reported that they experienced greater autonomy when they attended a film-based class and that they felt they were in charge of their own learning. Interestingly, the extent to which learners are autonomous may be dependent on their level of proficiency. Kobayashi (2011: 109), for example, claims that “the higher the proficiency of learners is, the more authentic materials they tend to seek for their learning. Likewise, the higher the level of their proficiency, the more benefits they are assumed to gain from watching movies”. Thus, students at higher levels of proficiency are believed to treasure autonomy more than less advanced learners.

#### **1.3.2.5. Cultural background**

Apart from exposing learners to authentic language, FL films provide a “window on English language culture” (Sherman 2003: 3). In this way, authentic films can be used as a springboard for cross-cultural discussions which make students more aware of the similarities and differences between their own culture and that of the target language (Stempleski and Tomalin 1990, Stempleski and Arcario 1992). Further, students are afforded the opportunity to learn about various customs, traditions, and everyday life; as Braddock (1996: 3) said, films are tools “for displaying the ways people live and behave in a foreign culture”. Bajrami and Ismaili (2016: 503) point out that “video materials show the students how people behave in the culture whose language they are learning by bringing into the classroom various communicative situations”. Thus, watching FL videos compensates for the

limited contact with native speakers and their culture. The knowledge of cultural background is not only useful for understanding the target language world, but it is also often a prerequisite for learning the foreign language, especially when it comes to vocabulary, such as novel blends, which cannot be found in dictionaries. Silaški and Đurović (2013: 102) argue that “the correct “unpacking” of novel blends by nonnative speakers of English requires the right cultural background, and if the knowledge of that background is missing, that is if extralinguistic opacity occurs, novel blends remain either incomprehensible or misdecoded”.

### **1.3.3. The impact of FL movies on the development of different skills and systems**

There is ample experimental research which shows that the abovementioned advantages of watching FL movies and videos are indeed reflected in the development of different areas of target language proficiency. Following is a review of studies that show the influence of exposure to FL movies on the development of overall proficiency in the target language, including different skills. The studies focus on the effectiveness of FL videos in general, regardless of the screening mode (with or without subtitles).

Bahrani and Sim (2012) investigated the effectiveness of cartoons, films and news broadcasts on the development of overall language proficiency in the case of low level language students. The participants were divided into three groups and each group was exposed to a different type of audiovisual material over ten weeks. It turned out that the group exposed to cartoons outperformed the other two. On the other hand, the participants who watched news programmes did not improve their overall proficiency, as evidenced by the results of the post-test. The research shows that exposure to FL audiovisual materials can be conducive to overall FL development. However, the materials have to be adjusted to the learners' needs because otherwise the learners will not benefit from them.

The results of a study on young learners from Iceland conducted by Lefever (2010) lend support to the idea of exposing children to foreign language media for the development of overall language proficiency. Seven and eight –year-old pupils were asked to complete tests on reading and listening skills, and some of them were also tested on conversational skills in oral interviews. The parents of most competent pupils were interviewed about their children's English learning practices at home. It was found that the children's

language learning was mostly attributed to their exposure to English through the media, especially watching videos and playing computer games.

Arikan and Taraf (2010) aimed to find whether the use of authentic animated cartoons is effective in teaching target language grammar and vocabulary. The participants of the study were fourth grade Turkish pupils. They were divided into two groups: the experimental group was exposed to a cartoon and made use of it as a learning material, while the control group followed a traditional grammatical syllabus. The juxtaposition of the results obtained from the pre-test and the post-test shows that the experimental group outperformed the control group in terms of learning vocabulary items and some grammar points. The researchers highlight the importance of contextualizing the new language, for example by means of cartoons, especially in the case of young learners. As they claim, “it can be stated that teachers should create learning environments in which children get both aural and visual support in meaningful contexts. While doing that, authentic animated cartoons offer an invaluable way of contextualizing and introducing authentic language by providing audio-visual input”(Arikan and Taraf 2010: 5215). By contextualizing the new language, teachers make the new language points more salient so that learners can acquire them more easily.

Not only may watching foreign language films exert an influence on language learners' vocabulary, but also on their listening skills. In his study on the impact of soap operas on listening comprehension and oral production, Weyers (1999) exposed the experimental group to two episodes of a soap opera per week throughout the whole semester. He concluded that this exposure resulted in improved listening comprehension skills among the participants.

Scheffler and Baranowska (in press) found that watching videos helps to develop pronunciation ability. In their research, Polish intermediate learners of English watched a video clip either with subtitles (L1 or L2) or without them. After the viewing, they were tested on recognition of the correct pronunciation and production of the unfamiliar words that appeared in the video clip. The results show that in the case of production, the groups varied as the L1-subtitles group performed significantly worse than the other two groups. However, when it comes to recognition, all groups had significant gains. Thus, it can be concluded that mere exposure to FL movies leads to significant gains in recognition regardless of the subtitling conditions. Even though production is the ultimate goal, recognition is

also important as it constitutes the first step in acquiring a word (Waring and Nation 2004), and this is why it should be also addressed in research on language acquisition.

Similarly, Wiśniewska and Mora (2020) investigated the impact of captions on developing second language pronunciation skills. In their research, Spanish/Catalan bilingual adult learners of English were exposed to 16 episodes of a TV-series over a course of 8 weeks. They were assigned to four experimental groups on the basis of the viewing mode (with or without captions) and the task focus (focus on phonetic form or meaning). Before and after the treatment, the participants completed different pronunciation-related tests including a shadowing task, an animacy judgement task, a sentence verification task, an ABX categorical discrimination task, and a foreign accent rating task. The results demonstrate that both the captioning and non-captioning groups benefited in terms of speech segmentation and speech processing skills, which means that exposure to audiovisual materials improves pronunciation skills regardless of the subtitling condition. Production was also unaffected by the subtitling condition, however, what did play a role was the attention-directing task. When there was no focus on phonetic form, captions lead to improvement in production, while when there was a focus on phonetic form, the absence of subtitles aided pronunciation learning. Thus, overall, the research shows that learners can enhance their pronunciation skills simply by watching FL videos irrespective of the subtitling condition.

Varga (2013) conducted a qualitative study investigating which skills can be developed with the help of FL videos. The research was based mainly on class observations during which intermediate Hungarian learners of English did different tasks before, while, and after watching a movie. Varga (2013) found that, contrary to previous beliefs, the development of not only receptive (listening and reading), but also productive (speaking and writing) skills can be aided by the use of FL videos. In terms of listening, the participants improved their listening strategies such as inferring the meaning of unfamiliar words from context and visual clues. Because the movie was subtitled, the participants had the opportunity to practise extensive reading and improve their reading strategies (e.g. skimming, scanning, inferencing the meaning of unknown words). Interestingly, there was a noticeable improvement of the students' speaking skills after the viewing. As Varga (2013: 353-354) says, "Whereas at the beginning students frequently asked for English words and sometimes even wanted to use Hungarian, (...) when they wanted to retell what they saw, the proportion of their use of Hungarian and their vocabulary-questions gradually decreased". According to Varga (2013), this was a result of exposure to authentic language

through the movie. It also turned out that movies can be beneficial for developing writing skills. Drawing on his observations of the students' progress in developing writing skills, Varga (2013: 354) noticed that "Whereas they produced funny stories full of mistakes and lacking organization in the pre-viewing section, they succeeded in composing valuable pieces of writing that were well-organized in the post-viewing section". Hence, watching FL movies can help learners master different areas of proficiency, even speaking or writing.

Sockett's (2014) publication contains an overview of quantitative and qualitative studies on the Online Informal Learning of English (OILE) conducted by the Author and his associates. Apart from investigating the learners' practices connected with online informal learning, the researchers sought to measure language acquisition from such activities. The qualitative data obtained through diaries indicated that students perceived exposure to watching series and films as beneficial especially for improving their listening comprehension skills. Another project (Kusyk and Sockett 2012) aimed to measure vocabulary knowledge of learners involved in online informal learning of English. The vocabulary knowledge scale test showed that there was a significant correlation between the frequency of watching films and vocabulary knowledge of frequently occurring chunks since regular viewers outperformed non-regular viewers. In another study, learners were asked to write a fanfiction story. It transpired that fans (those who frequently watch tv-series) used more target structures (most frequent 4-grams from the HHOLD corpus occurring in television series) than non-fans, which further corroborates the effectiveness of exposure to films and tv-series for vocabulary acquisition.

#### **1.3.4. Learners' perceptions of the usefulness of FL videos**

As demonstrated above, foreign language movies are credited with a positive impact on developing different aspects of target language proficiency, and they are also deliberately used for this purpose. There is also an abundant body of questionnaire-based research which shows that students themselves see the exposure to FL videos as a tremendous opportunity to master the target language.

Trinder (2017) conducted a survey on students' perceptions of the usefulness of online media in informal learning. The participants of her study were Austrian university students at intermediate and advanced levels of English. The results of the study demon-

strate that “respondents find viewing films and series not only engaging and motivating, but also an (effortless) way of developing a number of language skills” (Trinder 2017: 408). Hence, foreign language learning cannot be viewed just as a welcome by-product of exposure to the media, but rather as an intentional activity since learners are acutely aware of the benefits of watching FL videos (Trinder 2017). Of all technologies aimed at language learning, TV, radio, video clips and series were rated as second most frequently used technology by more than 40% percent of the respondents. Moreover, the respondents perceived them as useful for developing listening comprehension, pronunciation, speaking, and communicative competence (Trinder 2017)

Aliyev and Albay (2016) conducted a study which involved eighty undergraduate university students taught in English who were from different departments. They asked the participants to complete a questionnaire (based on a five point Likert scale) investigating their attitudes towards the use of films for language improvement. It transpired that the vast majority of the participants regarded films as useful and motivating in the learning process. For example, 48 out of 80 participants strongly agreed and 28 participants agreed with the statement “Films are valuable materials for overall language proficiency”. It is also noteworthy that there were no respondents who strongly disagreed or disagreed with the statements concerning positive aspects of the use of films in FL learning.

Goctu (2017) investigated the attitudes towards using films in EFL classrooms in the case of Georgian, Turkish, and Azerbaijani upper-intermediate students of English. The participants watched four movies at home and later analysed them in class. Subsequently, the students were asked to fill in a survey. Overall, the results show that the students were enthusiastic about integrating videos into their learning process. 80% of respondents strongly agreed and 20% agreed that watching films is beneficial for improving their language skills, 44% strongly agreed and 56 agreed that films help them in developing listening comprehension. The majority of the respondents perceived FL movies as beneficial for vocabulary acquisition, motivating, and facilitating learning. Moreover, the majority of the students expressed interest in learning English and taking part in classroom discussions based on the use of movies (Goctu 2017).

To analyse the perceptions of the usefulness of online media in improving L2 proficiency, Świątek (2013) surveyed Polish students of English at two levels of proficiency: advanced learners who were English Philology students, and intermediate learners from a foreign language school. His research revealed that new online media such as e.g. Face-

book, films and music were perceived by learners as helpful in many ways, for example in mastering L2 communication skills or socializing. Moreover, the respondents reported satisfaction with using online media, which means that they were more motivated to practise English in this way.

Safranj (2015) set out to explore learners' opinions concerning the use of videos for different aspects of foreign language learning. As much as 97% of the respondents believed that frequent exposure to FL movies enhances their listening skills. The results of the questionnaire reveal that students perceive films as useful for developing other areas, for example 83% regarded movies as useful for vocabulary learning and 75% as useful for developing communication skills with foreigners, and 91% for understanding foreign cultures.

A survey on informal learning activities, especially the communicative skills associated with it, administered in 2009 and 2012 to learners of English at a French university by Toffoli and Sockett (2010) revealed that around 80-90% of all learners reported frequent exposure to oral English with around 60% of the respondents more than once a week. As for the most frequent listening materials, the respondents mentioned music, films, and TV-series. Interestingly, the frequency of watching TV-series increased substantially between the 2009 and the 2012 survey (Toffoli and Sockett 2010).

Summing up, the results of both experimental studies and questionnaire-based research highlight the importance of incorporating FL videos into foreign language teaching and learning. There is, however, no consensus on which version of a foreign language video - with native language subtitles, with target language subtitles, or without subtitles - assists learners the most in mastering the target language.

#### **1.4. The use of subtitles in ELT**

According to the report on language policy in Europe (Kutyłowska 2013), in the vast majority of the countries surveyed, films were broadcast with subtitles in cinema versions. Dubbing was a dominant technique of broadcasting only in Spain, Italy, the French Community of Belgium, and the French and Italian-speaking part of Switzerland. It was also used in Austria and Germany, although the broadcasting of subtitled films was gaining in popularity there (Kutyłowska 2013: 97). As for TV, fourteen countries screened foreign language films with subtitles, ten used dubbing, and four used "voice-over". Poland re-

mained in a small group of four (Poland, Lithuania, Latvia, Bulgaria), or actually three countries that broadcast foreign language films with voice-over, because Bulgaria used a technique that could be described as half-dubbing: each film uses the voices of several actors. So, the traditional voice-over with only one voice was used only in Poland, Lithuania and Latvia (2013: 99). A study on screening preferences conducted in 2012 (European Commission 2012) shows that in most countries that broadcast films with subtitles at least two thirds of citizens declared support for subtitling, and in Scandinavian countries and the Netherlands even over 90%. On the other hand, in countries in which dubbing or voice-over is used, the support for subtitling was less than 40%. Thus, language policies that concern screening foreign language movies determine, at least to some extent, people's preferences (Kutyłowska 2013: 100). In Poland, most people preferred dubbing or voice over to subtitling, although the situation was changing. For example, in 2002 only 8.1% of the respondents were in favour of subtitling, and 50.2% in favour of voice-over. However, in 2008, the support for subtitling was 19% (Kutyłowska 2013: 101). Interestingly, in the same study, 70% were in favour of screening FL movies with subtitles for the purposes of FL learning. Hence, even though Poles preferred voice-over when watching TV for entertainment, they believed that subtitles were useful when watching TV to intentionally learn the foreign language (Kutyłowska 2013: 102).

It is also important to note that with the advent of online streaming services, the role of traditional TV is becoming less and less important. Having access to FL movies, videos or programmes through such services, learners are no longer limited by the language policy of their country, and they can watch FL video materials with or without subtitles, according to their preferences. This is probably why even in countries such as Spain or France, where dubbing was traditionally preferred, the popularity of subtitling has recently increased along with foreign language proficiency (Matamala et al. 2017), which also suggests that there may be a correlation between watching subtitled videos and foreign language learning. It turns out that students indeed perceive subtitles as useful for language learning. For example, in a survey conducted by Safranĵ (2015), 62% of students preferred watching movies with subtitles, believing that subtitles improve their listening comprehension skills.

In general, there are four types of subtitling conditions. In the interlingual (also known as "standard" or "L1") subtitling condition the soundtrack is in the foreign language and the on-screen text is a translation into the L1 of the viewer, in the intralingual (also known as "bimodal" or "L2") subtitling/captioning condition both the soundtrack and

the subtitles are in the foreign language. There is also reversed subtitling, which means that the soundtrack is in the viewer's L1 and the subtitles are in the target language, and dual/bilingual subtitling when both L1 and L2 subtitles are displayed simultaneously on the screen.

Despite ample research in the field, it still seems unclear which subtitling condition is the most beneficial or detrimental for language learning and comprehension. There seems to be no one simple answer to this question since the subtitling condition interacts with other variables like the viewers' level of proficiency, and thus different subtitling conditions may yield different results for FL learners at different levels of proficiency. For example, Lavour and Bairstow (2011) set out to determine the impact of interlingual, intralingual subtitles as well as the absence of subtitles on comprehension and visual processing in the case of beginner, intermediate and advanced French learners of English. The research revealed that subtitles had no impact on intermediate learners' comprehension and visual processing and were unnecessary for advanced learners as they proved to have better comprehension in the unsubtitled condition. However, in the case of beginners, comprehension scores were highest in the interlingual condition and lowest in the unsubtitled condition. Quite the reverse was found in a study on the effects of different subtitling conditions on comprehension of vlogs (Aldukhayel 2021). It turned out that there were no significant differences between L1 and L2 subtitles; instead, the results show that listening comprehension was affected by the participants' level of proficiency and pictorial support of the audio: the participants who were at a high level of proficiency outperformed low and mid-proficiency participants on the comprehension test, regardless of the subtitling condition. Similarly, Teng (2019) investigated the impact of full and keyword captions on global and detailed comprehension in the case of more and less advanced learners. While proficiency did not affect global comprehension, it did affect comprehension of details since learners at a higher level of proficiency outperformed learners at a lower level of proficiency on the test.

On the other hand, Leveridge and Yang (2013) found that captions assisted in comprehension in the case less proficient learners, but hindered comprehension in the case of more advanced learners. The effectiveness of subtitles may thus be dependent on learners' level of proficiency, however, the results of previous studies are inconclusive, and it is not possible to determine whether low or highly proficient FL learners benefit more from subtitled videos and whether subtitles are beneficial or irrelevant for more advanced learners. It

can be concluded that the benefits derived from watching FL movies with L2 subtitles are maximized if there is optimal alignment between viewers' proficiency and the language of the video. As Gass et al. (2019: 85) put it, :

when the content itself is more difficult and includes too much novel input, the processing load increases, making the intake and use of the multiple modalities more difficult. If the content is familiar and not difficult, the learner may not need captions to facilitate processing; in such cases, captions could be seen as superfluous or even annoying

Among a whole plethora of individual differences, one characteristic that should be taken into account while considering the effectiveness of subtitles is the so-called caption reliance. Leveridge and Yang (2013) created a special test that helps to determine the extent to which viewers process captions. First, a participant is presented with a video clip with congruent and incongruent subtitles— in the former case, a given line contains written words which are the same as the spoken words; in the latter case, one word in a given line is altered and contains a word that is incongruent with the spoken word. After the viewing session participants complete a comprehension test which reveals their caption reliance: if they rely on subtitles, they choose the answer that is based on what was displayed on screen; if they rely on the audio, they choose the answer that is based on what they heard rather than read.

Research shows that more- caption- reliant and less -caption -reliant viewers may benefit from different types of subtitling conditions. For example, Lee et al. (2019) found a differential impact of various subtitling modes (full, partial, real-time, control) on listening comprehension in the case of Taiwanese learners of English who differed in terms of the caption reliance index. Those participants who were more caption-reliant benefited most from full subtitles, while those who were less caption-reliant benefited most from partial subtitles (with only keywords). Interestingly, when caption reliance was ignored, no significant differences emerged between the four subtitling conditions. As can be seen, the effectiveness of subtitles is dependent on learners' caption-reliance profiles, so not all screening modes facilitate comprehension to all learners, but rather the effectiveness of subtitles is a result of an interplay of different individual differences.

Another important factor affecting the effectiveness of subtitling, familiarity with subtitles, is to some extent determined by the policies of the country in which the viewers live. The “subtitle effectiveness hypothesis” suggests that subtitles are effectively used even by viewers who live in a dubbing country and consequently have very little exposure

to subtitled movies (Perego et al. 2010, 2015). Pertinently, Perego et al. (2016) set out to determine whether the effectiveness of subtitling is related to the familiarity with subtitles in general. Their cross-national research which included more and less subtitling countries (Poland, Italy, Spain, Belgium) revealed that interlingual subtitling was perceived as effective and welcome irrespective of the viewers' previous experience with subtitled films. For example, the Spanish and Italian participants for whom dubbed films were prevalent, reported that they were open to subtitles. Some viewers may simply not be aware of the advantages of using subtitles due to the lack of experience in watching subtitled programs as well as due to some national trends of dubbing films instead of using subtitles. As the researchers purport, "exposure can partly shape preferences" (Perego et al. 2016: 223), which suggests that viewers as well as policy makers should familiarize themselves with the advantages and potential problems with the use of subtitles while watching FL movies. The following section presents an investigation of potential disadvantages and advantages of different types of subtitles and an overview of empirical studies investigating the effectiveness of subtitles in foreign language learning.

#### **1.4.1. Potential problems with the use of subtitles**

One of the major problems with the use of foreign language subtitles is their level of difficulty. If a video material contains the language beyond the viewer's level of proficiency, no gains will be derived from subtitles since they will not compensate for the difficulty of the language (Guillory 1998). Therefore, the use of subtitles may be ineffective in the case of beginners and students with limited linguistic competency (e.g. Lambert and Holobow 1984, Neuman and Koskinen 1992). Taylor (2005) examined the impact of L2 subtitles on comprehension in the case of beginning learners of Spanish. The analysis revealed no significant differences between the captioning and non-captioning groups on the multiple choice test on comprehension and free recall of facts from the video clip. Thus, it can be concluded that for beginners, L2 subtitles do not aid comprehension. Additionally, the participants, especially first-year students, reported having problems with attending simultaneously to three different channels and found subtitles distracting. Interestingly, even though subtitles did not bolster comprehension, the participants expressed positive opinions on the use of subtitles and believed them to be helpful. Hence, there is some potential in the use of

subtitles even if for beginners they may not have an additive effect on comprehension; as the researcher says: “teachers must recognize the problems faced by beginning learners in using captioned video, while at the same time realize its obvious benefits for providing comprehensible input, and helping learners to process the target language” (Taylor 2005: 426).

Suárez and Gesa (2019) investigated the impact of long-term exposure to captioned TV-series on vocabulary learning and the role of different factors, such as aptitude, vocabulary size, or listening skills in this process. The participants of the study were Catalan-Spanish bilinguals recruited from two educational contexts: high school and university. While all learners were pre-taught the target words, only half of them were additionally exposed to L2-subtitled episodes of a TV-series which contained the target words. The results demonstrate that the experimental group was superior to the control group only in the case of high school learners. Thus, L2 subtitles may be effective for less proficient learners only. Moreover, vocabulary acquisition through watching TV-series is influenced by individual learner differences, such as language aptitude, or vocabulary size.

Even if subtitles do not hinder vocabulary acquisition, they may not facilitate it either. Yuksel and Tanriverdi (2009) investigated the differences between captioned and non-captioned movie clips and their effects on incidental vocabulary learning. They found that there were no statistically significant differences between the two experimental groups in terms of vocabulary gains, which means that mere exposure to movie clips prompted vocabulary acquisition.

The effective use of subtitles is also dependent on the viewers’ familiarity with them. Viewers with experience of watching subtitled videos develop strategies for effective processing of subtitles, unlike the viewers who have had little exposure to subtitles (Danan 2004). Moreover, as Danan (2004: 73-74) says, “Lack of familiarity may lead to a sense of distraction and poor language gains because the foreign language can be bypassed for comprehension”. Thus, inexperienced viewers may treat subtitles only as a tool facilitating comprehension, not as a learning aid. In their experiment, Koolstra and Beentjes (1999) explored the effects of interlingual subtitles in the case of Dutch fourth and sixth graders. The researchers found that higher vocabulary scores obtained by sixth graders cannot be accounted for in terms of their greater linguistic competence since there were no statistically significant interactions between condition and age. Instead, the researchers found that vocabulary gains were correlated with the children’s frequency of exposure to subtitled

programs at home in that those children who frequently watched subtitled programs had higher vocabulary scores on the tests than those with a lower frequency of such exposure. Some studies also indicate that the more familiar a viewer is with the language of the soundtrack, the more likely they are to skip subtitles (Laskowska et al. 2015).

There have been some concerns whether children can use subtitles as efficiently as adults. In their eye-tracking study on the reading of subtitles, d'Ydewalle and van Rensbergen (1989) found that 8-year-old children had similar patterns of attention distribution to adults, which means that they also processed subtitles. However, the children were exposed to L1 subtitles only. According to d'Ydewalle and van de Poel (1999: 240), "As general cognitive ability and reading capacity increase with age, older children will succeed better in reading foreign-language subtitles". Therefore, the benefits of using L2 subtitles may be limited by the age of the viewers.

The benefits of watching subtitled videos may be compromised in certain L1 backgrounds. For example, Winke et al. (2013) found that orthographical differences between the native language and the target language may influence the extent to which viewers rely on subtitles. In their study, Winke et al. (2013) compared learners from different L1 backgrounds and they found that if the L1 was distant from L2 in terms of orthography (e.g. Chinese or Arabic), learners skipped subtitles and relied more on the audio input because they were not familiar with the written symbols.

"When we add subtitles as an additional textual element at the bottom of the screen, audiences often feel that the aesthetics of the film are marred by the subtitles, that the image is smudged" (Kruger et al. 2017: 24). Since subtitle reading is an obligatory behaviour which happens automatically (d'Ydewalle and de Bruycker 2007: 196), subtitles can be considered as gaze attractors (Bisson et al. 2014), which means that attention is allocated to the subtitle area instead of the picture area. Different actions may happen in the video while the viewers are focused on subtitles (Díaz -Cintas and Remael 2007), which may result in neglecting other aspects of the video, such as the on-screen visuals (Szarkowska et al. 2011), which may be even more important than the dialogues. Moreover, there have been some concerns about the impact of subtitles on working memory. For example, Lee et al. (2013: 414) claim that "subtitled films likely tax the attention and memory systems because there is visual information (the scene), as well as verbal information in the form of written, rather than audio, dialog". Subtitles may therefore add an extra source of information which requires an allocation of some cognitive resources thus becoming a burden on working

memory and hindering the learning process or comprehension (Brünken et al. 2003, Paas et al.1994)

Further, viewers have no control over the pace of fleeting subtitles (Kruger and Steyn 2013: 105). As a result, they are deprived of the opportunity to reread some words and if some words are beyond their level of proficiency and they spend too much time on them, they may not be able to read the whole subtitle from a given scene. In addition, as Guichon and McLornan (2008: 87) claim, “subtitles detract from the ecological validity of video transmission as they are not available in real-life situations”. Thus, when confronted with authentic videos without subtitles or while listening to native speakers, students may have problems with using different listening strategies to understand the message as they are used to subtitles which aid comprehension, but are not available in real life, e.g. in face-to-face conversations with native speakers.

Finally, some empirical studies did not find any significantly positive effects of watching subtitled movies on language learning. For example, Ebrahimi and Bazae (2016) investigated the effects of watching a subtitled and non-subtitled movie on comprehension and vocabulary learning in the case of higher level students. The analysis of the results obtained from comprehension and vocabulary post-tests yielded no statistically significant differences between the two experimental conditions, even though the participants from the subtitle group performed slightly better than the participants watching the unsubtitled film. Similarly, Karakaş and Sarıçoban (2012) found that there were significant vocabulary gains in the experimental group that watched a video with English subtitles and in the group that watched the movie without subtitles, but the subtitle group did not outperform the no-subtitle group. The researchers concluded that exposure to cartoons itself resulted in vocabulary acquisition, regardless of the subtitling condition.

Although subtitles are putatively beneficial for language learning, it does not hold true for all areas of proficiency. For example, van Lommel et al. (2006) conducted two experiments on the acquisition of grammar rules through watching a movie in the case of primary and secondary school children. They compared incidental and intentional learning. Moreover, some rules were explicitly presented before the viewing and some were not. The researchers found that grammar is probably too complicated to be acquired incidentally as its acquisition is a more gradual process. Thus, even subtitles could not facilitate grammar acquisition. However, the effectiveness of subtitles for grammar acquisition may be dependent on factors such as language proficiency or age. Lee and Révész (2020) found, for

example, that L2 subtitles can assist in the acquisition of grammar in the case of advanced learners of English (C1 and above). In their study, Korean learners of English watched video clips (news) with enhanced, unenhanced subtitles, or without subtitles. Subtitles-enhancement was about putting the target grammar structure, Present Perfect used for reporting the news, in a different colour. During the treatment, the participants' eye movements were recorded to examine their attention to the subtitle area. The results point out to the effectiveness of subtitling for grammar acquisition in that both enhanced and unenhanced subtitling groups outperformed the no-subtitles group, however, the unenhanced subtitling group outperformed the no-subtitling group only on the written production test, while the enhanced subtitling group on all tests including the oral production test. As for the eye-tracking data, enhanced subtitles drew learners' attention more than unenhanced subtitles, which also resulted in greater knowledge gains.

The effectiveness of subtitles for grammar acquisition may be also limited due to different levels of saliency of grammatical structures. Cintrón-Valentín et al. (2019) sought to find whether watching subtitled films can support grammar development and vocabulary acquisition in the case of English-speaking intermediate learners of Spanish. First, the participants watched a grammar video lesson which included a discussion of the rules and some exercises. Next, the participants viewed an animated video created by the researchers specifically for the purposes of the study in one of the three experimental conditions: captions with textually enhanced vocabulary items, captions with textually enhanced grammar structures, or no captions. After the viewing, the participants completed immediate post-tests on recognition and production of vocabulary and grammar. Two weeks after the experiment, a delayed post-test on grammar translation was administered to test the retention of grammatical structures. The results clearly point to the effectiveness of using subtitles for vocabulary acquisition since both captioning groups (with and without enhancement of target vocabulary items) outperformed the no-captions group. Input enhancement turned out to be conducive to vocabulary learning as well since the group that was exposed to subtitles with highlighted target items had larger gains in terms of recognition and production than the other two groups. When it comes to grammar, however, the results are somewhat inconclusive. While there was no differential effect of subtitles on grammar recognition, captions were found to be effective for grammar production but only in the case of certain structures. The researchers conclude that these confounding results can be accounted for by

the fact that grammar acquisition is dependent on structure-specific characteristics that either facilitate or hinder the ability to extract given patterns.

#### **1.4.2. The advantages of using subtitles**

As Guillroy (1998: 104) points out, “reading subtitles is an easily performed act, and subtitles make us feel comfortable because we can readily access meaning while watching foreign language films”. According to Krashen and Terrell (1988), a low level of anxiety, or low “affective filter” (Krashen 1985), facilitates language acquisition since students who feel comfortable are more open to new language input. Thus, one undeniable benefit of watching subtitled videos for learners is the feeling of comfort, which is considered a prerequisite for learning. This comfort can be misinterpreted as laziness, which may inhibit language learning. However, Vanderplank (1988: 272-273) noticed that “far from being a distraction and a source of laziness, subtitles might have a potential value in helping the learning process by providing learners with the key to massive quantities of authentic and comprehensible language input”. Hence, through FL videos, viewers are exposed to the target language which contains some unfamiliar words, but with the help of subtitles, viewers are able to notice the new language items which are otherwise lost in the speech stream.

According to d’Ydewalle and van de Poel (1999: 228), “Subtitling is particularly informative because it supplies the viewer with the following three different channels of information: the pictorial information, the original sound track, and the translation of the text in the subtitles”. Contrary to earlier assumptions that subtitles are a source of distraction (e.g. Reese and Davie 1987), it was found that when information is presented in the three channels simultaneously, it in fact reinforces learning (e.g. Baltova 1999) and does not result in cognitive overload. This is in line with Multimedia Learning Theory proposed by Mayer (2009), which suggests that learners benefit from multimedia materials since they learn through a combination of pictures and words more than if the information is presented in only one modality. Similarly, Sweller (2005b) argues that information which is presented via different channels eases the burden on working memory as the channels complement one another, which leads to greater comprehension. As pointed out by d’Ydewalle and van de Poel (1999: 228), “to allow for foreign-language acquisition, at least the channel in which the foreign language is presented should be processed”.

In accordance with the noticing hypothesis (Schmidt 1990), conscious awareness of features of input triggers acquisition of new linguistic forms. Hence, only the part of the input which is noticed by learners (“intake”) leads to language development. Subtitles may be conducive to language learning due to the fact that they make the language more salient, and, as Ellis (2017: 21) says, “salient items or features are attended, are more likely to be perceived, and are more likely to enter into subsequent cognitive processing and learning”. In this way, subtitles make learners notice the language and acquire form-meaning connections.

Although it has been argued that L1-subtitles cause laziness as viewers refrain from paying attention to the sound if they can understand a FL movie just by reading subtitles (e.g. Leveridge and Yang 2013), experimental studies show that viewers process the sound as well as the subtitles (e.g. de Bot et. al. 1986, d’Ydewalle and Gielen 1992, Borrás and Lafayette 1994, d’Ydewalle and Pavakanum 1997, d’Ydewalle and van de Poel 1999). Thus, different sources of information are not in competition and a viewer does not process subtitles at the cost of looking at the on-screen pictures. As Baltova (1999: 3) says, subtitled videos “provide simultaneous exposure to spoken language, printed text, and visual information all conveying the same message, and so promote content and vocabulary learning even in relatively inexperienced learners”. In their experiment, Kruger and Steyn (2013) gathered eye-tracking and performance data (comprehension test) from students watching videos with or without subtitles. They found that there was a positive correlation between subtitle reading and comprehension, which means that viewers tend to benefit from watching subtitled videos and that subtitles do not hinder comprehension. Frumuselu et al. (2015) advocate the use of subtitles for developing different areas of FL proficiency, which is possible due to the added value of simultaneous exposure to different channels of information. As they point out, “reading the dialogue in context while listening to the original language stimulates learners to consolidate what they are learning, enriching their vocabulary and making them familiar with the culture of the foreign language in an authentic setting” (Frumuselu et al. 2015: 108). In fact, there is ample experimental research which corroborates the usefulness of subtitles in developing FL proficiency in different areas (see section 1.3.3).

Even though the advantages of watching subtitled movies may be mediated by the age of viewers, since children may not benefit from subtitles as much as adults due to their inferior reading skills, research shows that exposure to subtitled movies may improve liter-

acy skills (e.g. Gernsbacher 2015). For example, Linebarger (2001) examined the impact of captioned and uncaptioned videos on beginning readers' reading skills. The children were assigned to one of four experimental groups based on two variables: the presence or absence of captions and narration. Overall, there were five viewing sessions and during each such session, having watched a video clip, a child had to answer some comprehension questions and read a fragment of the script containing target words. After the first session, before watching a new video clip, children had to read a passage from the previous video, and after the last session, they were asked to read a passage unrelated to the videos, but containing the target words. The results demonstrate that captions facilitated word recognition. Interestingly, the children could successfully recognize the target words in a new reading passage, which means that exposure to captions was in general conducive to developing literacy skills in L1 since captions led to long-term benefits in that the children retained the new words. The improvement of reading skills after watching captioned videos was also corroborated in a later study by Linebarger et al. (2010), in which second and third graders viewed videos either with captions and audio, or without captions but with audio. Moreover, children can benefit not only from captions in L1, but also foreign language subtitles while learning a foreign language. To take one example, Lekkai (2014) found that children aged between 9 and 12 years who were Greek learners of Italian acquired more foreign language words incidentally while being exposed to a subtitled video clip than children who were exposed to the clip without subtitles.

Research reveals that learners themselves perceive subtitles as beneficial for understanding a foreign language. Montero-Perez et al. (2013) conducted a study on the effectiveness of captioning for L2 listening comprehension. The quantitative part of the study in which students viewed a video with full captions, keyword captions, or without captions indicated that the full captioning group significantly outperformed the other two groups on the comprehension post-test, but only in terms of global comprehension since there were no significant differences between the three groups on detailed comprehension questions. The qualitative part of the study revealed that students perceive subtitles as useful for speech segmentation, comprehension, disambiguating pronunciation which may not always be clear, or reducing listening anxiety, since they feel much more relaxed while having access to captions.

Mariotti (2015) conducted an international survey on the usefulness of L1 and L2 subtitles for foreign language learning. Independent adult learners were asked to watch sub-

titled videos at least once per two weeks and completed two questionnaires before and after the intervention period. Over 76% of the participants who completed the second questionnaire reported that they found subtitled videos useful for language learning, especially for developing listening skills, comprehension, or reading skills.

Vanderplank (2019) conducted a qualitative study on learners' attitudes and behaviour while watching subtitled movies. Learners of French, German, Italian, and Spanish were given films with optional captions to watch in their free time. They were asked to provide feedback on their experience in the form of a diary and a checklist. There were two trial periods: one lasting six weeks, and the other lasting twelve weeks, and the participants were expected to watch at least one DVD per week. The analysis of the diaries showed that subtitles were valued among language learners as the majority expressed positive attitudes towards watching films with subtitles. For example, one of the participants said:

I feel that I could've watched this film even without captions. I didn't find it too difficult to understand the dialogues, just by listening to them. However, the captions were really useful for the parts in which there were words that I hadn't known. In my opinion it is much easier to learn a new word if you also see it written (Vanderplank 2019: 412).

It turned out that the participants relied on subtitles at the start of viewing when they were not familiar with the characters and their speech, or when the language exceeded their level of proficiency, for example in terms of vocabulary. It is also noteworthy that, according to Vanderplank (2019), two different types of learners emerged from the analysis of the gathered data: those who believed that they can boost their foreign language competency in terms of vocabulary and comprehension just by watching subtitled movies, and those who were autonomous language learners who deliberately employed different strategies such as writing down some words or re-watching with and without subtitles to maximise the opportunities for learning. For the latter type of learners, subtitles were especially helpful since they made the learners pay more attention to the spoken language and encouraged them to put greater effort into learning the language. The researcher concludes that subtitles proved to be facilitative for language learners. As he says, "For the most part, participants were able to make flexible and dynamic use of the captions to maximise enjoyment, enhance their understanding and develop their vocabulary knowledge and listening skills"(Vanderplank 2019: 421).

Sometimes viewers may feel that subtitles are redundant even if they do facilitate perceptual learning – a phenomenon called by Shepherd et al. (2017) the "subtitle effect".

In their study, Shepherd et al. (2017) exposed native speakers of American English to video clips with speakers of English using unfamiliar accents, e.g. Scouse, Irish, Jamaican, Louisiana Creole, etc. Some clips were presented with bimodal subtitles (in the same language as the audio), and some without subtitles. In the first experiment, the participants were asked to rate how necessary subtitles were for each clip, and it turned out that those who viewed subtitled clips rated subtitles as unnecessary for those clips while those who watched the same clips without subtitles viewed subtitles as more necessary for those clips. In the second experiment another group of American English speakers watched two video clips of the same speaker: after watching the first clip, which was either subtitled or unsubtitled, they were asked to rate the usefulness of subtitles and summarize the content of the clip, and after watching the second clip which was unsubtitled, they completed a multiple-choice comprehension test. In total, each participant watched 12 clips (6 speakers). The results of the comprehension test demonstrate that participants better understood the speaker from the unsubtitled clip if the first clip with the same speaker was subtitled. Thus, subtitles facilitated perceptual learning in that they helped viewers adjust sound-phoneme mappings underlying the speaker's unfamiliar accent. As the researchers conclude, "we demonstrated that this perceptual learning can, in a matter of seconds, make the very subtitles that facilitate it significantly less necessary, potentially creating the illusion that the subtitles were unnecessary all along. In light of these findings, perceptions of bimodal subtitles as unnecessary must be interpreted with caution" (Shepherd et al. 2017: 357). These findings may translate into foreign language learning since bimodal subtitles may assist learners in perceptual learning as well given that the underlying mechanism is the same (Shepherd et al. 2017: 351).

### **1.4.3. Experimental studies demonstrating positive effects of subtitles on language learning**

While the previous section focused on theoretical benefits of exposure to subtitles, this section provides an overview of experimental studies the results of which testify to positive effects of watching subtitled videos on vocabulary acquisition and overall plot comprehension.

Neuman and Koskinen (1992) set out to explore incidental learning of science vocabulary and concepts by young bilingual learners. They divided the subjects into four experimental conditions: watching captioned and non-captioned TV, using a textbook only, and listening to a text along with reading. They found that the students acquired more words while watching captioned than non-captioned video material. As they conclude: “providing different kinds of information through different modalities appeared to enhance incidental learning from context rather than overwhelming students’ attentional capacity” (Neuman and Koskinen 1992: 104). The researchers report, however, that incidental vocabulary learning depends on the level of linguistic competence, so when it comes to beginners, input alone is not sufficient and the teacher’s intervention is needed as well (Neuman and Koskinen 1992: 104).

Shabani and Zanussi (2015) conducted an experiment on the effects of captioned and non-captioned TV series on vocabulary development. Forty intermediate learners of English from Iran were divided into an experimental group that watched selected episodes of “Friends” with English subtitles, and a control group that watched the episode without subtitles. First, the participants completed a pre-test on vocabulary from another TV-series to specify their background vocabulary knowledge. The treatment session that involved watching the selected episodes lasted 20 sessions, and was followed by a post-test on vocabulary. The results revealed that captioned videos contributed to the development of vocabulary more than non-captioned videos. Before the experiment, the researchers conducted a semi-structured interview on the learners’ perceptions of watching captioned videos. The interview data showed that most participants had a positive attitude towards the use of captions, and that they perceived subtitled videos as useful especially for listening comprehension, word recognition, and vocabulary acquisition.

Marzban and Zamanian (2015) investigated the effects of subtitles on vocabulary learning in the case of Iranian low-intermediate students of English. The experimental group did the “subtitling task”, which was about translating a script from L2 to L1, and the control group did writing and oral comprehension tasks instead. The results of the delayed post-test demonstrate that the subtitling task lead to greater vocabulary retention than the other task-based activities.

Pujadas and Muñoz (2019) investigated the impact of long-term exposure to TV-series on foreign language vocabulary learning. The participants, Catalan-Spanish bilingual secondary school learners, were divided into four groups according to four experimental

conditions based on the subtitle language and type of instruction (with or without pre-teaching): captions (L2 subtitles) with pre-teaching, captions without pre-teaching, subtitles (L1 subtitles) with pre-teaching, and subtitles without pre-teaching. The treatment lasted one academic year and was divided into three terms; in each term the participants were exposed to 8 episodes of a TV-series and they were tested on the target items from these 8 episodes at the beginning and at the end of each term. There were two test types: a form recall test (aural and written form recall), and a meaning recall test. The results show that extensive exposure to TV-series led to vocabulary acquisition regardless of the experimental condition, especially when it comes to form recall. While the language of the on-screen text did not significantly influence vocabulary learning as there were no significant differences between L1 and L2 subtitles, the groups that were pre-taught the target items prior to the viewing session outperformed the groups deprived of pre-teaching. Thus, intentional learning proved to be more beneficial for learners than incidental learning.

In two longitudinal studies, Frumuselu (2018) exposed learners of English to 13 episodes of a TV-series with either interlingual or intralingual subtitles over a course of 7 weeks, and examined the learning of colloquial and informal language. In the first experiment, the participants were tested at the beginning and at the end of the treatment, and it turned out that intralingual subtitles had a more positive effect on learning than interlingual subtitles. In the second study, however, the participants were tested after watching each episode of the TV-series so that immediate vocabulary acquisition would be tested. The results of the second experiment contradict those obtained from the first experiment in that no significant differences emerged between intra- and inter-lingual subtitles. Frumuselu (2018) argues that the superiority of intralingual subtitles in the first study could be accounted for by the fact that the participants were given time to internalise the new vocabulary items, look up their meanings over the course of the treatment, while in the second study, they were tested immediately after the viewing session so only the effect of the exposure to the audiovisual materials was investigated. Hence, it can be concluded that subtitles, regardless of their type, support incidental vocabulary learning.

Wang (2019) set out to determine the impact of subtitles on comprehension and vocabulary learning. In the study, Chinese EFL learners at different levels of proficiency (freshmen, juniors, graduate students) watched videos with L1, L2 subtitles, dual subtitles (L1 and L2 displayed simultaneously), or without subtitles. After the viewing, they were tested on comprehension (via open-ended questions) and vocabulary acquisition (via a

translation test). The results indicate that subtitles turned out to be useful for vocabulary acquisition especially in the case of freshmen who performed much better after the exposure to L1- or L2- subtitled videos than an unsubtitled video. Juniors did not benefit from Chinese and dual subtitling as they learned more words in the L2 and no-subtitles conditions. In the case of first year graduate students, dual and Chinese subtitles were found to be more effective for vocabulary learning than English subtitles. When it comes to comprehension, subtitles significantly aided comprehension in the case of freshmen and graduate students, while no significant differences between subtitling and no-subtitling conditions were found in the case of juniors.

Sabouri et al. (2015) wanted to find out whether males and females can equally benefit from the use of subtitles. In their study, upper-intermediate students of English watched a subtitled movie material and took a vocabulary pre-test and post-test. The results demonstrate that both males and females significantly improved their scores on the post-test, but there was no statistically significant difference between the two genders.

Studies of incidental language acquisition with the use of subtitled movies are not limited to the English language only. For example, Lekka (2014) corroborated the beneficial effects of subtitling for Greek learners of Italian. The participants who watched a short video clip with Italian subtitles outperformed the ones who watched the clip without subtitles or with dubbing as a control condition in terms of vocabulary acquisition and recognition of FL words.

Markham (1999) found that subtitles may also help in aural word recognition. In his experiment, Markham (1999) exposed 118 advanced ESL learners to two videos with or without L2 subtitles in an alternating order. After the viewing session, the participants completed a multiple-choice in which they had to recognize the word from the video among the three distractors. It turned out that advanced learners of English improved their listening word recognition after exposure to subtitled television programs.

Ayand and Shafiee (2016) found that exposure to subtitled FL videos leads to improved accuracy and fluency in speaking. In their longitudinal study, 60 intermediate Iranian EFL learners were randomly assigned to one of three groups: one group watched videos without subtitles, one group with L1 subtitles, and one with L2 subtitles. The treatment lasted 10 sessions, 2 sessions per week. Before and after the viewing session, each participant took part in semi-structured interviews in which they had to answer questions about the city of Isfahan, and the researchers evaluated their fluency by counting the number of

syllables per minute), and accuracy by calculation the ratio of error-free clauses to the total number of clauses produced. The results show that exposure to both native-language and foreign-language subtitles significantly improved accuracy and fluency in the oral production task on the post-test. On the other hand, exposure to the videos without subtitles did not significantly affect performance on the post-test. Hence, the results of the study point to the effectiveness of using subtitled videos not only for developing learners' receptive, but also productive skills, especially fluency and accuracy in speaking, as well as active use of vocabulary from video clips to which they are exposed.

Lazareva and Loerts (2017) found that subtitles support FL vocabulary learning and visual scene processing even if the language of the movie is unknown to the viewer. In their experiment, Dutch students with no knowledge of Russian watched a Russian cartoon either with L1 (Dutch) subtitles or double subtitles (Dutch and Russian); additionally non-Dutch speaking students who also did not know Russian watched the cartoon without any subtitles as a control condition. The results demonstrate that double subtitles turned out to be more helpful for written word recognition than L1 subtitles only, while both subtitling conditions were useful for spoken word recognition. Interestingly, watching the cartoon with subtitles, either L1 or double, resulted in greater comprehension than watching the cartoon without subtitles. Thus, contrary to common beliefs, subtitles do not distract the viewers and assist them in scene processing and comprehension. Lazareva and Loerts (2017) argue that this may be due to the level of engagement – since the participants were not familiar with the target language, they needed subtitles to understand anything. When they were not provided with subtitles, they did not pay attention to the content of the video as it was completely incomprehensible. This lends support to the usefulness of subtitling in the case of beginner foreign language learners.

#### **1.4.4. Intralingual vs. interlingual subtitles**

Research on the differences between intralingual and interlingual subtitles did not emerge until the end of the 1990s (Matielo et al. 2017: 760). Although subtitles in general have been found to have facilitative effects on FL development, the findings from previous research in the field highlight some differences between different subtitling conditions and their influence on language learning.

In general, foreign language subtitles have been found to be most profitable for advanced learners (e.g. Vanderplank 1988, Danan 2004, Markham and Peter 2003), while interlingual subtitles for low-proficiency learners (Bianchi and Ciabatt 2008). In general, interlingual subtitles are credited with bolstering comprehension, while intralingual subtitles with facilitating foreign language vocabulary acquisition. For example, Baranowska (2020) investigated the impact of L1 and L2 subtitles on comprehension, vocabulary learning, and cognitive load. It turned out that in the case of Polish intermediate learners of English, exposure to FL subtitles resulted in significantly more vocabulary gains than exposure to L1 subtitles. On the other hand, the group exposed to L1 subtitles outperformed the L2-subtitles and no-subtitles groups on the comprehension test. Similarly, in Scheffler and Baranowska's study (In press), L1 subtitles proved to facilitate comprehension more than L2 subtitles or the absence of subtitles. Interestingly, comprehension was negatively correlated with gains in productive speech ability in terms of pronunciation, which was, on the other hand, bolstered by L2 subtitles.

There are also those who claim that there are no differences between interlingual and intralingual subtitles when it comes to their impact on comprehension and vocabulary learning as both conditions are beneficial to learners (e.g. Vulchanova et al. 2015), or at least the differences between them are not significant. For example, the experiments conducted by Matielo et al. (2013, 2018) show that the groups exposed to intralingual subtitles slightly outperformed the groups exposed to interlingual subtitles, but the differences were not statistically significant. Still, much research has been devoted to identifying the differences between intralingual and interlingual subtitles

In their survey on the use of the subtitling mode, Kusy and Sockett (2012) asked learners of English about their previous, current, and desired future choices concerning the subtitling mode. The results show that with an increase in proficiency in English, the viewers tend to move from French dubbing to English subtitles and/or no subtitles. As Sockett (2014: 53) says:

foreign language subtitling here plays the role of a basin attractor state. Evolution of the system is initially helped by the presence of foreign language subtitles as it enters the initial downslope into the basin. As the system continues to evolve in time and language proficiency increases, it reaches the upslope out of the basin and foreign language subtitling becomes a hindrance to comprehension. So it is that, a single phenomenon, in this case foreign language subtitling, can facilitate or inhibit language learning depending on the position of the learner in his learning system

#### **1.4.4.1. Intralingual subtitles**

As pointed out by Mitterer and McQueen (2009) ,“native-language subtitles appear to create lexical interference, but foreign-language subtitles assist speech learning by indicating which words (and hence sounds) are being spoken”. Therefore, they become a “hearing - aid”(Danan 2004) since they help the viewers link the spoken and the written word. In their experiment, Mitterer and McQueen (2009) exposed Dutch university students to audiovisuals in unfamiliar to them Scottish and Australian accents to investigate the impact of L1 and L2 subtitles and the absence of subtitles on accented speech perception. They found that perceptual learning was possible only when the participants watched the L2-subtitled material.

Zarei and Rashvand (2011) investigated the effectiveness of watching videos with verbatim (very detailed, including hesitations and pauses) and non-verbatim (summarizing key points) interlingual, intralingual subtitles. Having watched the videos, the participants completed a vocabulary comprehension and a vocabulary production test. The results demonstrate that intralingual subtitles were more beneficial in terms of vocabulary learning, regardless of the verbatim/non-verbatim condition.

Vanderplank (1988) found that FL videos with intralingual subtitles provide comprehensible input for more advanced learners of English. The students who took part in his study regarded L2 subtitles as beneficial for comprehension and noticing new words. Hence, foreign language subtitles may in a way bridge the gap between the foreign language and the viewers’ language proficiency.

Frumuselu et al. (2015) investigated the effects of interlingual and intralingual subtitles on informal vocabulary learning as well as the overall comprehension of the presented video material. They found that intralingual subtitles were more beneficial irrespective of the learners’ language level. Frumuselu et al.(2015) explain that this may be due to the fact that intralingual subtitles increase learners’ interaction with the target language.

Charles and Trenkic (2015) found that watching videos with L2 captions improves speech segmentation skills. In their first study, international students of English studying in the UK took a listening test in which they had to repeat what they heard. It turned out that, on average, they missed around 30% of the words presented to them. In the second experiment, another group of international students was divided into three experimental conditions: watching the documentary with sound and subtitles, watching the documentary with

sound but without subtitles, or watching the documentary with subtitles but without sound. The participants completed a pre-test, and a week later and two weeks later watched the documentary and completed an immediate post-test. In week 4, there was a delayed post-test. The post-tests included not only excerpts from the video material, but also “new words”, that is the words which were not presented in the video material. The results demonstrated that the participants exposed to bi-modal input (sound + subtitles) improved their speech segmentation abilities in general as they were also able to segment previously unheard utterances.

Zarei (2009) explored the differences in foreign language vocabulary recognition and recall in the case of students who watched videos with interlingual, intralingual and reversed subtitling. The materials used in the study included a multiple choice vocabulary test to measure vocabulary recognition and a “fill-in-the-bank” test to measure vocabulary recall. In terms of vocabulary recognition, there was no statistically significant difference between L1 and L2 subtitles. However, when it comes to vocabulary recall, the results demonstrate that intralingual subtitles were more beneficial than interlingual subtitles. Moreover, interlingual and intralingual subtitles were significantly more effective than reversed subtitling.

Watching L2 subtitled videos may also contribute to a better perception of target language phonology since learners can link sound with spelling and notice word boundaries, which helps in perceptual learning of foreign language sounds (Birulés-Muntané and Soto-Faraco 2016). In their experiment, Birulés-Muntané and Soto-Faraco (2016) asked intermediate learners of English to watch an episode of an English TV drama with L1 subtitles, L2 subtitles, and with no subtitles. The results reveal positive effects on listening skills derived from watching the clip with intralingual subtitles. As the researchers conclude, “this finding supports the hypothesis that subtitles in the original language can be used to retune the link of speech sounds with perceptive categories, so that intermediate to advanced English learners can adapt to English sounds in a more efficient fashion” (Birulés-Muntané and Soto-Faraco 2016: 7). Moreover, even though in terms of plot comprehension interlingual subtitles turned out to be the most beneficial, the L2 subtitle group outperformed the group without subtitles, which meant that L2 subtitles did not disrupt comprehension by adding extra mental effort.

Hayati and Mohmedi (2011) aimed to examine the effectiveness of different subtitling conditions on listening comprehension in the case of intermediate learners of English.

Out of three subtitling conditions, L2 subtitles turned out to be the most useful for enhancing listening skills. The researchers conclude that “double modal input may be processed more deeply because attention can alternate from the auditory to the visual format or be directed along parallel visual and auditory routes simultaneously” (Hayati and Mohmedi 2011: 189-190). However, the researchers also acknowledge some advantages conferred by L1 subtitles and the absence of subtitles. They claim that interlingual subtitles are most helpful for beginners, whose limited linguistic competence may hinder plot comprehension, while watching an original version of a movie (without subtitles) is best suited for advanced learners.

Guichon and McLornan (2008) explored the effects of multimodality on foreign language comprehension. The participants were French intermediate learners of English who were divided into four experimental groups: one was exposed to sound only, one to image and sound, one to image, sound and interlingual subtitles, and the last one to image, sound and intralingual subtitles. The results corroborate the beneficial effects of multimodality in that comprehension was facilitated when the information was presented by means of different modalities. Moreover, L2 subtitles facilitated comprehension more than L1 subtitles, mostly due to lexical interference that the latter created. After watching the video, the participants were asked to write a summary and the researchers found some evidence of L1-L2 negative transfer. As they conclude, “interference between French and English impaired lexical accuracy as students concentrated on L1 subtitles rather than on the oral message in L2”(Guichon and McLornan 2008: 91).

Interestingly, learners themselves perceive foreign language subtitles as conducive to language learning. For example, Tsai (2009) conducted a qualitative study on low-intermediate learners’ perceptions of the usefulness of L1 and L2 subtitles. After watching a movie clip, the students were asked to answer four open-ended questions on the pros and cons of the respective subtitling condition, and subsequently to justify their answers in the form of oral interviews. The responses reveal that both subtitling conditions had positive and negative sides, though overall, intralingual subtitles were perceived as more beneficial in terms of language learning in areas such as vocabulary learning, pronunciation, and listening comprehension. This is not to say that L1 subtitles were considered useless. For example, the participants who were in the L1 subtitle group reported that with the assistance of L1 subtitles they could verify their understanding of spoken words and simply acquired new vocabulary items. On a negative side, there were comments like “my focus is on Chi-

nese and I don't actually listen to the speakers (unless the words I hear are familiar to me)", or "I don't know how a word is spelt even if I know how to say it". Moreover, even if they could learn some new words, the words were familiar to learners and easy. When it comes to the L2 subtitle group, apart from positive comments such as "I can know how words are spelt", "I can know how grammar is used", or "the English subtitles help me know every word spoken by the speakers", there was also some criticism of L2 subtitles. For example, some students reported that they were not able to understand the content even if they knew the meanings of all individual words, which suggests that in the case of low proficiency students L2 subtitles do not help with comprehension. Even though Tsai (2009) concludes that intralingual subtitles may be more beneficial to low-intermediate learners, he highlights the importance of recognizing the benefits of both subtitling conditions. As he says,

The L1 subtitles may merely enable learners to improve their language proficiency in terms of vocabulary, listening comprehension of the language and oral abilities to a very limited extent. (...) It may be worth considering as well that whether to watch movies with the L2 subtitles or the L1 subtitles depends on the goals of teaching. For instance, if the teaching goal is to help students improve their pronunciation and spelling, watching movies with the L2 subtitles may be a choice (Tsai 2009: 16-17).

Peters et al. (2016) conducted two experiments to determine whether L1 or L2 subtitles are more beneficial for learners in terms of word learning. In the first study, using a pretest-posttest design, the researchers exposed EFL intermediate learners from Belgium to a FL video clip and tested them on form recognition and recall of the target words. It turned out that L2 subtitles had a positive effect on form recognition, though it was conditional on the participants' vocabulary size which was tested prior to the experiment – the bigger vocabulary size, the better scores on the form recognition test. As for meaning recall, there were no significant differences between the two subtitling groups. In the second experiment, low-proficiency EFL learners watched a video clip and completed three post-tests on vocabulary learning: a test on form recall, form recognition, and meaning recognition. The results show that the participants benefited more from L2 subtitles in terms of form recall, but when it comes to form and meaning recognition, there were no significant differences between the two groups. Overall, the results of both experiments indicate that exposure to FL movies can lead to vocabulary learning, even though the gains were not substantial. While both subtitling conditions may support this acquisition, L2 subtitles have a greater potential in supporting form learning. According to the researchers, however, what may

have an even bigger impact on learning vocabulary through exposure to FL films is frequency of occurrence and the learner's vocabulary size.

Rodgers and Webb (2017) sought to examine the effectiveness of L2 subtitles on comprehension in a longitudinal study in which 372 Japanese students watched 10 episodes of an American series over 13 sessions separated more or less by a week. L2 subtitles were found to aid comprehension, however, a significant difference between the caption and no-caption groups was found only in the case of three episodes. The researchers conclude that L2 subtitles are particularly useful for learners who engage in extensive viewing of TV-series, especially at the beginning of the process, or while watching more challenging episodes. With time, viewers make use of accumulated knowledge of a given series, and there is no need to resort to subtitles to understand the content of a given episode, and this is why with subsequent episodes the differences between the two groups did not reach the levels of significance. However, researchers purport that L2 subtitles assist in comprehension and should be used whenever learners view a more challenging episode, e.g. with more difficult vocabulary, accent, etc.(Rodgers and Webb 2017: 34).

Ashcroft et al. (2018) measured incidental vocabulary learning through a single exposure to a FL movie. In their study, Japanese learners of English were divided into two groups: the experimental group watched a video clip with English subtitles, while the control group was not exposed to the movie at all. The results indicate that the participants benefited from exposure to the audiovisual material with FL subtitles, even though the vocabulary gains were not substantial (there was a significant mean gain of 1.77 words out of 42 target words per student). The researchers explain that such low gains are attributable to the low frequency of the target words in the movie so that the participants did not encounter a given word frequently. Moreover, it was incidental learning, and this is why the participants did not deliberately focus on the meaning of particular words, but rather on overall comprehension of the movie content.

Muñoz et al. (2021) investigated, inter alia, the role of L1 and L2 subtitles in learning FL vocabulary and grammatical constructions. In their first study, 39 Catalan-Spanish bilinguals who were at an elementary proficiency level were divided into two experimental groups and watched 24 episodes of a TV-series in English over 8 months either with L1 or with L2 subtitles. Their vocabulary knowledge and comprehension was tested immediately after watching each episode, and the results revealed no significant differences between L1 and L2 groups in terms of vocabulary gains. The researchers account for the lack of signifi-

cant differences between the two groups in terms of the participants' level of proficiency, since beginners are not yet able to fully benefit from subtitling, especially L2 subtitles which have been found to facilitate vocabulary acquisition in previous research (Muñoz et al. 2021: 17). The second study targeted grammar acquisition, specifically constructions created through pattern-finding or constructions that allow for rule abstraction. In this longitudinal study, 60 Catalan-Spanish bilinguals watched 10 episodes of a TV-series in English over five weeks either with or without L2 subtitles, and completed various productive grammar exercises. The researchers found a significant advantage of exposure to subtitled videos over unsubtitled in terms of grammar acquisition.

#### **1.4.4.2. Interlingual subtitles**

According to Danan (2004: 72), interlingual subtitles are particularly beneficial for learners since they result in deeper cognitive processing caused by the need to process image, soundtrack in the foreign language, and text in the native language at the same time. This in turn leads to better recognition and retrieval. As Hummel (2010: 64) says:

One can view the dual set of structures – L1 and L2 – as providing an elaborated set of traces that appears to compensate for the fact that one language is less familiar to participants than the other. Exposure to translation equivalents may entail an increased set of interconnections, resulting in a more elaborate set of memory traces associated with the L2 structures.

The use of L1 subtitles may also assist in incidental foreign language learning since viewers hear the target language and they can acquire it without conscious effort (d'Ydewalle and van de Poel 1999).

There is not much experimental research which showed the superiority of interlingual subtitles over intralingual subtitles, but still there are studies which point to the advantages of using L1 subtitles, even if they are not compared with L2 subtitles. For example, in their experiment, Koolstra and Beentjes (1999) investigated vocabulary acquisition in the case of Dutch children through watching an English program with Dutch subtitles, without subtitles and a Dutch program as a control condition. They concluded that standard subtitling can contribute to incidental acquisition of vocabulary. Gorjian (2014) found that standard subtitling was superior to bimodal subtitling in terms of vocabulary acquisition.

However, in the study there was also a third experimental group that watched the video with reversed subtitling and this type of subtitling turned out to be the most effective of all three. Markham et al. (2001) investigated the influence of different subtitling conditions on listening and reading comprehension in the case of intermediate students. In terms of understanding and recall, the L1 subtitle group outperformed the L2 subtitle group and the no-subtitle group. The advantage of L1 subtitles over L2 and no subtitles was also confirmed in a later study by Markham and Peter (2003) in which the group exposed to L1 subtitles outperformed the other groups on a multiple-choice comprehension test.

Napikul et al. (2018) examined the impact of L1, L2 and no subtitles on vocabulary acquisition and listening comprehension in the case of tenth-grade children from Chiang Rai. Using a between-subject design, the researchers divided the participants into three experimental groups on the basis of the subtitling condition in which they viewed a movie clip. After the viewing, they completed a test on comprehension and vocabulary. Additionally, four students from each group were interviewed on the effectiveness of subtitling. The results of the quantitative part of the study indicate that the participants who watched the clip with L1 subtitles outperformed the other groups on the comprehension and vocabulary tests. Therefore, L1 subtitles turned out to be more effective than L2 subtitles for not only comprehension, but also vocabulary acquisition. The results of the qualitative part are somewhat inconclusive since six students preferred English subtitles, and six preferred Thai subtitles. It turned out that the participants who had less experience with English and had problems with understanding the content of the movie appreciated L1 subtitles more since while exposed to L2 subtitles, they were unable to guess the meaning of unfamiliar vocabulary. On the other hand, the participants who had more experience with English preferred English subtitles as the L2 subtitles helped them improve spelling and pronunciation as well as reduced confusion and helped them learn new words.

Pujadas and Muñoz (2020) explored the effects of extensive TV viewing with L1 and L2 subtitles on comprehension. The participants were Spanish-Catalan bilingual learners of English and they were divided according to the language of the subtitles (L1 or L2), and instruction (with or without pre-teaching of the target vocabulary). The treatment involved exposure to a TV-series over the period of 8 months. Comprehension was measured by means of multiple-choice and true/false questions testing explicit as well as inferential information. One of the most important findings is that L1 subtitles aid comprehension more than L2 subtitles in the case of beginners (A1-A2 level of proficiency). As the re-

searchers conclude, “in a school classroom setting— where students may have different levels of L2 proficiency—the use of subtitles would engage the weakest students at the beginning while offering all learners the benefits of listening to authentic input and raising their motivation”(Pujadas and Muñoz 2020: 570). Moreover, the research shows that prior vocabulary knowledge and lexical coverage are significant predictors of comprehension, however, when it comes to vocabulary size, it was a significant predictor only in the L2-subtitles condition. This highlights the role of L1 subtitles as a scaffolding which helps beginning and low-proficiency students access authentic language input.

Dizon and Thanyawatpokin (2021) focused on the influence of L1, L2, and dual subtitles on vocabulary learning and listening comprehension in the case of beginner Japanese learners of English. Using a pre-test post-test design, the researchers administered a vocabulary test on form recognition and meaning recall before and after the participants viewed a TV episode from an American sitcom. Additionally, there was a listening comprehension test which consisted of true/false and open-ended questions. The results reveal that L1 and dual subtitles were more effective for vocabulary learning and comprehension than L2 subtitles, and that dual subtitles were most effective of vocabulary learning of all three conditions. Dizon and Thanyawatpokin (2021) explain that beginners may need a scaffold for vocabulary learning in the form of native language subtitles since they may not understand many L2 words, especially given the speed of presentation.

## **1.5. Conclusion**

Summing up, the use of FL videos, especially with subtitles, is highly recommended in FL teaching and learning. In general, exposure to media leads to greater proficiency in the target language as is evidenced by the results of numerous large-scale international projects which demonstrate that out-of-class exposure to media is correlated with the level of proficiency in the target language. This finding necessitates the need to promote the use of media in and outside the classroom among language learners, especially in countries in which informal learning in the form of exposure to media is neglected, and learners have limited access to such materials, or are not aware of the benefits that such informal learning brings. Even though mere exposure to FL videos results in FL acquisition, of particular value is the use of subtitled videos. Admittedly, there are some potential problems connected with us-

ing subtitles – they may not be effective in the case of low level learners or children who have not yet developed reading skills in their mother tongue, they may also potentially result in cognitive overload and distract viewers. Even if captions help in FL acquisition, they may not be useful for developing all areas of proficiency, a good case in point being grammar, since exposure to FL videos without explicit grammar instruction has not been found to result in grammar acquisition.

However, despite these shortcomings, the review of experimental studies presented above definitively tips the scales in favour of FL subtitled videos. Ample experimental research shows that subtitles may facilitate comprehension, vocabulary acquisition, and foreign language learning in general, thus today they are considered to be one of the most facilitative factors bolstering foreign language learning. Intralingual subtitles have been found to assist mostly in developing listening comprehension skills as they help in speech segmentation (e.g. Charles and Trenkic 2015), acquiring vocabulary (e.g. Zarei 2009) since they help to notice unfamiliar words, or developing pronunciation skills (Wiśniewska and Mora 2020) as they help viewers link spelling with pronunciation. Interlingual subtitles, on the other hand, assist mostly in comprehension (e.g. Pujadas and Muñoz 2020), especially in the case of low proficiency FL students. The differences between L1 and L2 subtitles are not, however, clear-cut, and there are studies which show that L1 subtitles may facilitate vocabulary acquisition (e.g. Dizon and Thanyawatpokin 2021) since viewers are simultaneously presented with L1 and L2, which results in deeper processing, or studies which show that L2 subtitles may bolster comprehension (e.g. Rodgers and Webb 2017). Therefore, the effectiveness of a given subtitling condition may be dependent on different factors, for example the level of proficiency, so it is not possible to make generalizations and say whether L1 or L2 subtitles are more useful for vocabulary acquisition or comprehension.

The studies described in the chapter focus on identifying the benefits of watching FL videos in different subtitling conditions on the basis of the results obtained from different language tests. What they fail to take into account though is the measurement of the actual burden that different subtitling conditions or films in general impose on working memory and what learners think of the difficulty of the task. The following chapter describes the theory of cognitive load through which the usefulness of subtitles is considered.

## Chapter 2: Cognitive Load

### 2.1. Introduction

The knowledge of human mind architecture is a pivotal element of teaching foreign languages since it allows teachers to understand how students process information and how they learn. Each learning task imposes a certain load on cognitive resources available for learning, though this load differs depending on the task. As Sweller (1994: 295-296) said,

Two tasks may appear to have roughly similar amounts of information but differ enormously in the effort required to achieve mastery. Students can find the concepts and procedures discussed in some curriculum areas notoriously intractable while other areas may contain copious quantities of information that nevertheless, can be assimilated readily

One of the major tasks for teachers is tailoring learning materials to their students' capacities so as to maximize learning and minimise mental effort. As with other materials, it is possible to modify the cognitive load generated by foreign language films, for example through the mode in which they are viewed– with or without subtitles, with L1, L2, reversed subtitles or with dubbing. Accordingly, how a film is screened to learners is important since it may stimulate vocabulary acquisition, facilitate comprehension, develop listening or reading skills or lower anxiety, depending on the mode.

The present chapter describes cognitive load theory (CLT) in relation to learning. First, basic aspects of human cognitive architecture are described. The following sections deal with the notion of cognitive load, its types, effects on learning and measurements. Finally, the use of subtitles in EFL is analysed through the lens of cognitive load theory.

## **2.2. Theoretical underpinnings: Human Mind Architecture**

Cognitive Load Theory provides a framework for studies on mental effort and cognitive processes in the learning environment and it aims at “the generation of new, useful instructional techniques” (Chandler and Sweller 1991: 351). The theory presupposes that humans have limited working memory capacity and unlimited long-term memory, and it is working memory limitations that are of paramount importance to instructional designs. As Sweller et al. (1998: 253) claim, “any instructional design that flouts or merely ignores working memory limitations inevitably is deficient”. Although research indicates that humans can store up to seven items in the working memory (Miller 1956), the number decreases to two or three elements when they require processing and not just holding (Sweller et al. 1998). As for long-term memory, Sweller et al. (2011: 18) compare it to genomes in biology: it is a large organised knowledge base and it manifests itself as a feeling of familiarity, i.e. we feel that something is familiar. Long-term memory is regarded as a source of “human intellectual prowess” and as such is crucial to learning.

Not only is it important to use learning materials that do not exceed working memory capacity, but also materials that draw on long-term memory resources, i.e. previously acquired knowledge (Sweller et al. 1998: 254). Information in long-term memory is stored in the form of schemas, which are responsible for the organization of knowledge, e.g. there is a schema for a tree so that we can easily recognize trees even though each tree is different (Marcus et al. 1996: 49). Moreover, schemas reduce working memory load because a schema is a single entity which incorporates multiple elements acquired over years, so instead of processing each element individually in working memory, we access only one schema. In order to circumvent working memory limitations, schemas should ideally be automated. Automation results in a quick and accurate performance in familiar tasks and, due to this offloading of working memory capacity, it leads to a better performance in unfamiliar tasks since more cognitive resources can be devoted to their processing (Sweller et al. 2011). Conversely, if a schema is not automated, more resources have to be allocated to a familiar task, e.g. we have to spend some time on a given task before we recognize it as familiar (Marcus et al. 1996: 50).

The functioning of the human information processing system can be described by five principles. The information store principle states that humans store a huge amount of information in their long-term memory and this information is stored in the form of sche-

mas. The initial knowledge of the information store principle comes mostly from de Groot's (1965) work on chess players. It turned out that there was a disparity between chess grandmasters and weekend players in terms of their performance in the game. De Groot (1965) found that it was due to memory of board configurations since chess grandmasters were able to successfully reproduce board configurations and weekend players made more mistakes. Thus, the knowledge of chess rules is not enough to be an expert; what is needed is automated schemas that contain innumerable board configurations with the most appropriate moves for each of them. This early research on long-term memory has important implications for learning. As Sweller et al. (2011: 24) claim:

While we need to learn the well-defined rules of mathematics and science or the more ill-defined rules associated with language based disciplines such as literature or history, that knowledge will not take us very far. For real competence, we also must learn to recognise large numbers of problem states and situations and what actions we should take when faced with those states and situations.

Thus, schema formation and changes in long-term memory are essential to learning.

The second principle describing the information processing system is the borrowing and reorganizing principle which says that information stored in long-term memory is borrowed from other people's long term memory. Biologically-driven imitation plays a central role in learning as students absorb the knowledge they receive from teachers. According to this principle, explicit teaching or at least the use of scaffolding techniques is much more effective than implicit learning where learners gradually discover information on their own. Granted, students are not always perfect at imitation and the information they imitate undergoes a reorganization process since it must be combined with previously acquired knowledge. As a result, the newly acquired information may be different than the original information. This necessitates testing for effectiveness so that learning is effective and all the negative distortions of the imitated information can be eliminated (Sweller et al. 2011).

The randomness as genesis principle is responsible for the creation of novel information during problem solving when there are no schemas available. A random generate and test procedure generates new information on the basis of previously learned items and then tests them for effectiveness so that only successfully generated information is retained. This principle is, therefore, the only source, or the genesis of new information when the borrowing principle fails (Sweller 2006: 354). Brainstorming is an example of an activity that encourages the use of random generation procedure (Sweller et al. 2011: 36).

The narrow limits of change principle indicates that humans have a limited working memory capacity and that is why the acquisition of new information is a slow process. In other words, working memory is not adjusted to dealing with a large amount of new elements simultaneously (Sweller 2006: 354). As has been mentioned above, working memory capacity is limited to more or less seven items (Miller 1956). However, it is also limited in terms of duration: new information is held in working memory for no longer than 20 seconds (Peterson and Peterson 1959), though this limit may be overridden by rehearsal. Finally, there is the environmental organizing and linking principle which, in contrast to the narrow limits of change principle, says that working memory capacity is not limited when it comes to dealing with information stored in long term memory. As the name suggests, the environmental organizing and linking principle allows us to link the information from long-term memory to the environment we live in (Sweller 2006: 354-355). A retrieval of a particular schema is triggered by the environmental information so that we know how to act in this environment. For example, we have a schema for solving a given type of equation, but it is not retrieved from long-term memory until we see an example equation of the type and we have to solve it (Sweller et al. 2011: 49).

### **2.3. Types of cognitive load**

The central tenet of CLT is the notion of cognitive load and its impact on working memory. Cognitive load can be defined as “a multidimensional construct representing the load that performing a particular task imposes on the learner’s cognitive system”(Paas et al. 2003: 64). According to Paas and van Merriënboer (1994b), there are three types of causal factors that affect cognitive load– task characteristics, subject characteristics, and interactions between the two. Time pressure is an example of a task characteristic that may influence cognitive load since high pressure results in high cognitive load. Cognitive style or prior knowledge are examples of subject characteristics that do not change abruptly depending on the task. Finally, an interaction between the characteristics of the task and characteristics of the subject may affect cognitive load, e.g. the structure of the task may induce a different level of cognitive load on reflective and impulsive learners (Jelsma and Pieters 1989).

Traditionally, cognitive load can be subcategorised into three different types with respect to its source: intrinsic, extraneous, and germane.

### 2.3.1. Intrinsic cognitive load

Intrinsic cognitive load is related to the inherent difficulty of the material and thus it cannot be altered by, for example, introducing a different instructional design (Leppink et al. 2013); to change intrinsic cognitive load is to change the nature of the task or the level of knowledge (Sweller 2010). The source of intrinsic cognitive load is element interactivity, i.e. the number of elements (e.g. concepts that need to be learned) which interact in working memory. Low element interactivity means that we can learn an element independently of other elements and thus it induces low intrinsic cognitive load, e.g. while learning chemical symbols, working memory processes only a given symbol without simultaneous processing of other symbols. Conversely, solving algebra equations imposes a high intrinsic load since many elements interact and must be considered simultaneously (Sweller 2010: 124). Similarly, learning foreign language grammar generates higher intrinsic load than learning FL vocabulary since it consists of elements that interact such as subject, object and predicate (Antonenko et al. 2010: 426). For example, we say “when learning a language” instead of “a language learning when” because we have to process all four words with their functions and relations (Tindall-Ford et al. 1997: 260), and this processing in turn results in higher intrinsic load. It should be noted, however, that element interactivity is not equivalent to task difficulty. In the aforementioned example, learning FL vocabulary may be very difficult as there is an abundance of vocabulary items that need to be acquired, yet learning individual items does not impose a great load on working memory since element interactivity is low (Sweller et al. 2011: 61).

The level of cognitive load is, however, dependent not solely on element interactivity. Prior knowledge and experience (practice) lead to the formation and automation of schemata, which lowers working memory load. Once constructed, a schema with its embedded interacting elements is retrieved to govern an activity. Thus, instead of processing multiple elements simultaneously, which imposes a load on cognitive resources, working memory processes only a single schema, which reduces cognitive load (Sweller et al. 2011: 66).

### 2.3.2. Extraneous cognitive load

Extraneous cognitive load is an unnecessary load imposed on the working memory by instructional procedures. This type of cognitive load is extraneous to learning, however, it is not imposed by the nature of the material itself but the way it is presented, and that is why it is an unnecessary load which can be reduced (Sweller et al. 2011: 57). The same task may generate intrinsic and extraneous load depending on the learning objectives. For example, when presented with a text on stock companies laws written in legal terminology, students of law would experience only intrinsic cognitive load connected to comprehension, while 10th grades would experience intrinsic as well as extraneous cognitive load due to the difficulty of the text (Schnotz and Kürschner 2007: 478). Intrinsic and extraneous cognitive load are connected in that they both determine the overall level of cognitive load that learning materials induce. If extraneous CL is too high, there are no cognitive resources available to deal with intrinsic cognitive load, which hinders learning (Sweller et al. 2011: 58). Moreover, Sweller (2010) argues that both intrinsic and extraneous CL are caused by element interactivity. While in the case of intrinsic CL there is no possibility of modifying what is to be learned, in the case of extraneous CL the number of elements that need to be processed simultaneously can be reduced (Sweller 2010: 125).

Schnotz and Kürschner (2007: 481-482) claim that there are different types of extraneous cognitive load depending on its cause, i.e. the type of misalignment that occurs between task difficulty and the level of expertise: either task difficulty exceeds expertise or expertise exceeds task difficulty. In the former case, extraneous cognitive load may result from interactivity between relevant information when the task is too difficult for the current level of expertise due to element interactivity, or maintenance of relevant information when the task requires split attention between different sources of information. In the latter case, there are also two types of extraneous cognitive load. It may result from interactivity between irrelevant information which is associated with the redundancy effects since it occurs when element interactivity is high due to the presentation of redundant information, for example a diagram is presented with an unnecessary text which is impossible to ignore. In addition, extraneous load may be a result of a waste of time and effort when a student processes redundant information, for example he or she studies a diagram and reads the explanatory text afterwards, even though the diagram is fully intelligible to the student. Hence, extraneous load may be caused not only by element interactivity, but also by irrele-

vant cognitive activities, that is the ones which do not lead to schema formation and automation, and are thus of no relevance for learning (Schnotz and Kürschner 2007).

Extraneous cognitive load is said to be detrimental to learning and this is why instructional designers tend to reduce it in learning materials so as to increase the affordances for working memory resources that can be allocated to learning. However, extraneous cognitive load may be sometimes connected to germane load and its reduction may in fact hinder learning. For example, when students are provided with redundant information, e.g. a graph and a formula, it generates high extraneous load. At the same time though, germane load conducive to learning increases as the students are engaged in deeper processing since they have to process information from the two representations relating them to each other, so that the information is better acquired (de Jong 2010: 108). Redundant information has been found to be beneficial when it is presented near the main information and when it is brief (Mayer and Johnson 2008). Moreover, a total reduction of extraneous cognitive load would be not only impossible, but also deleterious to learning. For example reducing the split attention effect is beneficial, but the information presented has to be still readable, so it is sometimes better to avoid presenting all the information in one place (de Jong 2010: 109).

### **2.3.3. Germane cognitive load**

Contrary to intrinsic and extraneous cognitive load, germane load is coveted in instructional designs as materials inducing germane load are challenging for learners (Antonenko et al. 2010: 426). It is, therefore, the “good load” which is generated as a result of the development of schemata and is thus required for learning (Sweller et al. 1998). Germane cognitive load can be defined as working memory resources that are germane to learning because they deal with intrinsic and extraneous load (Sweller et al. 2011: 57). As Sweller (2010: 126) purports, “a decrease in extraneous cognitive load results in an increase in germane cognitive load as working memory resources are switched from elements associated with extraneous to elements associated with intrinsic cognitive load”. Thus, when intrinsic load is high and extraneous low, cognitive resources are allocated to dealing with the essential material, and germane load increases.

While it has been established that there are limits to intrinsic and extraneous cognitive load because cognitive overload impedes learning due to the limited working memory capacity, there is no clear indication of whether there are limits to germane cognitive load. Sweller (2005b) argued that instructional design should aim to decrease extraneous and increase germane cognitive load provided that total cognitive load is within the limits of working memory capacity. Hence, even though germane load is considered to be conducive to learning, it should be increased in moderation, with relation to intrinsic and extraneous load.

#### **2.3.4. Other classifications**

Xie and Salvendy (2000) argued that cognitive load is a dynamic construct that changes while learning. They suggest a different classification of cognitive load based on its measurement. According to this classification, we can differentiate instantaneous, peak, accumulated, average and overall load. Instantaneous load reflects the dynamic nature of cognitive load as it captures the fluctuations in cognitive load during performing a task. Peak load is the maximum instantaneous load experienced while performing a task, accumulated load is the total amount load experienced at task execution, average load is a mean value of instantaneous load which equals the accumulated load per a particular unit of time, and overall load represents the perceived load experienced by the learner, thus subjective methods such as self-reports are utilized to measure this type of load. Fig. 1 below, adapted from Paas et al. (2003: 65), shows a graphic representation of different types of cognitive load.

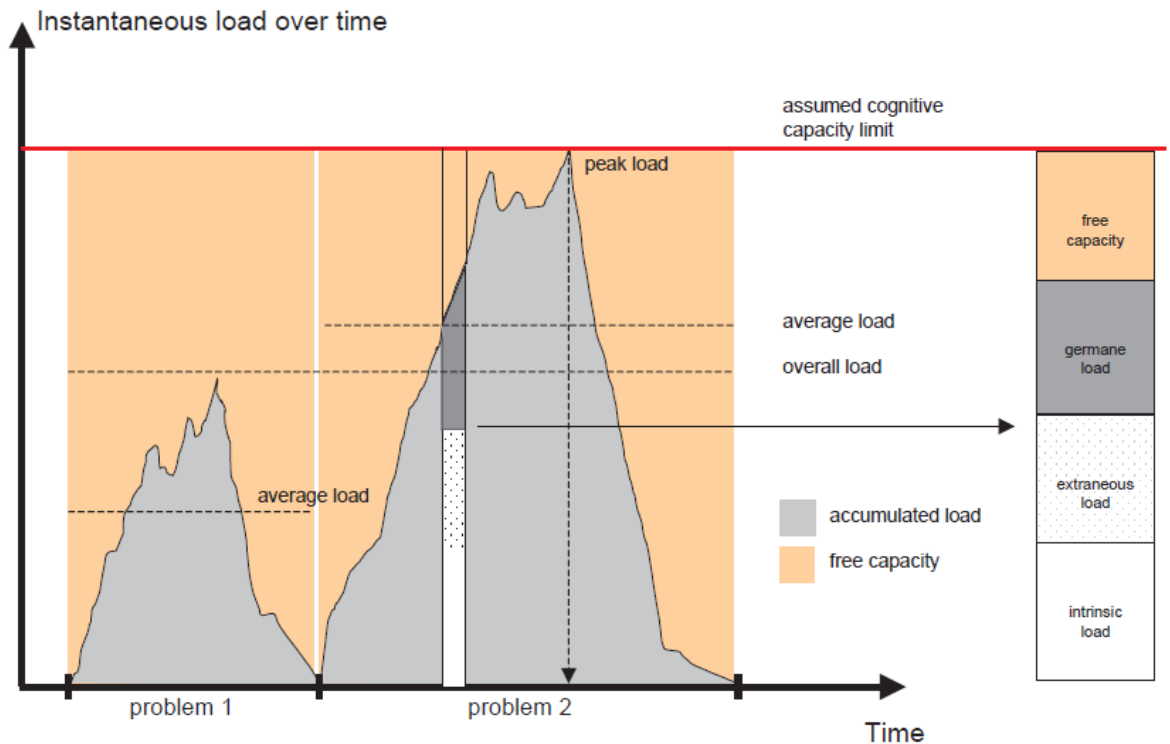


Fig. 1. Different types of cognitive load (adapted from Paas et al. 2003: 65).

## 2.4. Cognitive load effects: instructional implications

Cognitive load is said to have numerous effects on learning (Sweller 2010). Although intrinsic cognitive load is basically unalterable, it is still possible to modify the level of extraneous and germane load. As cognitive load does affect learning, a number of ways to reduce cognitive load has been suggested so as to augment working memory capacity and facilitate learning.

One way to reduce cognitive load is to use the so-called hierarchical approach (Frederiksen and White 1989). Learners exposed to the hierarchical approach focus first on component skills and knowledge, and only later do they perform the whole task. In other words, they work on separate parts of the task prior to doing the task, instead of doing the whole task straightaway. In this way, cognitive load imposed by the task is reduced because attention is allocated to smaller, decomposed parts of the task and not overburdened with the whole task (Paas and Van Merriënboer 1994b).

Another way of modifying cognitive load lies in the manipulation of emphasis on particular components while the whole task remains intact. The emphasis-manipulation

approach was proposed by Gopher et al. (1989) and the essence of this approach is, as the name suggests, manipulating the emphasis on component skills. In their experiment using the Space Fortress Game (a very complex computer game requiring many skills and knowledge), Gopher et al. (1989) laid emphasis either on mine handling or ship control. The results demonstrate that the participants exposed to the emphasis-manipulation approach significantly outperformed those from the control group who played the game with no instruction. It can be concluded that emphasis changes reduced cognitive load as they helped to direct the participants' attention to given subcomponents.

Learning tasks may force students to work towards a specific goal, but they may also allow a certain degree of freedom in that they do not require the learner to consider multiple elements at a time, only the current problem. Such "goal-free" problems off-load working memory by focusing attention on the relevant information. This is known as the goal-free effect (Sweller et al. 2011). Because learners do not refer to a goal, they experience a lower level of extraneous cognitive load than students who are provided with a goal (Sweller et al. 2011). There is vast experimental research which found evidence for the effect. For example, in their experiment, Bobis et al. (1994) asked students to fold paper into a given shape either with the help of a model of the target figure or without it. In the latter condition, there was no clear goal and the participants outperformed the participants from the group provided with a ready-made model, which lends support to the effectiveness of the goal-free effect. The effectiveness of goal-free problems is, however, limited to transformation problems in which the number of possible moves is small, because otherwise learning may be inhibited by too many options available so that learners would be distracted from the main aim of the task (Sweller et al. 2011).

It has been found that for novice learners learning from examples is more beneficial than solving a problem without analysing expert solutions given as examples. Such example-based learning leads to the formation of problem-solving schemas and reduces cognitive load as learners do not invest mental effort into irrelevant aspects of the task. For example, it is easier for novice learners to solve an algebra equation when they can first study an example than when they are just given the task (Sweller et al. 2011). This is known as the worked-example effect and has been extensively researched and found to be conducive to learning, especially in mathematics and related domains (e.g. Sweller and Cooper 1985, Zhu and Simon 1987, Carroll 1994, Quilici and Mayer 1996). Some argued that using worked examples results in passive rather than active learning since learners are not en-

gaged in problem solving. Nevertheless, worked-examples have been found to facilitate learning since they reduce extraneous cognitive load, and this outcome is more important than the level of learners' activity (Sweller et al. 2011: 107). Moreover, the effectiveness of worked-examples is dependent on learners' expertise – with an increase in expertise, worked-examples become ineffective, which is related to other cognitive load effects such as the redundancy effect or the expertise-reversal effect (Kalyuga et al. 2001b).

The completion effect is a “variation” of the worked-example effect in that a step-by-step solution is provided, however, it is only partial because learners themselves have to complete some steps (Sweller et al. 2011). Both the completion as well as the worked example effect have been found to be conducive to learning. For example, Paas (1992) made his participants learn statistical concepts in three different conditions: worked-example, completion, and problem solving. The results demonstrate that conventional problem solving was less effective than the other two in terms of performance as well as cognitive load since it required more mental effort.

The redundancy effect occurs when learners are exposed to the same information in different modalities, for example there is a self-explanatory diagram, but additionally there is an explanatory text, which is redundant. Redundant information is unnecessarily processed and increases extraneous cognitive load, which in turn inhibits learning. It should be pointed out that the probability of the redundancy effect depends on the level of expertise as the same information may be redundant for advanced learners, while non-redundant for novice learners. The redundancy effect is ubiquitous in everyday life – it can be found in numerous manuals in which the instruction is accompanied by unnecessary pictures, or in maps which contain redundant textual explanations (Sweller et al. 2011). The redundancy effect has been frequently investigated in foreign language learning. For example, there is a vast body of experimental research which shows that reading a text which is accompanied by a concurrent oral presentation (listening and reading at the same time) results in the redundancy effect and is detrimental to learning (e.g. Diao et al. 2007, Diao and Sweller 2007). Another important implication coming from the redundancy effect is, for example, the design of PowerPoint presentations– if the speaker reads the texts from the slides, it results in the redundancy effect and the audience may find it difficult to comprehend and learn anything from the presentation (Sweller et al. 2011).

When designing instructional materials it is also important to consider the expertise-reversal effect, which is about differences between novice and more experienced learners –

a particular instructional procedure may be at the same time beneficial for novice learners and detrimental to more advanced learners as it may lead to the previously mentioned redundancy effect (Sweller et al. 2011). Many longitudinal and cross-sectional studies found evidence for the expertise-reversal effect. For example, Nückles et al. (2010) conducted a longitudinal study on writing journals. The participants were asked to write an entry after each seminar throughout the whole semester. The experimental group received prompts suggesting the use of different strategies, while the control group wrote the journal without any prompts. It turned out that for the experimental group the prompts were useful as long as they were novice learners (in the first half of the semester), but when their level of expertise increased, the prompts stopped being effective and, as a result, the control group outperformed the experimental group at the end of the experiment. Oksa et al. (2010) found that the expertise-reversal effect is connected to the split-attention effect. In the first experiment, students who were not familiar with studying Shakespearean texts worked with excerpts from two plays either in an integrated (Modern English explanation along with the original version) or traditional format (explanations in footnotes). It turned out that the integrated condition group outperformed the traditional condition group on the comprehension test. In the second experiment, the participants were professional Shakespearean actors. This time the traditional condition group outperformed the integrated condition group since for such experienced participants the explanations were redundant. While the traditional condition group could ignore the explanations in the footnotes, the integrated condition group had to process them, which in turn resulted in higher extraneous cognitive load. Hence, the two experiments show that different techniques may be effective for novice learners, but not for experts.

Related to the expertise-reversal effect is the guidance-fading effect. As the level of expertise increases, instructional guidance should be tailored to the learners' needs and thus the guidance should "fade" with time (e.g. Renkl 1997, Kester and Kirschner 2009, Nückles et al. 2010). What is intrinsic to learning at the beginning of a training process with time becomes part of long-term memory, and, as a result, it becomes extraneous to learning when the level of expertise is higher (Sweller 2010: 132). A typical technique used in accordance with the guidance-fading effect is a gradual transition from worked-out steps to problem-solving tasks so that novice learners are equipped with detailed instructional help, while more advanced students are engaged in problem-solving activities which draw on their long-term memory knowledge (Sweller et al. 2011).

The split attention effect says that information presented in an integrated format induces lower extraneous load and is more conducive to learning than information presented in the split-attention format where a learner has to gather information from different sources. For example, when we have a diagram, explanatory notes may be either embedded into the diagram or provided below it. The integrated format substitutes for the unnecessary visual search and mental integration, and thus it reduces extraneous cognitive load. The split attention effect occurs when different sources of information cannot be learnt and understood in isolation. Otherwise, the redundancy effect described above occurs (Sweller et al. 2011). Yeung et al. (1998) conducted a series of experiments in which they examined, inter alia, the split attention effect in reading with explanatory notes. They found, for example, that an integrated format in which explanatory notes were provided in the text improved comprehension of the text (but not vocabulary acquisition) more than the split-source format in which the notes were provided below the text. However, this effect was found only in the case of low-ability ESL learners and young learners in high element interactivity tasks, while in the case of more experienced adult learners the effect was reverse: the integrated format enhanced vocabulary acquisition but not comprehension.

The modality effect occurs when information must be presented by means of visual and auditory presentation rather than single modality presentation in order to reinforce learning, because if different sources of information were in isolation, students would not be able to understand them (Mayer 2009). The modality effect is rooted in the Cognitive Theory of Multimedia Learning, which presupposes that there are two separate channels in our cognitive system: auditory and visual. When materials consist of a written text and a picture, only the visual channel is used, which may lead to the cognitive overload of this channel. Conversely, if materials consist of a picture and a recording of the text, both channels process the information, which in turn leaves more working memory resources for learning because neither channel is overloaded (Mayer 2009). However, the effectiveness of this type of off-loading may be affected by element interactivity. According to Tindall-Ford (1997) for example, dual-modality instructions are beneficial when element interactivity is high because there is a need for off-loading working memory resources. However, if element interactivity is too high, for example the auditory material is lengthy and complex, we may expect the reversed modality effect, which means that a visual-only presentation will facilitate learning more than a dual-channel presentation (Leahy and Sweller 2011).

Hence, the modality effect works provided that certain conditions, such as element interactivity or the length of the auditory material, are taken care of.

For more knowledgeable learners, using imagination may be an effective way of reducing cognitive load. The so-called imagination effect is based on the premise that imagining a procedure or concept helps in transferring the information to long-term memory and assists in schema formation (Sweller et al. 2011). However, this technique has been found to be ineffective for novice learners. For example, Ginns et al. (2003) found that studying worked examples is more beneficial for learners with little prior knowledge than imagining the examples. In their experiment, students learnt the HTML code and because they were considered novice learners, the imagination effect did not work for them. In their second experiment, students with prior knowledge of geometry worked with geometry materials. The results of the post-test showed that the students who worked with examples only obtained lower scores than the students who used the imagination technique.

The self-explanation effect is similar to the imagination effect in that students have to resort to mental reproduction of the information, but instead of using imagination, they are asked to self-explain the new concepts, which facilitates their understanding and leads to schema formation (Clark et al. 2006). For example, Chi et al. (1994) found that students prompted to self-explain while reading about the human circulatory system outperformed the ones that were not encouraged to use the self-explanation technique in terms of knowledge gains.

## **2.5. Measurements of cognitive load**

The importance of investigating cognitive load for instructional designs has necessitated the need to develop different instruments indicating the actual level of mental effort experienced by students. Measuring cognitive load is a prerequisite for tailoring materials for students. What matters the most in instructional designs is not the level of cognitive load per se, but an indication of cognitive overload, i.e. when students' working memory is overburdened and learning is inefficient (Khalil et al. 2005). According to Paas and van Merriënboer (1994b), cognitive load is measured along three dimensions: mental load, mental effort and performance. Mental load is the load imposed by the task, mental effort is

the effort required to complete the task, and performance is based on the number of errors and time taken to complete the task (Paas et al. 2003).

The measurements of cognitive load have been classified into different categories – subjective and objective, online and offline, a priori and posteriori, direct and indirect ones. However, since cognitive load is a multidimensional construct, usually more than one measure is employed to ensure reliability and validity of results. While a priori estimates of cognitive load seem logical, we need more tangible measurements of cognitive load which can determine various hitherto only assumed differences between different learning materials in terms of the amount of cognitive load they induce. This section provides a comprehensive overview of currently available methods assessing cognitive load.

### **2.5.1. Self-reports**

A self-reported questionnaire is a subjective and offline (posteriori) measurement of cognitive load. Such questionnaires are based on a rating scale technique, which means that people are asked to report the experienced level of cognitive load on a unidimensional, or more frequently on a multidimensional scale which addresses different dimensions of cognitive load (Paas et al. 2008: 16). For example, the National Aeronautics and Space Administration Task Load Index (NASA-TLX) (Hart and Staveland 1988) consists of six components: Mental Demands, Physical Demands, Temporal Demands, Own Performance, Effort, and Frustration, and the total score measuring the workload is based on a weighted average of ratings from each component. Self-reports can be direct and indirect measures of cognitive load; the former investigate comprehension effort or frustration and engagement levels, while the latter focus on the mental effort experienced (Kruger et al. 2013: 63). They are easy to administer, unobtrusive, they do not hinder the completion of a primary task, and they are reliable as in numerous studies the results of self-reports correlate with the results obtained from objective measures (Kalyuga et al. 2001a: 10). As Park and Brünken (2014: 233) state, “subjective rating scales are advantageous as they can be used in a very easy, fast, and economic way without much effort in different learning contexts”.

Evidence seems to indicate that people “are quite capable of giving a numerical indication of their perceived mental burden” (Paas et al. 2003: 66). As Sweller et al. (2011: 74) claim, “The simple subjective rating scale, regardless of the wording used (mental ef-

fort or difficulty), has, perhaps surprisingly, been shown to be the most sensitive measure available to differentiate the cognitive load imposed by different instructional procedures”. Due to their multiple advantages, self-reports are frequently used by researchers. In an overview of studies on cognitive load conducted between 1992 and 2002 provided by Paas et al. (2003: 67), 24 out of 27 studies used this subjective measurement of cognitive load.

Paas (1992) used self-reports to measure cognitive load imposed by solving statistical problems. He found that performance scores matched self-ratings of perceived mental effort since learners presented with a design hypothesized to generate low cognitive load obtained high scores on tests and reported a low level of cognitive load. As the researcher concludes, “the findings concerning the cognitive-load variable, indexed by the perceived amount of mental effort, indicate that subjective measures of mental effort can be valuable research tools for assessment of cognitive load in instructional research”(Paas 1992: 433). Van Gerven et al. (2002) examined the effects of worked examples on young and elderly people’s training. The participants had to solve “water-jug problems” (filling a target jug with a certain amount of water with a limited set of operations) displayed on a computer screen, and their cognitive load was measured by means of self-ratings of difficulty. The results show that the elderly gained from worked examples more than younger participants since they experienced less mental effort and achieved equal performance. On the other hand, while dealing with conventional problems, the elderly reported greater difficulty and their performance was poorer than their younger counterparts’ results. Self-reports were again found to be reliable and sensitive measurements of cognitive load.

Self-reports have been found to be more sensitive measurements of cognitive load than the psychophysiological ones. Kruger et al. (2014) examined the impact of interlingual and intralingual subtitles, as well as the absence of subtitles on cognitive load and comprehension of an academic lecture. They employed different measures of cognitive load to ensure triangulation of data– eye-tracking, EEG, and self-reported questionnaires. Out of those three methods, only self-reports were sensitive enough to detect some differences between the experimental groups in terms of the cognitive load experienced. It turned out that the interlingual subtitle group experienced the lowest comprehension effort, while the no-subtitle group experienced higher levels of frustration than the other groups.

Even though self-reports have been found to be reliable measurements of cognitive load, due to their subjectivity, their validity is often questioned and the interpretation of results may pose a difficulty. For example, “a low amount of invested effort could be a re-

sult of low-cognitive load or, arguably, of such a high load that the learner decreased the mental effort expended on comprehending the materials” (Brünken et al.2003: 56). Moreover, the level of expertise may affect the ability to assess cognitive load. For example, in the experiments conducted by Ayres (2006), students used self- reports to assess intrinsic cognitive load of different algebraic problems. Overall, subjective measures turned out to be very effective instruments of assessment as their results correlated with error rate. However, the results of self-reports were affected by the participants’ level of mathematical expertise. As Ayres (2006: 398) concludes, “more knowledgeable students have well developed schemas in the domain giving them a greater understanding of the intrinsic complexities, enabling them to specifically pinpoint more problematical computations. In contrast, less-experienced students lack such schemas, preventing them from having a well-defined understanding of such complexities”.

In order to measure instructional efficiency of learning materials, mental effort scores are compared against performance scores (Paas and van Merriënboer 1993). While there is a plethora of studies demonstrating that self-report and performance scores are highly correlated, in some studies no significant correlation between the two measures was found. For example, in their experiment, Cuevas et al. (2002) exposed the participants to a tutorial designed for training pilots. Apart from performance tests, the researchers asked the participants to rate the difficulty of the tutorial. Although there were differences in terms of performance scores among different experimental groups, these differences were not reflected in the subjective measures of difficulty. Similarly, in their study on the influence of prior knowledge on learning from a non-linear electronic document, Amadiou et al. (2009) found differences in performance between the experimental groups but no differences in terms of cognitive load measured by self-reports.

A somewhat reversed outcome emerged from a study by Homer et al. (2008). The researchers investigated the impact of video on cognitive load and learning. Their participants were divided into two groups– one watched a presentation with a video lecture, while the other watched only the slides with an audio narration, but without the video. It turned out that there were no significant differences in the effects of video on learning, however, differences in cognitive load were noted. It turned out that the video generated higher cognitive load, though this greater mental effort did not negatively impact learning. In their second experiment, Homer et al. (2008) additionally considered the impact of individual differences among learners. Students who preferred visual information experienced smaller

cognitive load in the video condition that low visual-preference students. Hence, self-ratings of cognitive load may not always match performance data since they may be dependent on individual learner differences. Sweller et al. (2011: 75) argue, however, that “the correlation between subjective rating scales and test performance cannot be perfect. Notwithstanding that occasional inconsistency, subjective measures have had a profound influence and provided a useful tool in providing evidence in support of cognitive load theory”.

The results obtained from self-reports may also be marred by “subject expectancy” as people may form some expectancies about the goal of the study and give answers that are expected by the researcher (Brown 1988: 34). In addition, the validity of the results is threatened by the social desirability bias as people tend to lie to gain more prestige (Dörnyei 2003: 12). For example, even if a particular task was demanding, they may judge it as easy so as not to be perceived as less intelligent.

As has been mentioned, a self-report is a posttreatment measurement of cognitive load. There is, however, some debate when exactly self-rating should be administered: they can be applied immediately after the a task, or after the whole learning stage. Schmeck et al. (2015) conducted two experiments in which they investigated the differences between the two approaches to using self-reported questionnaires. The participants worked on six “weekday problems” which were different in terms of complexity. For example, a task that imposed a low level of cognitive load was “Suppose today is Tuesday. What day of the week is the day after tomorrow?”, while a task with a high element interactivity was : “Suppose last Tuesday was the 2nd day. What day of the week is it in 17 days, if the 8th day is in two days?” (Schmeck et al.2015: 98). The self-reports were administered after each task and after the whole phase. The results of delayed self-reports demonstrate that difficulty and mental effort were rated higher than in immediate self-reports, though it did not concern the ratings of affective variables (e.g. motivation). The researchers suggest that “the perception of “the task” as a series of problems rather than individual problems, affects cognitive load ratings but not affective ratings” (Schmeck et al. 2015: 111). The choice of time points at which researchers decide to administer self-reported questionnaires is therefore important in that immediate and delayed self-reports may yield different results. In addition, the frequency of administration should be taken into account. If a self-report is used several times during the learning process, it may yield a different average score than the score obtained from the same self-report administered only once, after the treatment (de Jong 2010: 115).

### 2.5.2. Performance outcome measures and instructional efficiency

Achievement scores along with learning time and error rate can be utilized as objective and indirect measurements of cognitive load (Paas and van Merriënboer 1994a, Brünken et al. 2003). In studies employing this measurement technique, learning materials that are used are the same for all participants, thus the level of intrinsic cognitive load is held constant. However, such performance based measures may add depth to the investigation of extraneous cognitive load. As Brünken et al. (2003: 56) say, “the more knowledge the learners acquire, the less extraneous load is induced by the instruction”.

To gain a better insight into the cognitive load experienced, researchers measure the so-called “instructional efficiency score” developed by Paas and van Merriënboer (1993), which combines actual performance scores and the perceived level of cognitive load measured by self-reports. High instructional efficiency denotes low mental effort invested in the task and high performance, while low instructional efficiency denotes high mental effort and low performance (Sweller et al. 2011: 75). In a series of experiments, Tindall-Ford et al. (1997) investigated the effectiveness of single and dual modality formats of instruction. For their second experiment, they recruited trade apprentices who were asked to study either audio-visual or visual-only instructional materials on electrical installations. After the instructional period, the participants were asked to rate the experienced mental load, and subsequently to complete a test on the studied material. Tindall-Ford et al. (1997) found that the audio-visual procedure resulted in higher instructional efficiency than the visual-only procedure since the participants from the former group had better test results and lower ratings of cognitive load than the participants from the latter group.

In his experiments, Yeung (1999) explored the impact of cognitive load, learner expertise and different formats of vocabulary definitions on reading comprehension and vocabulary learning. In the second experiment, secondary school ESL learners were divided into three groups: the integrated group had the less frequent words translated in the text (directly above the target word), the separated group had a separate glossary, and the control group had just the reading passage with no translations. Apart from comprehension and vocabulary tests, the participants rated task difficulty on a subjective scale. To analyze the data, instead of raw performance data, Yeung (1999) calculated the instructional efficiency score. While in terms of comprehension there were no significant differences between the

groups, the integrated format turned out to be the most efficient in terms of vocabulary learning.

The combined measures of performance and subjective ratings of cognitive load were also employed by Dervić et al. (2019). In their experiment, they investigated the effects of animations used for teaching purposes on cognitive load and learning. High school students were divided into three experimental groups – one was taught with the use of Physlet animations (animations for teaching physics), one with Physlet-based static pictures, and the third one with traditional static pictures. The materials used in the experiment included a cognitive load questionnaire which differentiated three types of cognitive load (intrinsic, extraneous, germane), and a knowledge test consisting of multiple choice and open-ended questions. Dervić et al. (2019) found that teaching with Physlet animations was more effective than teaching with the use of traditional materials since the Physlet group obtained the highest scores on the test. Moreover, the Physlet animations induced a lower level of intrinsic cognitive load and a higher level of germane load responsible for learning than other experimental conditions.

Tuovinen and Paas (2004) modified the original computation of instructional efficiency developed by Paas and Van Merriënboer (1993) by adding an additional dimension. While the traditional efficiency score is based on the measurements of learning performance, for example by means of a test and mental effort by means of self reports, the new three-dimensional approach to measuring efficiency combines the measurements of learning effort, test effort and test performance. The new dimension, test effort, resembles learning effort as it is also a subjective self-rating, but in this case students are asked to estimate the effort required to answer each question on the test. As Tuovinen and Paas (2004: 149) say:

The 3-D measure can be argued to be a more representative indication of the overall instructional process than either the learning or test efficiency measures, because it incorporates in one measure the effort throughout the whole process, rather than only during one part of it. It also appears to iron out many of the random fluctuations in the learning and test effort measures obtained at different times, rather than producing spurious results based on chance when effort measures are sought only during limited components of the learning and test process

Another variation on the use of performance outcome measures is the use of not only immediate but also delayed post-tests, which gives an indication of how much of the presented information was transferred to long-term memory. Chandler and Sweller (1991) con-

ducted a series of experiments on the effectiveness of instructional materials. In the first experiment, they compared conventional and integrated instructions using elementary electrical engineering. In order to test the instructional effectiveness, the researchers employed theoretical (e.g. questions about the use of the multimeter) and practical tests (e.g. safety test of an electrical appliance). In total, there were three testing periods: in the first one, an immediate written test was administered, in the second period a week later, a written and practical test, and in the last testing period twelve weeks later, written and practical tests. The results show that conventional instructions imposed a greater cognitive load on working memory since they required mental integrations so that attention was not directed at knowledge acquisition. The researchers noted that there was an increase in performance scores over the testing periods in both groups, however, the integrated instruction group outperformed the conventional group. The researchers point out that they chose performance scores as a measurement of cognitive load due to ecological validity of the experiment as employing more direct measures would negatively impact the realistic environment of the study.

Instructional efficiency measurement has been frequently adopted by researchers since the differences in effectiveness itself may not go hand in hand with differences in efficiency. Kalyuga et al. (2001a) explored the efficiency of two types of instructional guidance – one based on worked examples and the other more exploratory– in the case of mechanical trade apprentices engaged in problem solving tasks. The researchers administered a performance test as well as a self-reported questionnaire on task difficulty. In the first experiment it turned out that the worked-examples group had higher instructional efficiency than the exploratory group. Though there were no significant differences on performance tests between the two groups, the worked-examples group rated task difficulty significantly lower than the exploratory group. Thus, performance data itself may not be a precise indication of cognitive load since learners may obtain the same score on the performance test with different amounts of mental effort invested. This is why instructional efficiency score seems to be a more valid measurement of cognitive load.

The results of performance outcome measures may be challenged by individual differences between learners. Plass et al. (2003) examined cognitive load in reading foreign language texts. In their experiment, English learners of German had to read a story in the foreign language and look up all the marked words. Different types of annotations were available for the three experimental groups–translation and pronunciation, picture or a vid-

eo, or both, while no marked words and no annotations were available for the control group. On the following day, they were given a comprehension and a vocabulary post-test. Among other things, Plass et al. (2003) found that there were individual differences between the participants which affected their performance scores. For example, low-spatial ability learners acquired more words than high-spatial ability learners when they were presented with visual and verbal annotations, as well as with no annotations. The reversed effect was found in terms of comprehension since high-spatial ability learners outperformed low-spatial ability learners on the comprehension post-test. As the researchers conclude, the latter “spent more cognitive resources on the lower-level processing of individual vocabulary words and their meaning and did not have enough resources available for organizing the propositions of the text in working memory and integrating them with one another and with the mental model of the reading text” (Plaas et al. 2003: 238). Moreover, as de Jong (2010: 121) claims, “A low performance associated with a low cognitive load would result in a similar efficiency value as a high performance with a high cognitive load, which leads to unclear experimental situation”. Thus, the same instructional efficiency score may in fact denote different “efficiencies” of materials.

Finally, in order to measure cognitive load induced by learning materials, it should be measured during learning, not after the treatment since the main goal is to measure the load imposed on cognitive system during knowledge acquisition (de Jong 2010: 121).

### **2.5.3. Dual task methodology**

Dual task methodology presupposes that when people attend to a primary and secondary task simultaneously, the performance in the secondary task can be regarded as a direct and objective measurement of cognitive load. It is because cognitive resources are limited and they are allocated first to the primary task. When an extra, secondary task is added, the resources available for its execution depend on the resources already allocated to the primary task— the more resources are left, the faster a participant will respond to the secondary task. The speed of response is said to reflect mental effort generated by the primary task since the faster a participant responds, the lower the level of cognitive load is (Brünken et al. 2002, Schoor et al. 2012). One of the biggest assets of this measurement is the fact that contrary to self-reports or performance scores, it is an online measurement,

which means that cognitive load is measured during learning and not after the completion of the task. It allows researchers to see precisely at which point in time during learning the load was imposed on the learner (Brünken et al. 2003: 57). Moreover, the use of dual task methodology may help reduce different confounding variables such as prior knowledge or abilities, since this technique is used in within -subjects designs. Dual task methodology is a sensitive measure of cognitive load which can be used in different fields, not only in experimental psychology or multimedia learning, but even for ergonomic software evaluation (Brünken et al. 2002: 118). It has also been used for measuring cognitive load experienced by pilots of unmanned robots (e.g. Goodrich 2004), or drivers (Merat et al. 2010).

A secondary task may take different forms. Marcus et al. (1996) examined the effectiveness of instructions using text or diagrams while solving electrical resistor problems. In one of their experiments, they employed a secondary task which was about using a foot pedal to respond to a tone. The participants had to connect resistors (primary task) and use a foot pedal whenever a computer generated a tone. The results support the hypothesis that the more difficult the instruction is for a participant, the longer it takes them to react to a secondary task.

Dual task methodology was also used by Chandler and Sweller (1996) to measure cognitive load while learning to use a computer software. In their study the participants were given some computer-aided design (CAD) and computer-aided manufacture (CAM) instructions to perform on their computer and subsequently completed written and practical tests. The primary task was therefore learning CAD/CAM systems. The secondary task was performed on a different computer where a letter appeared after a tone, and then after eight seconds a new letter appeared again preceded by a tone. The participants had to verbally recall the previous letter while they were memorizing the new one. The researchers found that cognitive load was high when participants had to deal with materials with high element interactivity.

Saariluoma (1992) investigated cognitive resources needed for acquiring chess skills. The primary task was a minor piece-counting task in which the subjects had to count the number of target pieces. The researchers compared two types of secondary tasks– an articulatory and a visuospatial task. The former was about repeating aloud a given word, and the latter was adapted from Brooks (1968). It required the participants to imagine walking around the edges of a word “vaiva” and tell whether they had to turn left or right while being at the corner. It turned out that contrary to the visuospatial task, the articulatory sec-

ondary task did not interfere in chess players' information intake. Similarly, Robbins et al. (1996) examined the impact of different online secondary tasks on memory for chess positions (primary task). In their first experiment, one group was given an articulatory suppression task which was about repeating the word "the" with the use of a metronome, one group was given a visuospatial-sketchpad suppression task which involved completing a sequence of keypresses, and one group was given a central-executive suppression task in which the participants had to generate a random sequence of letters with the use of a metronome. The results demonstrate that memory for chess positions is affected by the type of a secondary task— the central executive and the visuospatial-sketchpad suppression tasks degraded recall performance, which means that they interfered with memory, while the articulatory loop suppression task did not have an impact on performance.

Ayres (2001) investigated the cognitive load induced by algebraic bracket tasks. In one of the experiments, he employed a secondary task in which the participants had to remember a given sequence of letters before completing an operation, and after the computation they were asked to recall it. He hypothesized that different operations would induce different levels of intrinsic cognitive load as indicated by the accuracy of recall. Although the experiment did not yield many recall differences, there were still differences in cognitive load experienced in different operations.

Brünken et al. (2002) promoted the use of the primary and secondary task technique for measuring cognitive load in multimedia learning. In their first experiment, the primary task was to learn about the human cardiovascular system either by means of an audiovisual or visual-only presentation. The secondary task was a visual observation task in which the participants had to monitor a letter which was displayed on the screen and press the space bar when the colour of the letter changed. The reaction time was treated as an indicator of cognitive load imposed by the primary task. Results showed that the reaction times decreased when the primary task included audiovisual materials, which means that visual-only materials induce a higher cognitive load than audiovisual materials.

In their study, de Leeuw and Mayer (2008) combined three measures of cognitive load: reaction time, difficulty ratings and mental effort ratings. The participants learned from different versions of a multimedia lesson on how electronic motors work. The researchers manipulated extraneous cognitive load by means of redundancy (presentation with narration, animation and text or only with narration and animation), intrinsic cognitive load by means of complexity (high and low complexity sentences used in the presentation),

and germane cognitive load by means of transfer (differences in transfer performance). The secondary task that they implemented was a monitoring task in which a background colour changed and the participants were asked to press a button as soon as they noticed the change. The analysis revealed that different types of cognitive load should be measured by different techniques—dual task methodology (reaction time to colour change) turned out to be most effective for measuring extraneous load manipulated by redundancy, difficulty ratings for germane CL indicated by differences in transfer performance, and mental effort ratings for intrinsic load manipulated by complexity.

Madrid et al. (2009) examined the learning outcomes and cognitive load while learning with different versions of a hypertext. As a secondary task the researchers used reaction time to a beep— the participants had to press a key as soon as they heard a beep while reading a hypertext. Among other things, they found that the participants who chose a low coherence reading order experienced more cognitive load since their reaction times were slower than those of the participants who chose a more coherent reading order.

Schoor et al. (2012) measured cognitive load during multimedia learning by means of spatially contiguous or non-contiguous secondary tasks to cater for individual differences between learners. The former involved pressing a key when the background colour changed, while the latter involved pressing a key as soon as a letter in the upper part of the screen changed its colour. The results show that audiovisual presentation was found to be more effective than visual-only presentation as measured by a spatially non-contiguous task, however, no modality effect was found with respect to the spatially contiguous task. The researchers conclude that changes in cognitive load were not detected by the spatially contiguous task because the task did not require a lot of additional cognitive resources so the participants could easily perform the primary as well as the secondary task.

In their experiment, Park and Brünken (2014) used a foot-tapping rhythm method as a secondary task. The participants had to learn about a cellular molecule by means of a multimedia instruction (primary task) and tap a given rhythm using a foot pedal during the learning session (secondary task). The subjects who achieved better learning performance turned out to have higher rhythm precision, which indicates a lower level of cognitive load. The researchers note that tapping rhythm is a direct, continuous, objective measure of cognitive load which is independent of the primary task. Moreover, “the rhythm method includes inhibition processes, as learners have to stop tapping in the rhythm pauses, which can be used as an indicator for executive control and total cognitive load. Rhythm precision

therefore allows a precise measurement of cognitive load in the learning process” (Park and Brünken 2014: 240).

Dual task methodology has several limitations. First of all, the secondary task has to be chosen cautiously with respect to the nature of the primary task so as not to interfere too much with the primary task execution. For example, Hegarty et al. (2000) investigated the impact of different secondary tasks on performing psychometric visuospatial tasks. The participants were divided into five experimental groups depending on the secondary task they were asked to perform. There were three primary tasks for each subject: paper folding (imagining a folded piece of paper with a punched hole and deciding what the unfolded piece would look like), card rotations (choosing planar rotations of a figure) and identical pictures task (choosing an identical figure to the target figure). The secondary tasks were: random number generation task (saying random numbers to the beat of a metronome), 2-back task (deciding whether a just heard consonant from a series of consonants was identical to the consonant heard two items before), spatial tapping task (tapping a pattern on a keypad without looking at it), articulatory suppression task (repeating a word aloud), and simple tapping task (pressing a key on the keypad). The results demonstrate that secondary tasks had the smallest impact on the performance in the paper folding task, and the largest impact on the identical pictures task. Thus, if a secondary task is too demanding, it may suppress the completion of the primary task and ideally, there should be little interference between the primary and the secondary task. What should be taken into consideration while choosing a secondary task is, therefore, its format since if both primary and secondary task are in the same modality, the possibility of interference is greater (Park and Brünken 2014). Moreover, the measurement of a secondary task should be reliable and valid and the secondary task itself should be dependent on the primary task performance in that it should require the use of the same cognitive resources (Brünken et al. 2003: 57). It should also be noted that secondary tasks address only some specific aspects of cognitive load, for example auditory secondary tasks aim to measure phonological processes in working memory, not the overall cognitive load (Park and Brünken 2014).

Finally, there is no congruity on the interpretation of results. Although there is a vast body of research which shows that the shorter response time, the smaller cognitive load since more cognitive resources are left after the execution of the primary task, there is some evidence which suggests that increased cognitive load results in shorter response time to a secondary task (e.g. Reeves and Thorson 1986; Lang et al. 2004). For example, Fox et

al. (2007) found that RT to a secondary task was faster when the participants experienced cognitive overload. As they say, “the fast STRTs accompanying the declining recognition memory performance when overload is experienced suggest that encoding resources are being shifted from the too difficult primary task to the secondary task when overload occurs” (Fox et al. 2007: 281). Thus, when the primary task is too difficult, subjects give up on it and instead focus solely on the secondary task.

#### **2.5.4. Physiological measures**

Physiological measures allow for continuous, online and objective measurements of cognitive load, they can be indirect (e.g. heart rate, pupil dilation) and direct (neuroimaging techniques) (Brünken et al. 2003). As is the case with all measurements of cognitive load, physiological measures have several limitations. For example, it is assumed that when heart rate increases, the level of cognitive load increases as well (Roscoe 1993). However, this measurement cannot be regarded as reliable since there are other factors, for example stress, which may influence the participants’ heart rate (Brünken et al. 2003). In addition, heart rate variability has been found to be insensitive to fluctuations in cognitive load (Paas and van Merriënboer 1994a). Some physiological measures, for example measuring hormone levels, have been found to be too slow to be an online measurement of CL (Antonenko et al. 2010: 428). Other physiological measurement techniques may be intrusive, e.g. positron emission tomography (PET) is a neuroimaging technique which allows for monitoring blood flow related to neural activity, but requires subjects to ingest some substances prior to the experiment (Antonenko et al. 2010: 428). Despite their objectivity and precision, physiological measures provide “only an indirect causal link to cognitive load” (Brünken 2003: 56), which means that they are not fully valid. Nevertheless, due to their sensitivity and objectivity, physiological measures are often utilized in studies on cognitive load, and the most frequently used techniques are Electroencephalography (EEG) and eye-tracking.

##### **2.5.4.1. Electroencephalography (EEG)**

Electroencephalography (EEG) is a neuroimaging technique which measures brain-wave activity picked up by electrodes placed on the scalp (Antonenko et al 2010: 428). Traditionally, EEG has been used in medical research to, for example, investigate coma, brain death, epilepsy, stroke, to monitor brain development or cognitive engagement (Bickford 1987). Since EEG is sensitive to responses to cognitive stimuli, this non-invasive, objective technique has been used in educational psychology as a measurement of cognitive load (Antonenko et al. 2010). Changes in brain wave rhythms reflect changes in brain activities related to different functions, e.g. learning, perception or sensory registration (Başar 1999). The brain emanates a range of waves connected to different levels of brain activity (Kumar and Kumar 2016). For example, delta activity increases during attention tasks (Harmony et al. 1996), gamma waves designate sensory information processing (Freeman 2001), beta waves indicate engagement or frustration (Freeman 2001; Klimesch 1999). Out of four main brain waves produced by the brain (alpha, beta, theta, delta), of particular relevance for research on cognitive load are alpha and theta waves which are reported to be reactive to task difficulty. In general, alpha activity decreases and theta activity increases with an increase in task difficulty (Klimesch 1999; Gevins and Smith 2000, 2003; Antonenko et al. 2010).

EEG has been used in many experimental studies on cognitive load and learning. For example, Gerlič and Jaušovec (1999) examined average and gifted students' cognitive processes engaged in learning in multimedia and text formats using EEG. In their experiment, students learned about the Sun and Mars in different modes of presentation— with text only, with text, picture, and sound, and with text, sound and video. One of the findings was that while learning, lower mental activity was observed in the case of gifted students. Moreover, alpha power was lower for text-only presentation than for picture and video presentations, which indicates that audiovisual presentations induced lower mental effort. Antonenko and Niederhauser (2010) investigated the differences in cognitive load experienced while learning from hypertext with and without leads which are defined as short summaries of the content found in the link so that a reader has a preview of what is to come prior to leaving the current node. The EEG results demonstrate that lead-augmented hypertexts induced a lower level of cognitive load than hypertexts without leads. In addition, hypertexts with leads turned out to be more efficient learning materials since they resulted in greater acquisition of knowledge as evidenced by performance scores, though no differences were detected by self-reports on mental effort.

EEG results may be marred by artifacts such as eye blinks and eye or muscle movements (Anderson and Bratman 2008). Artifacts and noise from the subjects' heartbeat or breathing distort signal from the brain (Berka et al. 2004). Moreover, because it requires the use of special apparatus, the use of EEG in experimental studies has technical and practical limitations (Brünken et al. 2003: 56). Setting up the equipment is also time-consuming since each electrode has to be placed with great precision (Wang et al. 2011).

#### **2.5.4.2. Eye-tracking**

There is a variety of eye-movement measures that can be considered reliable and non-invasive measurements of cognitive load as they “provide an unobtrusive, sensitive, real-time behavioral index of ongoing visual and cognitive processing” (Henderson and Ferreira 2004: 18). One of the most popular measurements is a task-evoked pupillary response, which is pupil dilation as a response to, for example, paying attention, analysing a sentence, or recalling something from memory (Klingner et al. 2008). As Andreassi (2000: 357) said, “the pupillary response appears to reflect the information processing load placed on the nervous system by cognitive tasks”, thus an increase in pupil dilation is said to reflect higher cognitive load. For example, Ahern and Beatty (1979) used task-evoked pupillary dilations to measure cognitive load experienced by more and less intelligent students (as indicated by the results of the Scholastic Aptitude Test) while solving arithmetic problems. It turned out that more intelligent students had smaller pupil dilations while engaged in such mental tasks, which means that had more efficient information processing capacity. Porter et al. (2007) observed that pupil dilation increased with the increase of the difficulty of the word search task. Klingner et al. (2008) measured task-evoked pupillary response to measure cognitive load while their participants performed an aural vigilance task. The participants listened to someone counting from 1 to 19 and had to click the mouse whenever the person made a mistake. The researchers found that there was an increase in pupil diameter during the mistake points.

Another measure used in eye-movement research on cognitive load is the magnitude and rate of microsaccades, which are involuntary, fixational eye movements that create small displacements in the retinal image in stationary viewing (Engbert and Kliegl 2003). There is experimental evidence which indicates that microsaccade magnitude increases

while microsaccade rates decrease with task difficulty (e.g. Siegenthaler et al. 2014, Dalmaso et al. 2017).

According to the eye-mind hypothesis, fixation reflects to what the mind attends (Just and Carpenter 1980). Fixation duration and fixation count are therefore also used as measurements of cognitive load – longer fixations translate into deeper processing (Holmqvist et al. 2011), thus the longer the fixation, the higher the cognitive load induced by the material. Reading Index for Dynamic Texts (RIDT) is yet another measure which indicates to what extent the text was read and processed, so it is also used in experimental research on cognitive load, especially in the context of subtitled videos (e.g. Kruger et al. 2014).

Eye-movement measures have, however, some limitations. Pupillary response changes with age (van Gerven et al. 2004), thus it may not be possible to compare younger and older participants' pupillary responses to changes in cognitive load. In addition, pupil dilation is sensitive to various environmental factors such as lighting or luminosity, which may negatively affect the results of experiments using videos (Kruger and Doherty 2016: 24), as well as individual differences and external factors such as gender, schizophrenia, arousal or novelty (Janisse 1977). Moreover, pupil dilation is not effective when the task involves continuous reading (Iqbal et al. 2004). Fixations may be problematic for interpretation since long fixations may indicate that the subject was either interested or confused by the focused information (Holsanova 2014). Moreover, fixations depend on the nature of the task, e.g. while reading, fixations will be shorter not because of the lower cognitive load but because of the reading process (Kruger et al. 2013: 63). Finally, the use of eye-tracking measures necessitates the use of expensive equipment and thus may have practical and technical limitations.

## **2.6. Cognitive load and subtitles**

Subtitling is commonly used as a translation method since it is less expensive than dubbing and allows viewers to enjoy watching foreign language movies with the original soundtrack (Perego et al. 2010). Moreover, native-language subtitles are used in movies with soundtrack in the native language in order to promote literacy (e.g. Kothari and Takeda 2000) or to facilitate comprehension for deaf and hard of hearing viewers (e.g. de Linde and Kay

1999). The use of subtitles in ELT seems to be a contentious issue since in the light of cognitive load theory they are a double-edged sword: on the one hand they may lead to cognitive overload resulting from, for example the redundancy effect or the split-attention effect, but on the other hand they may reduce cognitive load and result in the reversed redundancy effect by providing written backup (Kalyuga 2012). The following section presents arguments for and against the use of subtitles for foreign language learning.

### **2.6.1. Empirical evidence on the positive impact of subtitles on cognitive load**

Perego et al. (2010) found that subtitles are processed effectively and do not hinder comprehension of a movie. Since subtitle processing is a cognitively demanding task due to the need to process information from different sources, the first hypothesis was that scene recognition and text recognition would be in competition and there would be a negative correlation between them. The second hypothesis, however, posited no trade-off between subtitle processing and scene recognition due to the fact that reading and visual processing is automatized. In their experiment, native speakers of Italian watched a Hungarian video clip with well-segmented and ill-segmented Italian subtitles, and subsequently completed a comprehension test, a scene recognition test and questionnaires on subtitle reading and subtitle recognition. Moreover, while viewing the video, eye-movement data were collected. As in previous research, Perego et al. (2010) found that subtitles were read and that both the on-screen visuals and the subtitles were processed as evidenced by the eye-movement data. Moreover, subtitle-line segmentation did not significantly impact either performance or processing. The results corroborated the effectiveness of subtitle processing— the presence of subtitles did not have disruptive effects on comprehension and scene or word recognition. Hence, it can be concluded that despite a potential problem with split-attention, subtitles do not result in cognitive overload as the participants were able to allocate cognitive resources to comprehend the content and remember visual images from the movie.

Kruger et al. (2013) measured cognitive load experienced by ESL learners of English while the learners were watching an academic lecture with English subtitles or without subtitles. They used different measures of cognitive load—eye-tracking, EEG, self-reports, and performance in the form of a comprehension test. The results demonstrate that subtitles did not result in cognitive overload as evidenced by the triangulated data. EEG as well as

self-reports showed that the participants in the no-subtitle group experienced a higher level of frustration, while pupil dilation data show that the same group experienced a higher level of cognitive load. In terms of performance, there was no significant difference between the groups. Nevertheless, the results of the experiment support the idea of using subtitles in instructional design as they do not overload working memory capacity.

Lin et al. (2016) investigated the effects of subtitles and taking e-notes on cognitive load. In their experiment, EFL Mandarin Chinese learners of English learned about brain anatomy by means of a multimedia program. After the viewing session, they completed a performance test and a self-report on cognitive load. Lin et al. (2016) found a reversed redundancy effect— subtitles imposed cognitive load, but they did not result in cognitive overload; instead they had an auxiliary role since they helped in learning as evidenced by the results of the performance test.

Lång (2016) conducted two experiments on the effectiveness of subtitled television programs. The video material used in both experiments was a Russian documentary with Finnish subtitles. The participants in the first experiment were native speakers of Russian fluent in Finnish and native speakers of Finnish who did not know the Russian language. The results show that the Russian participants outperformed the Finnish on subtitle-related questions. Thus, the researcher concludes that parallel processing of the same information coming from both subtitles and soundtrack leads to a better acquisition of the information. In the second experiment, the participants were native speakers of Finnish not skilled at Russian and native speakers of Russian with no knowledge of Finnish. This time eye-movement data were also gathered while the participants were watching the clips. It turned out that the Russian participants who were not able to effectively follow the subtitles due to the unfamiliarity with the subtitle language acquired less information compared to the Russian participants from the first experiment who were familiar with the subtitle language. This lends support to the hypothesis that redundant information channels have a positive impact on the acquisition of information.

Szarkowska and Gerber-Morón (2019) compared the processing of two- and three-line subtitles and their impact on comprehension, cognitive load, enjoyment and preferences in two experimental studies: in the first they compared speakers from various L1 backgrounds (English, Polish, Spanish), and in the second they compared native speakers of English who were hearing, hard of hearing and deaf. The results of both experiments show that even though three-line subtitles generated higher extraneous cognitive load than

two-line subtitles, they did not hinder comprehension. The researchers account for this finding in terms of the viewers' prior experience with watching movies, since the viewers may have been exposed not only to high, but also poor quality subtitles, and this made them learn to process non-standard subtitling that may potentially strain cognitive resources.

While monolingual subtitles (in one language) have not been found to overburden working memory (Perego et al. 2010; Kruger et al. 2014), bilingual subtitles (in L1 and FL), which are also used in multimedia learning (e.g. Lazareva and Loerts 2017) and in multilingual countries (Corrizzato 2015), may potentially lead to cognitive overload since in this screening mode subtitles are presented in two languages simultaneously, which increases the likelihood of the redundancy effect. In a recent study, Liao et al. (2020) explored the effectiveness of bilingual subtitles in terms of cognitive load, visual attention, and comprehension. In their study, Chinese EFL learners watched four video clips in four subtitling conditions— L1, L2, bilingual, and no subtitles while their eye movement was recorded. After watching each clip, the participants completed a self-report on cognitive load, and a free recall task measuring comprehension. One of the most important findings is that bilingual subtitles did not lead to cognitive overload. What is more, exposure to FL videos with bilingual subtitles resulted in better comprehension than exposure to unsubtitled clips.

### **2.6.2. Potentially negative effects of subtitles on cognitive load**

Even though experimental research shows that subtitles usually reduce cognitive load, there are some aspects that may counterbalance the positive effects of subtitling on cognitive load.

The first factor that needs to be taken into account is film editing. Viewers may experience a higher cognitive load if subtitles cross film cuts, i.e. the shot changes, but subtitles from the previous shot stay on the screen, which makes viewers reread and unnecessarily process them (e.g. Díaz et al. 2007). Moreover, line segmentation may potentially hinder subtitle processing, though there is no strong empirical evidence to support this hypothesis (Kruger et al. 2015). Another important factor that may influence cognitive load is subtitle speed. Szarkowska and Gerber-Morón (2018) conducted an experiment on reading subtitles at different speeds. Their research reveals that viewers do not have problems with

reading fast subtitles and process them effectively together with the soundtrack and the image. Moreover, extended display time does not lead to better comprehension and in fact increases mental effort. Slower subtitles induce higher cognitive load because viewers spend more time on processing them as indicated by the eye-movement data, especially the increased mean fixation duration. In addition, Szarkowska and Gerber-Morón (2018) investigated the impact of experience with subtitling on subtitle processing. Even though subtitling turned out to be effective even for participants having little prior exposure to watching subtitled films, there were some differences between participants from different countries. Those who had more experience with subtitling reported smaller cognitive load than those with little experience with subtitled films.

The effectiveness of processing subtitles may decline with age as older viewers tend to focus on visuals rather than reading subtitles due to limited cognitive capacity (e.g. d'Ydewalle and van Rensbergen 1989). Subtitles may also inhibit visual scene processing if the material is too complex. For example, Bergen et al. (2005) investigated how attentional capacity changes when viewers watch visually complex and visually simple news stories. The visually complex material consisted of the news anchor only, while the visually simple material had additional ancillary visual messages such as news crawls and graphics. The results show that the former condition resulted in poorer performance as the participants lost around 10% of the information presented in the news. Thus, the researchers argue that the multimessage format induces cognitive load and hinders story fact comprehension.

The level of proficiency in the foreign language may also impact subtitle processing. More specifically, the occurrence of the redundancy effect is dependent on foreign language competence: the less competent the viewer the smaller the redundancy of subtitles. Subtitles may lead to the split-attention effect since viewers have to integrate information from different sources. In the light of the Multimedia Learning Theory (Mayer 2009), information which is presented using the auditory as well as the visual channel is processed more effectively than the information presented only in one channel. Szarkowska and Gerber-Morón (2018) found that watching a film in an unfamiliar language with native language subtitles results in poorer comprehension than watching a film in a familiar language with L1 subtitles. Moreover, the participants who watched a film in the unknown language reported higher cognitive load. This stems from the fact that there was no support from the auditory channel (the soundtrack) and the subjects had to spend more time on reading the subtitles, which leads to the overload of the visual channel as the auditory in-

formation was not helpful. However, there are also studies which found a reversed multimedia effect. For example, Mayer et al. (2001) examined the impact of two sensory modalities on retention and transfer. In their experiments, students were exposed to a multimedia presentation with or without concurrent onscreen text. It turned out that the subjects who were deprived of the text performed better on retention and transfer tests. The text was, therefore, redundant and created higher cognitive load as cognitive resources had to be allocated to processing visual and auditory information.

In addition, translation may affect the effectiveness of subtitle processing. As Szarkowska and Gerber-Morón (2018) conclude, “as viewers are mapping the sounds from the dialogues onto the words in subtitles when they know the language of the soundtrack, any discrepancies between the two may disturb their viewing process”. In the context of subtitle translation, Ghia (2012) examined the differences between literal and non-literal translations where the text was different than the source text. The results show that fewer deflections were observed when literal translations were available.

Despite ample experimental research showing that subtitles do not lead to cognitive overload (see section 1.5.1), there are also studies which found that subtitles may increase extraneous load due to their redundancy. For example, Diao and Sweller (2007) compared the effectiveness of single modality (written), and dual modality (written and spoken) presentations for reading comprehension in the case of Chinese EFL learners. The results show that dual modality input (text + concurrent narration) led to inferior comprehension, smaller gains in lexical knowledge, and induced higher mental effort. The researchers claim that this negative effect of dual modality presentation may be attributed to the learners’ level of proficiency, since less advanced learners still struggle with sound-symbol correspondences and in this case presenting subtitles, or written text with narration, may hinder learning and overburden working memory.

## **2.7. Conclusion**

In summary, the present chapter described the most essential aspects of cognitive load theory which serves a critical function in teaching and learning. In line with principles of human cognitive architecture, educators should aim at schema formation and automation and avoid materials that overburden working memory capacity. In principle, intrinsic and extra-

neous cognitive load should be reduced within reason, while germane cognitive load should be maximised as it is responsible for schema formation. Cognitive load theory has numerous practical implications for instructional designs. Teachers can minimize extraneous cognitive load for example by analyzing examples and expert solutions prior to giving students a task, by avoiding redundant information which will be unnecessarily processed, or by integrating various sources of information so as to reduce the split-attention effect. These are just some examples of how learning can be improved with the knowledge of basic cognitive processes. The measurement of cognitive load is no mean feat. Each measurement technique available has its pros and cons and none of them is perfect, however when we combine different measurements, we can obtain valid and reliable results.

As far as watching subtitled movies is concerned, the present chapter helps to understand the processes which occur while engaging in this activity. Most studies on subtitles neglect the notion of cognitive load, which is in fact crucial to learning since tailoring materials for learners is seriously constrained without its understanding. The knowledge of different cognitive load effects significantly adds to the ongoing debate on the benefits and dangers of the use of subtitles in EFL.

Relevant to cognitive load theory are also the processes of comprehension and vocabulary learning. The following chapter focuses on the notion of comprehension with its multiple levels, theories of vocabulary learning and the impact of modality on comprehension and learning. All of these are described with a view to understanding what is happening in students' minds while they are learning a foreign language, especially when they are watching subtitled foreign language movies.

## **Chapter 3: Modality and its impact on comprehension and foreign language vocabulary learning**

### **3.1. Introduction**

Nowadays, instructional designers have a whole array of presentation modes at their disposal like text, pictures, audio, video and animations, which can all be brought into action. As a result, the learner is bombarded with multimedia instructions that are bursting with colour, sound and movement. Learning has become fun again, some instructional designers proudly proclaim. That might be true. Or not. In any case, the fun will only be complete if multimedia instructions are also effective (Tabbers 2002: 5)

The use of different modalities in multimedia learning has long been advocated for teaching and learning foreign languages since the modality of input caters for different learning styles (Brinton 2001), thus maximizing learning benefits for all types of learners. The “meshing hypothesis” (Pashler et al. 2008) postulates that learning is facilitated if instruction is received in the preferred modality, for example, visualizers benefit most from visual material, while verbalizers from auditory material. Support for this can be found in empirical research. For example, Kam et al. (2020) investigated, inter alia, the role of modality in L2 listening comprehension. It turned out that in the case of participants with high working memory capacity, modality exerted an influence on the effectiveness of subtitling. Auditory learners benefited most from watching videos without subtitles unlike visual learners, for whom subtitles had a facilitative effect on listening comprehension. Therefore, incorporating materials in different modalities is essential to cater for the needs of all learners in a given class.

Depending on modality, input can be processed in different ways. According to Paivio (1971), there are two modality-specific channels – one responsible for processing visual, and one responsible for processing acoustic information. Given that human working

memory capacity is limited, multimedia learning is effective only if both modality channels are used optimally, without being overloaded. The choice of a presentation modality is, therefore, crucial in order to optimize learning.

While the issue of cognitive load in multimedia learning has been extensively described in the preceding chapter, the present chapter takes a closer look at the effects of modality on comprehension, as well as on foreign language vocabulary learning. A short description of theoretical underpinnings of the use of different modalities in FL instruction is followed by an overview of experimental studies investigating the effects of using materials in different modalities on comprehension. Next, a description of relevant aspects of vocabulary learning is given, followed by an overview of experimental studies on FL vocabulary learning.

## **3.2. Theories supporting the use of different modalities in foreign language teaching**

### **3.2.1. Dual Coding Theory**

Dual Coding Theory (DCT) introduced by Paivio (1971, 1986) posits that there are separate mental representation systems for verbal and non-verbal stimuli. The verbal system consists of visual and auditory codes which are arbitrary symbols denoting objects or ideas. The non-verbal system, on the other hand, consists of imaginal representations, for example mental images, environmental sounds, or visceral sensations (Clark and Paivio 1991: 151). Although different, the two systems are linked via the so-called referential connections, which enable the two channels to interact. Hence, the existence of such links allows for imaging words (e.g. the word “school” may evoke negative images), as well as naming pictures (labelling some objects, e.g. finding a name for an insect – a “praying mantis”)(Clark and Paivio 1991: 153). Thus, cognition appears to be a result of a constant interplay of the verbal and the non-verbal system.

There are three different types of processing that occur between and within the verbal and the non-verbal system. Representational processing occurs when a stimulus in a given modality activates the respective system, that is, a word activates the verbal system, and an image activates the non-verbal system. The second type, referential processing, occurs

when the verbal system activates the non-verbal system or vice versa, which means that it is possible to imagine a word or verbalize an image. Finally, associative processing occurs within one system, e.g. a given image evokes another image, or a word triggers the association with other words related to the same category (Paivio 1986, Clark and Paivio 1991, Kanellopoulou et al. 2019).

The integration of the two channels, audio and video, has been found to be more effective for information processing and acquisition than single-modality presentation, as evidenced by a bulk of experimental research, which provides support for DCT. For example, Stoneman and Brody (1983) investigated the differential impact of the audio, video, and audiovisual mode of presentation on immediate and long-term recognition of advertised products in the case of preschool, kindergarten, and second-grade children. They found that exposure to video and audiovisual material resulted in better recognition of advertised products than exposure to audio only version of the material.

In their experiments, Mayer and Anderson (1991) confirmed the existence of representational and referential connections assumed by the DCT. In Experiment 1, college students watched an animation about a bicycle tire pump. One group listened to the narration prior to watching the animation, while the other group listened to the narration simultaneously with the animation. The results highlight the importance of simultaneous as opposed to sequential presentation of auditory and visual material since the “words-with-pictures” group outperformed the group that was exposed to the narration before the viewing. In another experiment, Mayer and Anderson (1991) compared three modality conditions: words only, pictures only, and words and pictures. The procedure was identical to that from Experiment 1, the only exception being an extra task—a verbal recall test. The research revealed that the “words and pictures” group outperformed single modality groups on a problem-solving task, which corroborates the effectiveness of the use of bimodal input.

The dual channel assumption has clear relevance to foreign language education. One of the most important implications that emerge from the DCT is that while learning vocabulary, the combination of the two modalities, visual and verbal, has an additive effect on recall as it leads to more gains than constant repetition of the new words (silently and aloud), or translation (Paivio and Lambert 1981). One possible explanation is that while being exposed to input through two different modalities, there are two different traces left in students’ memory (Kanellopoulou et al. 2019). If they forget what they heard, they may still remember what they saw. Thus, learning materials are more effective if the items to be

learnt are annotated with both verbal and visual input, a good case in point being foreign language movies with subtitles or captions, where FL vocabulary can be both seen and heard.

One of the most prominent limitations of the DCT is that it accounts for the learning of mostly concrete nouns. While concrete nouns can be easily visualized, it is not always possible to process abstract nouns as images (Paivio et al. 1994). This was supported by the results of Paivio's research (1963, 1965), which indicates that concrete nouns are better remembered than abstract nouns, and nouns are better remembered than adjectives.

The DCT has been extended to refer to more than one language. The so-called Bilingual Dual-Coding Theory (Paivio and Desrochers 1980) presupposes the existence of three channels: the non-verbal system, and two verbal systems, which are independent, but also connected to some extent, which manifests itself in, for example, code-switching (Soh 2010). There is a whole plethora of studies examining the Bilingual DCT, especially the connections between L1 and L2. For example, in his experiments, Danan (1992) compared the effects of standard, reversed, and the absence of subtitles on vocabulary recall after viewing a foreign-language movie. Overall, students benefited from subtitling, which supports the DCT. However, it is reversed subtitling that turned out to have the most additive effect on vocabulary recall. As he says, "once translation has linked the two verbal systems, students have established more paths for retrieval and can benefit from visual traces as well as from two distinct sets of verbal trace" (Danan 1992: 522). This is a strong argument in favour of using translation, which turned out to have a facilitative effect on foreign language encoding. One serious constraint of the Bilingual DCT is that it does not apply when there is no link between L1 and L2 words, for example a word that exists in L1 does not have an equivalent in L2 (Kanellopoulou et al. 2019).

### **3.2.2. The Cognitive Theory of Multimedia Learning**

The Cognitive Theory of Multimedia Learning (CTML) developed by Mayer is based on the "modality principle", which says that people learn more deeply from words and pictures than from words alone (Mayer 2009: 47). The theory is grounded primarily in the Dual Coding Theory (Paivio 1986), and Cognitive load theory (Sweller 1988, 1994). As described above, the dual-channel assumption postulates that auditory and visual information

is processed in two different systems. What the CTML adds to this assumption is the active role of a language learner, who becomes a knowledge constructor responsible for connecting visual and verbal knowledge and constructing mental representations (Mayer 1997, 2009). This active processing assumption includes, *inter alia*, the integration of visual and verbal information with prior knowledge residing in long-term memory (Mayer 2014). As mentioned, another important assumption of the CTML emerged from the Cognitive Load Theory, which postulates that human working memory capacity is limited (Sweller 1988, 1994). In the light of this theory, overloading one of the channels impairs learning. Mayer (2009: 66-67) purports that it is possible for a learner to hold only a few images or a few words in the respective channels. For example, if learners are presented with too many verbal stimuli at a time (e.g. different sounds and spoken words simultaneously), the verbal system will be overloaded, which will subsequently impede the learning process.

CTML generated a set of principles or effects that serve as educational guidelines when creating multimedia learning materials. One such principle which draws on CLT is the redundancy principle, which says that redundancy leads to cognitive overload. Hence, presenting written words with concurrent narration and visuals may overload the visual channel since there are two forms of visual stimuli that need to be processed in the same channel simultaneously, even though the information in each source is self-contained. This may cause learners to split their attention between the two sources of information (Sweller 2005a), and, as a result, pictorial information may be skipped. Kalyuga et al. (1999) conducted an experiment in which they used three different presentation formats: visual text, audio text, and visual and audio text. The findings corroborate the negative influence of redundancy in that the audio text group outperformed the audio and visual text group where the same information was presented via written and auditory format. This challenges the results of previous studies in the field (e.g. Mayer and Anderson 1991) in which bimodal input proved to be more effective than single modality input. As Kalyuga et al. (1999: 362) conclude, “Having auditory textual explanations duplicated in a visual form significantly inhibited learning due to an increase in cognitive load. In fact, the dual-mode duplication format was the worst of the three instructional procedures. Redundancy overrode all the benefits of dual-mode presentation”. Temporal contiguity principle dictates that the presentation of information in different modalities should be simultaneous rather than sequential, while the spatial contiguity principle says that text and pictures should be placed next to each other (Koscianski and Zanotto 2014).

Even though information is best acquired if it is presented via different modalities, according to the modality principle, spoken text is more beneficial than written text, as the results of various experimental studies indicate. The modality principle and the spatial contiguity principle have been confirmed in one of Moreno and Mayer's experiments (1999), in which the participants viewed a computer animation with either on-screen text or narration. Additionally, the on-screen text was placed either close to the animation or far from it. The results show that learning was facilitated when visual and verbal materials were next to each other. The modality principle was also confirmed; as Moreno and Mayer say, "students who learn with auditory verbal materials plus animations recall more, solve problems better, and are better able to match the visual and verbal elements than those who learn with on-screen text plus animations (Moreno and Mayer 1999: 363). A comprehensive overview of all principles can be found in Koscianski and Zanotto (2014), while other important cognitive load principles are described in Chapter 2 of the dissertation.

Tabbers et al. (2004) tested the effectiveness of replacing visual text with spoken text (the modality principle) and adding visual cues to pictures (the cueing effect). There were four experimental groups with respect to the two independent variables: VN group (visual text without any cues in the presented diagram), VC group (visual text with cues), AN group (audio with no cues), and AC (audio with cues). The participants studied the instructional material in the assigned condition, and subsequently completed a retention and a transfer test. Additionally, during the instruction and after each test they completed a self-report on the mental load experienced. The results partially confirmed the cueing effect in that adding visual cues to diagrams resulted in higher scores on the retention test, but not on the transfer test. The modality principle, however, was not corroborated since replacing visual text with spoken text did not lead to better performance either on the retention or the transfer test; on the contrary, the visual text groups outperformed the audio groups. As for cognitive load, the visual groups reported higher mental effort in the retention test, but at the same time they scored higher than the audio groups. Tabbers et al. (2004) conclude that the reversed modality effect obtained in their study can be accounted for by non-laboratory settings of the experiment and the pacing of instructions. As they say:

The advantage of bimodal instructions is that the picture and the text can be perceived simultaneously, resulting in a lower extraneous load than in visual-only instructions where the learner has to skip between text and picture in a limited time. In learner-paced instructions, however, this advantage disappears because the learner with the visual-only instructions has more time to relate the text to the picture (Tabbers et al. 2004: 80)

When it comes to the effectiveness of multimedia learning materials, it should be noted that individual differences in learning preferences also come into play. Since visualizers and verbalizers process verbal and visual information in different ways, they may not be able to benefit from the mode of presentation which they do not prefer. Plaas et al. (1998) conducted an experiment in which they exposed students with visual, verbal, and no strong preferences to a story in a foreign language presented by means of a multimedia program. The participants were allowed to look up key words from the story using either a verbal annotation (seeing a translation into L1), visual annotation (a picture or video clip), or both. While the results provide support for the multimedia principle as students had the biggest gains from choosing both types of annotations, it is also interesting that students benefited most from selecting their preferred mode of presentation— visualizers visual cues, and verbalizers verbal cues.

### **3.3. The effects of different modalities on comprehension**

#### **3.3.1. Comprehension as a multifaceted concept**

Although comprehension is frequently treated as an umbrella term that simply denotes the understanding of a material, it can in fact be treated as a multifaceted concept consisting of different dimensions which should be analyzed separately. In the literature, there exist different taxonomies of comprehension levels. King (2007), for instance, makes a distinction between two major levels of comprehension: shallow (literal) and deep (inferential), “suggesting the metaphor of a lake and simply skimming its surface as opposed to diving down into its depths” (King 2007: 267). While shallow processing involves the understanding of information only explicitly stated in the text, deep processing refers to going beyond the text and using prior knowledge to construct the meaning of the text. The importance of striving for deep comprehension is echoed in Graesser (2007: 4), who said:

Shallow readers believe they have adequately comprehended text if they can recognize the content words and can understand most of the sentences. However, deep comprehension requires inferences, linking ideas coherently, scrutinizing the validity of claims with a critical stance, and sometimes understanding the motives of authors. Shallow readers believe they are comprehending text when in fact they are missing the majority of contradictions

and false claims. Acquisition of better reading strategies is apparently needed to crack the illusion of comprehension in readers who are settling for low standards of comprehension

One of the most popular taxonomies of comprehension, which consists of three levels, was proposed by van Dijk and Kintsch (1983). The first level of discourse comprehension is the “surface code” which includes mostly words and syntactic composition. The next level is the “textbase” which encompasses explicit propositions and some inferences needed for establishing local text coherence. The “situation model” involves inferences made on the basis of the information from the text and prior background knowledge, dimensions of spatiality or temporality, or actions, objects, agents in the mental microworld. Graesser et al. (1997) added two more levels to the model suggested by van Dijk and Kintsch (1983). Level 4, text genre level, includes categories of text genre (e.g. narration, persuasion, jokes etc.) with their different features and components, as well as a rhetorical composition. Finally, Level 5, the communication level, pertains to communicating ideas, that is the goals of the writer, to the reader,

According to Day and Park (2005), there are six levels of reading comprehension. Literal comprehension can be defined mainly as the understanding of facts and vocabulary from the text, that is, information that is explicitly stated in the text. The next level, reorganization, refers to the ability to integrate information from different parts of the text to comprehend it in its entirety. Inference is a level of comprehension which goes beyond the literal meaning of the text since the reader must combine their knowledge with the knowledge gained from the text, and make inferences. The next level, prediction, involves the ability to make predictions about what happens next (for example, what happens when the story ends) on the basis of the information included in the text and one’s general knowledge. The fifth level of comprehension is evaluation, which entails making judgments about the text. The final level of comprehension, “personal response”, is not based on the information included in the text, but rather on the reader’s feelings. An example question tapping into this level of comprehension could be “What did you like or dislike about this article” (Day and Park 2005: 64). Responses to such questions, though reflecting personal feelings, must also draw on the global understanding of the text.

In their research on the comprehension of television news, Francuz and Szalkowska (2007) used a taxonomy of comprehension of audiovisual materials consisting of four levels. Level 1 involves the understanding of words, and the ability to recognize some fragments taken out of the watched material, thus, it is a level of shallow comprehension, or the

“surface code”. Level 2 refers to the understanding of detailed information from the material and it includes, *inter alia*, the ability to determine causal, spatial or temporal dimensions of the material, or to differentiate between facts and opinions. Level 3 concerns the understanding of the material in its entirety, the ability to synthesize the message included in the material, and the evaluation of the characters’ intentions. Level 4 involves the ability to look at the text critically, make predictions, or inferences.

The taxonomy of educational objectives developed by Bloom (1965, 1984) frequently serves as a framework for developing curricula as it helps to organize and clarify educational goals (Anderson and Krathwohl 2001). The taxonomy presupposes the classification of cognitive processes into six categories, which increase in complexity and abstractness: knowledge (e.g. recall of specific facts), comprehension (e.g. summarizing, explaining), application (e.g. implementing the learned material into new situations), analysis (e.g. analyzing the relationships between different fragments), synthesis (synthesizing the information from different parts to create something new), and evaluation (judging the value of the material) (Bloom 1965, Bloom 1984). Knowledge and comprehension are classified as lower- order skills since they involve shallow understanding (Crowe et al. 2008), while analysis, synthesis, and evaluation as higher-order skills (Zoller 1993); application is generally considered to be in-between lower- and higher- order skills, so it is considered to be at an intermediate level (Crowe et al. 2008). Bloom’s taxonomy is hierarchical, which means that developing lower-order skills is a prerequisite for developing higher-order skills, thus Bloom’s classification does not allow for acquisition in a random order.

While constructing comprehension tests, teachers often tap into Bloom’s taxonomy to engage their students not only in lower- order, but also higher-order thinking skills, and research has shown that effective teachers make use of all levels of Bloom’s taxonomy, including higher-order skills. For example, Taylor et al. (2002) investigated classroom practices in eight elementary schools, which serve high-poverty populations, to identify the practices that are most beneficial to learners in terms of improving reading ability, and to examine the relationship between teachers’ practices and students’ achievement. Among many findings, the researchers found that implementing higher level questions was a technique that turned out to be most effective for learners from grade 4 to 6 since there was a significant positive correlation between time spent on such higher level questions and learners’ reading growth. Jensen et al. (2014) found that students taking tests that target higher-order thinking skills have a deeper understanding of the learned material, which

leads not only to better acquisition, but also to better retention. In their experiment, c. 180 undergraduate students of biology were divided into two treatment conditions: the participants completed regular weekly quizzes and unit tests either with the use of lower-level questions only (the LL group), or the use of higher-level questions only (the HL group). The format of the final examination was the same for both groups and contained 20 lower-level and 21 higher-level questions. The results demonstrate that the continuous higher-level assessment format contributed to the HL's group success on the final examination since the HL group outperformed the LL group on both lower-level and higher-level exam questions. As the researchers conclude:

Assessments should be designed to truly test scientific process skills and as such should be written at higher levels of Bloom's taxonomy. Not only will this assessment format give the appropriate evidence of the attainment of desired learning outcomes, but this study shows that it actually directs student learning, focusing their study efforts on these desired skills and ultimately leading to deep conceptual understanding. Effective assessment can turn students' time inside and outside of class into productive learning time, rather than bouts of rote memorization (Jensen et al. 2014: 320).

Although the abovementioned taxonomies differ in terms of the number of levels, labels, or the way the word "taxonomy" is defined (independent categories or a hierarchical order in which levels increase in difficulty), they all assume the existence of different dimensions of comprehension ranging from very shallow comprehension that includes the understanding of vocabulary, syntax and explicitly stated information, to a deep level of comprehension including the ability to draw inferences, evaluate or respond to the material. As has been demonstrated, recognizing comprehension as a multidimensional concept has serious implications for the effectiveness of teaching since effective teachers recognize the complexity of comprehension levels and aim for developing not only lower-level, but also higher-level cognitive skills, which can lead to better acquisition and retention.

It goes without saying that non-verbal communication also plays a crucial role in the comprehension of the messages we receive. Hence, we can understand a great deal of information from body language, gestures, or facial expression. As Knapp and Hall (2007: 260) say:

The face is rich in communicative potential. It is the primary site for communication of emotional states, it reflects interpersonal attitudes; it provides nonverbal feedback on the comments of others; and some scholars say it is the primary source of information next to human speech. For these reasons, and because of the face's visibility, we pay a great deal of attention to the messages we receive from the faces of others

There is a bulk of experimental research which shows that non-verbal communication may also facilitate comprehension in the L2 learning environment. Cabrera and Martinez (2001) examined the influence of interactional adjustments (e.g. adding gestures or comprehension checks) on the comprehension of a story in the case of Spanish EFL primary school learners. First, one group of learners listened to the story with linguistic adjustments (simple vocabulary, simplified syntax), and the other one with linguistic as well as interactional adjustments. After completing a comprehension test, the groups listened to another story, but this time they switched places (the group exposed to a story with only linguistic adjustments was now exposed to a story with linguistic and interactional adjustments, and vice versa). The results demonstrate that interactional adjustments significantly enhanced the comprehension of the story. Although classroom body language is more prominent than that used in everyday life, it can be tentatively inferred that having access to the visual modality while learning a foreign language may aid comprehension more than having access to the audio-only modality, at least in the case of learners at a low level of proficiency.

Sueyoshi and Hardison (2005) explored the role of gestures and facial expression in comprehension of a videotaped lecture. The participants of the study were low intermediate and advanced ESL learners. They were divided into three experimental groups: one watched the lecture with audio, video and gestures with facial cues (AV-gesture-face), one with audio, video and facial cues (AV-face), and one only with audio (A-only). The results show that the presence of the visual channel, be it with gestures or without them, facilitated listening comprehension as evidenced by a multiple-choice test administered after the viewing session. There was, however, a difference in the effectiveness of particular conditions between the two levels of proficiency: while the advanced learners benefited most from the AV-face condition, in the case of the low-intermediate learners it was the AV-gesture-face that turned out to be most beneficial for comprehension. Overall, the results indicate that the presence of the visual channel positively affects comprehension of a FL learning material.

### **3.3.2. Experimental studies on the effects of modality on comprehension**

Understanding audiovisual materials is of paramount importance to learners since without comprehension learning is severely hindered. For example, when learners watch a movie in

a foreign language, their primary goal is to understand its content, and only when this major goal is achieved can learning of different aspects of the foreign language occur. This section contains an overview of studies investigating the effects of different modalities in multimedia learning contexts on comprehension. The selected research is summarized in Table 1 below.

Table 1. A summary of selected studies on the impact of modality on comprehension

Researcher(s)	Modalities tested	Methods	Results
Beagles-Roos and Gat (1983)	Audiovisual, audio-only	Story retelling, comprehension questions, scene ordering	Audiovisual presentation resulted in better recall of detailed information
Baltova (1994)	sound only, video and sound, silent viewing (no audio)(experiment 1); video and audio, audio-only (experiment 2)	Comprehension test	Video bolsters overall comprehension (experiment 1); no significant differences between the audio and audiovisual groups (experiment 2)
Brett (1997)	audio, video, multimedia	Comprehension test, cloze-test on the language used	Multimedia presentation led to best comprehension and vocabulary recall
Guichon and McLorinan (2008)	audio, video and audio, video, audio and FL subtitles, and video, audio and L1 subtitles	Written summary	video with audio and subtitles (either FL or L1) supported semantic units recall from the presented material
Homer et al. (2008)	audio and video, audio	Multiple choice and short-answer comprehension questions, cognitive load questionnaire, social presence questionnaire, background knowledge test	the audiovisual materials resulted in higher mental effort; no significant differences between the groups
Londe (2009)	Audio, audio and video in two formats (“talking head”, “full body”)	Open-ended comprehension questions	input processing was unaffected by modality

Whiting and Granoff (2010)	Audio, audio with video	Comprehension questions	Audiovisual input bolsters comprehension
Safarali and Hamidi (2012)	Audio, audio with video	listening comprehension ability test, Longman TOEFL test comprehension tasks and questions	Audiovisual input bolsters comprehension
Pusey and Lenz (2014)	Audio, audio and video	multiple-choice comprehension test, digit span task	The presence of video hinders listening comprehension
İnceçay and Koçoğlu (2017)	audio-only, audio and video, audio and video with FL subtitles, audio and video accompanied by a PowerPoint presentation	listening comprehension test, think-aloud protocol, focus interviews	the audiovisual material with subtitles resulted in poorest comprehension and cognitive overload
Aldukhayel (2021)	audio, video, and subtitles (L1, L2 or no subtitles)	multiple-choice on comprehension, questionnaire	audiovisual input with subtitles improves comprehension but only in the case of high-proficiency learners

Beagles-Roos and Gat (1983) investigated the differences in the impact of television and radio on story comprehension by elementary school children. The children were presented with a story either in a television or radio version. Having heard or watched the story, each child had to retell it to the researcher who was not present during the viewing session in the classroom. Later, the researcher asked some questions about the story, and finally, the child was presented with pictures depicting characters from the story and was asked to order them. The results demonstrate that the children who were exposed to the television presentation of the story managed to recall more details from the story than the children who were exposed to the story via radio, however, both groups were able to retell

the story. Of particular interest is the fact that the format of presentation had a differential effect on different aspects of comprehension. While the radio format facilitated recognition of expressive language and making inferences using knowledge unrelated to the story, television format enhanced picture sequencing and making action-based references.

Brett (1997) focused on the impact of multimedia on listening skills. In his study, learners were exposed to a material in either audio, video or multimedia format. They completed a comprehension task after the listening/viewing session, and cloze tests on the language used in the presented material. While the audio and the video groups were given the tests in the paper format, the multimedia group took the tests on-line using a computer interface. It turned out that learner success rate in terms of comprehension and language recall was highest in the multimedia group. This finding may suggest that traditional listening tasks in an audio-only format may not be as effective as listening tasks embedded in multimedia programs.

Guichon and McLornan (2008) explored the impact of different modalities and subtitles on comprehension. In their experiment they employed four modality conditions: audio, video and audio, video, audio and FL subtitles, and video, audio and L1 subtitles. The participants of the study were French-speaking learners of English. They were exposed to a news report in the assigned modality, and they were allowed to take notes during the viewing session. After a short break for note-review, they were presented with the story once again, and finally, they produced a written summary of the news report. Even though it was a small-scale pilot study, the results point to the effectiveness of presenting video materials in different modalities as the groups exposed to video, audio, and subtitles (either FL or L1) reported more semantic units from the presented material in their summaries.

Whiting and Granoff (2010) sought to determine the effects of additional multimedia input on comprehension. The participants of the study were learners of English enrolled in English for Speakers of Other Languages classes. They all read a story at home and subsequently they were divided into three experimental groups: one group just discussed the story in class, one group discussed the story and listened to it (in the audio format), and one group discussed the story and watched it (video and audio format). The results show that comprehension is bolstered when an additional video input is received. As Whiting and Granoff (2010: 5) conclude, “watching a story on screen that closely follows a text acted as a strong corrective to misunderstandings, and at the same time reinforced and refined what

readers had gleaned from the text and discussion. In other words, the video was helpful to those with all levels of comprehension”.

Safarali and Hamidi (2012) compared the impact of audio-visual and audio-only input on comprehension in the case of advanced Iranian learners of English. First, all participants completed a pre-test on listening comprehension ability and general English proficiency (Longman TOEFL test) to make sure that the groups were homogenous. After the pre-test, two experimental groups were created: one watched interviews, while the other one was exposed to the same material in the audio-only format. All participants received some pre-teaching of key vocabulary items, and were given comprehension tasks and questions to answer. They were permitted to listen to or watch the interviews as many times as they wanted to complete the tasks. After ten such sessions, a listening comprehension ability test was again administered as a post-test. The results show that audio-visual materials are more beneficial for learners than audio-only materials in terms of developing general listening ability skills.

There are also studies that challenge the effectiveness of using audiovisual materials. In her study, Baltova (1994) found that while video aids general comprehension, it does not lead to the understanding of specific language. In the first experiment, Canadian pupils learning French watched a video clip in one out of four modality conditions: sound only, video and sound, silent viewing (no audio), and no-story. The presence of video proved to be beneficial for overall comprehension since the video and sound and silent viewing groups significantly outperformed the audio-only group. In the second experiment, however, Baltova (1994) compared a video and sound condition with an audio-only condition. The results demonstrate that there were no significant differences between the groups, thus the visual clues did not significantly facilitate listening comprehension.

Homer et al.'s (2008) experiments revolved around the effects of video embedded in a lecture on comprehension and cognitive load. In Experiment 1, students watched a lecture in the form of a PowerPoint presentation either with narration and video, or just narration. The results demonstrate that the two groups significantly differed in terms of the cognitive load experienced since the video group reported higher mental effort due to, mostly, the split attention effect. This, however, did not interfere with learning outcomes (comprehension) as the differences between the groups were not significant.

Londe (2009) measured comprehension of an academic lecture when it was delivered to mid and mid-high ESL learners in three different formats: in the audio format, or in

two different video formats (video plus audio) – “talking head”(only the face and head of the lecturer was visible on screen), and “full body”(whole body and some background was visible on screen). Comprehension was measured by means of a test consisting of open-ended questions about the content of the lecture. The results indicate that input processing was unaffected by modality, since the differences in performance scores between the three groups did not reach the level of statistical significance. Hence, the results challenge the dual-channel assumption which postulates that dual modality input is more effective than information delivered via a single modality.

Pusey and Lenz (2014) explored the interaction between input in different modalities, working memory, and listening comprehension. The participants of the study were Chinese and Arabic learners of English as a Second Language. They were divided into two groups, one watched a lecture in the video format (video plus audio), and one in the audio-only format. Listening comprehension was measured by means of a multiple-choice test, while working memory by means of a digit span task in which the participants were asked to repeat a sequence of numbers. The results demonstrate that the presence of video hinders listening comprehension, as the video group performed poorer on the listening comprehension test than the audio group. The modality condition did not affect working memory as the interaction between input and working memory was not significant. However, contrary to what was hypothesized, learners with lower working memory capacity scored higher on the listening test when video was not available (in the audio-only condition).

İnceçay and Koçoğlu (2017) sought to examine the effects of input modality on listening comprehension. In their study, using a within-subject design, Turkish university students of English were exposed to input in four modality conditions: audio-only, audio and video, audio and video with FL subtitles, and audio and video accompanied by a Power-Point presentation. The results demonstrate that after exposure to the audiovisual material with subtitles the participants obtained significantly lower scores on the listening comprehension test than after exposure to the material in the other three modalities. Apart from the listening comprehension tests, the researchers conducted think-aloud protocols and focus group interviews that were meant to obtain some information on the participants’ feelings about each delivery mode. In line with quantitative data, students reported being nervous, anxious, and confused while being exposed to audio, video and subtitles simultaneously, which led to cognitive overload.

Aldukhayel (2021) found that the processing of audiovisual materials may be influenced by the viewers' level of proficiency and pictorial support. In the study, low, mid, and high – proficient Arabic learners of English watched video clips that were highly, partially, or slightly supported with pictures, and the clips were viewed with L1, L2, or without subtitles. After the viewing, the participants completed a multiple choice test on comprehension and questionnaire concerning the effectiveness of L1 and L2 subtitles. The results show that subtitles had no differential effect on comprehension; instead, proficiency and pictorial support contributed significantly to better comprehension. According to Aldukhayel (2021: 187), the lack of significant differences between the three subtitling conditions may be attributed to limited working memory capacity since learners had problems with integrating the three channels (audio, video, subtitles) simultaneously and were not able to read subtitles. This is especially true for low-proficiency learners for whom the vlog induced cognitive load that impaired comprehension and, as a result, their performance on the comprehension test was significantly poorer. Hence, even if learners are provided with subtitles in their native language, which should guarantee full comprehension of a video clip in the FL, the combination of three different modalities may be overwhelming for low-proficiency learners, and, consequently, they may not make use of this extra help in the form of subtitles. On the other hand, more proficient learners are more capable of processing audiovisual materials with subtitles and can actually benefit from exposure to subtitled videos in terms of comprehension. Moreover, the integration of audio and video leads to better comprehension since when the audio was highly supported with visuals it resulted in higher scores on the comprehension test than when the audio was slightly supported with visuals.

Overall, the above literature review indicates that input modality has a differential impact on comprehension, however, there is no consensus on whether the combination of different modalities (audio, video, subtitles) facilitates comprehension more than single-modality presentation. While there is a bulk of research which is a testament to DCT and CTML (e.g. Whiting and Granoff 2010, Safarali and Hamidi 2012), there are also studies which challenge the assumptions of these theories (e.g. Pusey and Lenz 2014, İnceçay and Koçoğlu 2017), which necessitates further empirical exploration of the effectiveness of bimodal input.

### **3.4. The effects of different modalities on foreign language vocabulary learning**

#### **3.4.1. Key concepts in foreign vocabulary learning**

Vocabulary underlies language proficiency. As Richards (2015: 324) says, “vocabulary knowledge is a core component of all language skills; good language learners have large vocabularies and look for ways to expand their vocabulary knowledge”. Acquiring foreign language vocabulary can be, however, a daunting task given the number of words that need to be learnt and the many dimensions of vocabulary knowledge which affect the “learning burden of a word” (Nation 2013: 44-45). According to Nation (2001, 2013), for example, knowing a word involves knowing its form (spoken and written), meaning (e.g. associations or concepts and referents) and use (e.g. collocations or constraints of use). Furthermore, as learners strive for long-term retention of newly acquired words, they need to revise, recycle the words and this repetition should be spaced over time. Also, a learner should be able to use the words productively, and use them in new contexts (Nation 2001).

##### **3.4.1.1. Incidental vs. intentional vocabulary learning**

Vocabulary learning can be either incidental or intentional, and the difference lies in intent and awareness. Intentional learning pertains to direct, conscious, learning of a given material, for example intentional learning of words involves “the deliberate committing to memory of thousands of words (their meaning, sound and spelling)” (Hulstijn 2003: 349). On the other hand, incidental learning is a by-product of being engaged in other tasks, for example watching a foreign language movie. Thus, while learning vocabulary incidentally, the learner is not aware of learning that takes place as they did not specifically plan to learn new vocabulary items (Schmidt 1994, Laufer and Hulstijn 2001). Incidental learning via, for instance, extensive reading is credited with fuelling learners’ motivation, autonomy, exposing learners to words in their context of use, or, since class time is limited, enabling learners to acquire new vocabulary items outside the class (Pigada and Schmitt 2006: 2). Intentional learning, on the other hand, is often criticized for being based on rote learning, which may entail a lot of effort and demotivate students (Ahmad 2012: 72).

The effectiveness of incidental learning is, however, dependent on the frequency of exposure (Huckin and Coady 1999), therefore, one incidental encounter of a word, for example while reading a book, may not be sufficient for its acquisition. Saragi et al. (1978) for example, suggested that a learner must encounter a word at least 10 times to acquire it. Another important factor determining successful incidental learning is the context in which a given word is presented, and a learner's familiarity with the words surrounding a new word, which is essential for the correct interpretation of the word's meaning. Since a learner must possess some prior knowledge to be able to learn new words from context, it can be inferred that intentional learning often precedes incidental acquisition (Ramos 2015: 164). If learners do not know the words surrounding the new word, they may incorrectly infer its meaning, and such an incorrect lexical meaning may be fossilized over time (Hulstijn 1992: 114). It is also important to note that many newly acquired words are lost on the way to long-term memory, especially if exposure to the new words is limited. Brown et al. (2008), for example, found that the knowledge of newly learnt words decays at a fast rate – three months after the treatment session, on average only 1 out of 28 words was retained in the case of participants who were exposed to the reading while listening and reading-only treatments, and no words in the case of participants who were exposed to listening only.

Despite the aforementioned shortcomings, research on incidental vocabulary learning shows that mere exposure to a foreign language, for example through reading, leads to vocabulary growth (for an overview see Waring and Nation 2004 and Nation and Waring 2020). Ponniah's study (2011), for instance, provides strong evidence supporting the effectiveness of incidental vocabulary learning. In his experiment, ESL students were divided into two groups; the control group read a passage and used dictionaries to find the meaning of selected words from the text, while the experimental group read the passage for comprehension only. In the post-test, the participants were asked to provide definitions of the words and use them in sentences. The results lend support to the effectiveness of incidental learning in that the students from the experimental group not only learnt the meaning of the words, but also were able to use the newly acquired words in sentences, unlike the students from the control group.

Not only experimental studies, but also many foreign language teachers' accounts testify to the effectiveness of incidental vocabulary learning. For example, Ao Ran, a teacher and teacher educator from Singapore, in his account said that those students who

had large active and passive vocabulary immersed themselves in incidental learning. As he says,

I talked to them and found that about 30% of their vocabulary was not from direct teaching, but from incidental reading (e.g. simplified readers and novels) and listening (e.g. to pop songs and news). Incidental vocabulary learning is helpful, probably because students who use this method are normally those highly motivated ones who often learn self-imposedly through different channels (Richards 2015: 308).

As it turns out, students themselves also value the effectiveness of incidental learning. Below is a story found in the media, which testifies to the benefits of watching television in a foreign language, which is a form of incidental learning:

Every day for about five years, Israeli sisters Reut and Shoham Nistel ran home from school, made themselves sandwiches and plopped down on the couch to watch an Argentine telenovela with Hebrew subtitles. The girls became so proficient in Spanish that they started speaking it at home to keep secrets from their parents. “That’s how we learned English, too,” said Reut, now 26. “We had English class in school, but I never paid attention. All my English is from “Full House” and “Family Matters””. (Cohen 2018)

#### **3.4.1.2. Short -term vs. long- term vocabulary learning tests**

It is important to note that the newly acquired vocabulary items may be stored in short-term and long-term memory, thus, depending on the learning objective, testing vocabulary acquisition requires different tests for short and long-term gains. Waring and Takaki’s study (2003) shows the importance of testing not only short-term, but also long-term memory gains by means of delayed post-tests, as the differences between what was remembered after the treatment as opposed to what was really remembered were substantial. As Hulstijn (2003: 363) says:

The results of vocabulary learning experiments whose design includes immediate but no delayed posttests often meet with skepticism from teachers as well as researchers. They question the validity and relevance for L2 instruction of studies showing that, after a single incidental or intentional learning session, method A yields higher retention rates than method B. They tend to dismiss results of such studies unless delayed posttests, administered after days, weeks or even months, revealed that method A remains superior to B

It is, however, an oversimplification to state that delayed post-tests are the only valid measurements of gains. Immediate post-tests are of great value if we want to measure solely the

effects of treatment and cognitive processing that took place. The results of delayed post-tests may be affected by what happened after the session (Hulstijn 2003: 364). For example, in the case of vocabulary learning, high scores on the delayed post-test could not be attributed only to the treatment during the experiment (e.g. watching a movie), but also to additional purposeful practising of the newly encountered words outside the classroom. It is, therefore, impossible to determine whether vocabulary gains resulted from exposure to a FL movie, or conscious vocabulary activities done in the meantime, so to avoid this problem, it is advisable to resort to immediate post-tests.

#### **3.4.1.3. Recognition vs. Production**

While measuring vocabulary knowledge, it is also important to make a distinction between recognition and production as these are two different degrees of knowing a word. According to Nation (2013), receptive vocabulary knowledge includes mostly the ability to recognize a form of a word (spoken and written), the knowledge of the word's general meaning, component parts, collocations, or grammatical function. Productive knowledge, on the other hand, involves the ability to correctly spell and pronounce a word, the knowledge of different meanings of a word and the precise context of its use (Nation 2013: 49-50). In general, receptive vocabulary knowledge is easier to achieve than productive knowledge. This may be due to the fact that knowing the word receptively entails learning fewer distinctive features of its form than using the word productively. Moreover, receptive knowledge of words is more frequently practised in language learning environments than their productive use, which is why receptive knowledge can be acquired faster. Finally, receptive knowledge is more easily accessed since upon hearing a foreign language word, only one translation of the word is retrieved from memory, while when it comes to production, there are many more options to choose from, for example synonyms of a given word, its collocates, etc, which makes vocabulary recall more challenging (Nation 2013: 51-52).

Although the ultimate goal for learners is to acquire productive knowledge to be able to use the newly learnt items, recognition should not be neglected. According to Waring and Nation (2004), the ability to recognize a word constitutes a starting point for vocabulary learning. This first stage of vocabulary acquisition can be measured by means of, for example, a sight recognition test in which learners are asked to decide whether they

have seen the word or not. At the next stage of vocabulary knowledge, a learner shows some knowledge of form and meaning, but this knowledge is not yet sufficient for using the words productively. This stage of knowledge can be measured by a multiple choice test in which a learner chooses the correct translation of the word from a list. Finally, a translation test measures the ability to recall the meaning of a given word (Waring and Nation 2004).

### 3.4.2. Experimental studies on the effects of modality on foreign language vocabulary learning

This section presents an overview of experimental studies investigating the effects of modality on foreign language vocabulary learning. For easier reference, Table 2 below contains key information about the studies.

Table 2. A summary of selected studies on the impact of modality on foreign language vocabulary learning

Researcher(s)	Modalities tested	Methods	Results
Al-Seghayer (2001)	still picture + written text, video + written text, written text only	Recognition test (multiple choice), production test (provide definitions)	Dual modality superior to single modality
Bird and Williams (2002)	Text, audio, text+audio	recognition memory and spoken word recognition test (Experiment 1), rhyme judgement task (Experiment 2)	Bimodal presentation more effective for recognition memory (Experiment 1) and spoken word recognition (Experiment 2)
Nassaji (2004)	Audio, visual, audiovisual	Test on recognition and recall	Audiovisual input superior to both single-modality presentations
Kim and Gilman (2008)	visual text only, visual and spoken text, visual text and graphics, visual and spoken text with graphics, reduced visual and added spoken text, reduced visual	Immediate and delayed post-test on vocabulary	Multimodal input beneficial to vocabulary learning

	and added spoken text with graphics.		
Sydorenko (2010)	Video with audio and captions, video and audio, video and captions	vocabulary recognition test, translation test, word knowledge test	Differential effect of input modality: video with audio and subtitles most beneficial for overall gains, video with audio for aural recognition, video and captions for written recognition
Zarei and Gilanian (2013)	Video with audio and captions, video and audio, video and captions	Test on recognition (multiple choice) and production (fill-in-the-blanks).	no differential effect of different modality modes on vocabulary acquisition
Hsu (2017)	Sound with text and image, sound and image, text and image, sound only	Immediate and delayed post-test on vocabulary	audio-only input most beneficial for immediate word recall, text and image (no audio) most beneficial for long-term gains
Kıvrak and Gökmen (2019)	Written, audiovisual	Two post-tests: provide definitions or L1 equivalents of the target words, and provide the target words to the given definitions.	audiovisual input more beneficial than the written input at the upper-intermediate level of proficiency; written input more effective when paired with a lower involvement task, the audiovisual input more effective with a higher involvement task at a lower intermediate level of proficiency,
Hsieh (2019)	no captions, captions with no audio, captions, captions with highlighted target-word, and captions with highlighted target-word and L1 gloss	comprehension test and three vocabulary tests: on form recognition, on meaning recognition, and on meaning recall.	dual modality input beneficial for vocabulary learning and comprehension
Feng and Webb (2020)	written, audio, audiovisual	Checklist and a multiple choice vocabulary test	No significant differences between the three modalities – dual

Al-Seghayer (2001) investigated the impact of three modalities— still picture, video, and written text on the acquisition of new words in the case of intermediate ESL learners. Using a multimedia learning program, the participants read an English narrative with glosses available in the form of a written definition, definition and a corresponding picture, and definition with a corresponding video. After the reading session, the participants completed two previously unannounced vocabulary tests: one multiple choice test which tested recognition of the new vocabulary items, and one test on production in which the participants had to provide definitions of the given words. The results corroborate the Dual Coding Theory (Paivio 1971) in that dually coded information was more effective for vocabulary learning than single modality information (written definition only). Moreover, the results revealed that definition coupled with a video led to greater vocabulary gains than definition accompanied by a still picture. After the experiment, the participants were additionally interviewed on the usefulness of all modalities. The interviews suggest that the superiority of video can be attributed to the fact that it aids to create a mental image, combines different modalities and makes learners more focused.

Bird and Williams (2002) examined the effects of bimodal and single-modality input on recognition memory and spoken word recognition. In Experiment 1 measuring explicit memory, the participants, who were native speakers or advanced non-native speakers of English, were presented with a list of familiar and unfamiliar words either via a recording, text, or both. Their task was to decide whether they knew the word or not, and later, in the next phase of the experiment, whether a given word appeared in the first phase or not. It turned out that the availability of text, be it in the text only or text and sound condition led to faster reaction times. When it comes to recognition memory scores, the bimodal input group performed better than single modality groups. In Experiment 2, advanced non-native learners of English performed a rhyme judgement task in which they were presented with pairs of non-words. The first item was presented in the audio format, while the second in the audio-only, text-only, or both formats. Their task was to decide whether the second item rhymed with the first one. After the rhyme judgement task, the participants were presented with non-words in the audio format, and they were asked to determine whether a given

word appeared in the first part of the experiment or not. One of the most interesting findings is that non-words which were presented in two modalities resulted in higher spoken word recognition.

Nassaji (2004) explored the effects of input modality on remembering name-referent associations while learning nonsense words. High intermediate EFL learners were divided into three experimental groups: auditory only, visual only, and audiovisual. Each group was presented with name-referent associations (picture and a non-word) in a given modality. After the treatment, the participants completed a recognition test in which they had to choose the correct word in a format parallel to the format (modality) of the treatment session. There was also a test on recall in which the participants were presented with pictures and had to provide the appropriate word in the assigned modality (write it or say it). The results showed that there were no differences between the audio-only and visual - only conditions. However, the audiovisual condition turned out to be superior to both single-modality conditions in terms of recognition and recall of the newly learnt words. Thus, the results lend support to the dual-modality hypothesis, which is consistent with the Dual Coding Theory (Paivio 1971).

Kim and Gilman (2008) investigated vocabulary learning by means of a special Web-based program that offers different methods of instruction in different modalities. The participants of the study were middle school students from South Korea who were divided into six experimental groups: visual text only, visual and spoken text, visual text and graphics, visual and spoken text with graphics, reduced visual and added spoken text, and reduced visual and added spoken text with graphics. After the treatment session, the researchers measured vocabulary acquisition by means of a post- test and a retention vocabulary test, as well as student attitude inventory. The results indicate that the combination of text and graphics, as well as spoken and visual text with graphics led to greatest gains in vocabulary, which shows that using input in different modalities reinforces vocabulary learning.

Of great interest is the question of what modalities learners rely on the most, e.g. whether they pay attention to audio at all if they have access to subtitles, or whether they focus on audio and subtitles while skipping some visual images. In her experimental study, Sydorenko (2010) investigated attention to input in different modalities, and the effects of input modality on vocabulary learning. The participants of the study were 26 beginning learners of Russian as a foreign language who were divided into three experimental groups:

one group watched a video with audio and captions (VAC group), one group watched a video with audio but without captions (VA group), and the third group watched a video with captions, but without audio (VC group). After the viewing session, the participants took a vocabulary recognition test, a translation test, and a word knowledge test in which the participants rated their knowledge of the target words. The results demonstrate that presentation modality has an impact on vocabulary acquisition – watching the video in the VA condition facilitated aural recognition of the target words, while watching the video in the VC condition resulted in better scores on the written recognition test. When it comes to recall of meaning, however, the differences between the groups were not significant. In terms of overall vocabulary gains, the VAC group outperformed the VA group, which lends support to the beneficial influence of captions on vocabulary acquisition. The participants were additionally asked to rate the usefulness of each modality while watching a video as well as how much attention they paid to video, audio, and captions. The overall results indicate that all three modalities were attended to, however, captions and video were reported to be more important to learners than audio. Interestingly, students found video to be more useful than captions, but this can be attributed to their level of proficiency– since the participants of the study were beginners, they did not understand all the words from captions, but they were able to follow visual images without any problems.

Zarei and Gilanian (2013) obtained somewhat opposite results to that of Sydorenko's (2010), since they found no differential effect of different modality modes on vocabulary acquisition. In their study, students majoring in English Teaching and Translation from Qazvin watched a movie either with video, audio and subtitles (VAC group), video and captions (VC group), or video and audio (VA group). To measure vocabulary acquisition, the researchers administered a post-test on recognition (multiple choice) and production (fill-in-the-blanks). The analysis yielded no significant differences between the three modality groups in terms of both recognition and production. As the researchers conclude, “regardless of the various forms and combinations of forms, multimedia is an asset that can positively influence L2 vocabulary learning” (Zarei and Gilanian 2013: 1017).

Hsu (2017) investigated the impact of modality and subtitles on vocabulary learning in the case of pre-intermediate learners of English from Taiwan. She employed four different modality conditions: with subtitles (sound, text, image), without subtitles (sound and image), subtitles with no sound (text and image), and audio track only (neither text nor image available). First, the students read four news stories as a supplementary material to their

coursebook. One week later, they took an unannounced test on vocabulary from the reading material, and a week after the test, they watched the four news stories in one of the four modality conditions. The viewing session was followed by an immediate and delayed vocabulary test. It turned out that the most effective modality in terms of immediate word recall was the audio-only presentation. On the other hand, the audio condition contributed to the largest vocabulary loss as evidenced by the results of the delayed post-test. The “silent captioning” condition, that is text and image with no audio, proved to be the most beneficial for long-term vocabulary gains. It should be noted, however, that the effects of all four modalities were investigated in terms of their impact on vocabulary consolidation since the learners first encountered the target words in a written form. Hsu (2017) highlights the importance of repeated exposure to newly acquired words, which can be facilitated by using audiovisual materials.

Kıvrak and Gökmen (2019) sought to find, among other things, whether input in two different modalities (written and audiovisual) would result in different vocabulary gains at lower-intermediate and upper-intermediate levels of proficiency. After watching a video (podcast) or reading a passage (transcribed version of the podcast), the participants from each level of proficiency were assigned to different experimental groups that differed in terms of the vocabulary task that they were asked to complete. In total, there were six task types: reading or watching only tasks, fill-in by watching or reading tasks, and sentence writing by watching or reading tasks. Immediately after the treatment and two weeks later, two vocabulary post-tests were administered: one in which the participants were asked to provide definitions or L1 equivalents of the target words, and one in which they had to provide the target words to the given definitions. The results revealed that at a lower intermediate level of proficiency, the written input was more effective for incidental vocabulary learning when it was paired with a gap-filling task (lower involvement task), while the audiovisual input was more effective with a sentence writing task (higher involvement task). At the upper-intermediate level, on the other hand, audiovisual input turned out to be more beneficial than the written input. As for the impact of the modality of input on receptive and productive knowledge, the sentence writing task was more effective for receptive vocabulary acquisition than the gap-filling task in the case of both proficiency levels regardless of the modality of input. When it comes to productive vocabulary knowledge, at both levels of proficiency, written input was superior than the audiovisual input when

paired with gap-filling, while the audiovisual input was more beneficial for the learners if it was accompanied by a sentence writing task.

Hsieh (2019) corroborated the effectiveness of dual modality presentation on vocabulary learning and listening comprehension. In the study, low-intermediate Chinese learners of English watched two video clips in a given subtitling condition twice. Overall, there were 5 subtitling conditions: no captions, captions with no audio, captions, captions with highlighted target-word, and captions with highlighted target-word and L1 gloss. After the viewing, the participants completed a comprehension test and three vocabulary tests: one on form recognition, one on meaning recognition, and one on meaning recall. The results reveal that dual modality input did not lead to cognitive overload as the participants benefited from simultaneous exposure to audio, video and captions in terms of vocabulary learning and comprehension.

Feng and Webb (2020) compared the effectiveness of audio, written, and audiovisual input for incidental vocabulary learning. In the study, Chinese learners of English were assigned to one of three experimental groups: one group read the transcript of a documentary (the reading group), one group listened to a documentary without video (the listening group), and one group watched a documentary without subtitles (the viewing group). The analysis of pre-test and post-test vocabulary tests revealed that the three modalities were equally effective in terms of incidental vocabulary learning. According to Feng and Webb (2020), the lack of significant superiority of audiovisual input over single-modality input may be attributed to the learners' limited experience with viewing L2 television as in China reading and listening are much more frequently implemented in EFL classrooms, and, as a result, learners are not used to being exposed to audiovisual input in L2 (Feng and Webb 2020: 516).

As has been demonstrated, even though most experimental studies point to the effectiveness of multimodal input for foreign language vocabulary acquisition, the results are somewhat inconclusive since there are studies in which no significant differences emerged between single and dual modality input in terms of its impact on vocabulary learning (e.g. Zarei and Gilanian 2013), or studies in which single modality was found to be more effective than multimodal input (e.g. Hsu 2017). Thus, further research is needed to determine the influence of input modality on foreign language vocabulary acquisition.

### **3.5. Conclusion**

To conclude, the impact of modalities on comprehension and vocabulary learning is one of the key considerations while choosing and optimizing learning materials. Despite individual differences, combining visual and auditory input seems to be more effective than delivering the same information via a single modality, though the results of the experimental studies quoted above are somewhat inconclusive, which necessitates further research in this area. In the case of FL movies, contrary to common misconceptions, research shows that subtitles do not overload the visual channel and can in fact aid foreign language vocabulary learning and comprehension.

Vocabulary learning is also a multifaceted, multidimensional activity since there are different stages of knowing a word, from recognizing its form to producing it during spontaneous conversation. Vocabulary tests should, therefore, capture all the dimensions of knowing a word, as well as investigate short and long term acquisition.

## Chapter 4: The experimental study

### 4.1. Rationale for conducting the experiment

Exposure to movies and media in formal and informal contexts has become a springboard for learning foreign languages, since there is a general consensus that “one *should* be able to learn a foreign or second language from watching TV programs, films, and other audio-visual material in a foreign language” (Vanderplank 2020: 183). Recently, there has been an upsurge of publications revolving around the effects of watching foreign language movies on different language skills at all levels of proficiency in different subtitling conditions – without subtitles, with L1, L2 or reversed subtitles. While there is a bulk of quantitative and qualitative research that is a testament to the usefulness of subtitles, the results are somewhat inconclusive, as there is no consensus on which subtitling condition is most effective for learners at a particular level of proficiency. Moreover, little is known about the interaction between vocabulary learning and comprehension while watching FL movies, and the actual level of cognitive load experienced by students. This is crucial for tailoring materials to students at a given level of proficiency so as to avoid cognitive overload, which would impede the learning process.

What seems to be a neglected aspect in studies on the impact of movies on FL learning is comprehension and the role of non-verbal cues in comprehension. Although the question of how much students understood from a movie is frequently addressed in research, researchers fail to acknowledge that comprehension is a multifaceted concept which can be investigated at different levels. Since different levels of comprehension seem to be under-researched in studies on second language acquisition, the current project seeks to fill this

gap by incorporating a test examining different levels of comprehension and the role of non-verbal communication.

Although films in education are mostly used in a FULL version, that is with sound and picture, and studies on the use of films in education focus on this type of version, investigating the impact of modality on learning and comprehension may significantly add to the existing body of research into foreign language acquisition through videos. Including different versions of a video clip, for example without the sound (language), may show how much we can infer from pictures only. This in turn may show whether comprehension is dependent on the language only, and allow for a more detailed analysis of any comprehension tests to see whether a student indeed understood the dialogues, or rather inferred the content of the dialogue on the basis of the pictures only. Investigating the role of modality in watching movies contributes to exploring the effectiveness of a wider range of learning materials. For example, without a picture, a movie becomes a listening material, with or without subtitles.

When it comes to vocabulary learning, there is a plethora of studies addressing incidental and intentional learning while watching FL movies. However, previous research in the field fails to take into account various aspects of vocabulary acquisition, such as short and long term acquisition, “vocabulary loss”, i.e. the number of newly acquired words that are lost on the way to long-term memory, as well as recognition. According to Waring and Nation (2004), recognition of the form of the word is crucial as it is the very first step in acquiring new vocabulary items. Therefore, tests that address recognition, such as a sight recognition test, should be also used for investigating vocabulary acquisition.

Finally, of great relevance for teachers and learners is the knowledge of different factors that can predict learning outcomes. While previous research in the field focused on the effects of subtitles on comprehension, vocabulary learning or cognitive load, it did not take into account the predictor variables that may determine success. Hence, there is a need for research investigating which factors exert an influence on comprehension, vocabulary learning or cognitive load, e.g. whether comprehension and cognitive load determine short and long term vocabulary gains, or whether the level of cognitive load and the number of new vocabulary items acquired may predict comprehension of a video clip.

## 4.2. Research questions and hypotheses

In order to address the abovementioned gaps in previous research, on the basis of existing literature and previous research in the field, the following main overarching and subordinate research questions and hypotheses have been formulated:

### RQ 1: What is the impact of subtitles and modality on comprehension?

**1A:** What is the impact of subtitles and modality on comprehension at level 1?

**1B:** What is the impact of subtitles and modality on comprehension at level 2?

**1C:** What is the impact of subtitles and modality on comprehension at level 3?

**1D:** What is the impact of subtitles and modality on comprehension at level 4?

### **Hypotheses:**

**H1:** Polish (L1) subtitles will facilitate comprehension the most, while the absence of subtitles will result in lowest comprehension scores. (e.g. Birulés-Muntané and Soto-Faraco 2016, Pujadas and Muñoz 2020, Dizon and Thanyawatpokin 2021).

**H2:** The availability of sound and picture (“full’ version) will result in highest comprehension (e.g. Guichon and McLornan 2008, Whiting and Granoff 2010, Safarali and Hamidi 2012, Aldukhayel 2021).

### RQ 2: What is the impact of subtitles and modality on cognitive load?

**2A:** What is the impact of subtitles and modality on cognitive load measured objectively by Reaction Time?

**2B:** What is the impact of subtitles and modality on cognitive load measured subjectively by a self-report?

**2C:** What is the impact of subtitles and modality on germane cognitive load?

### **Hypotheses:**

**H1:** The presence of subtitles will lower the level of cognitive load the most, while the absence of subtitles will increase cognitive load the most (e.g. Perego et al. 2010, Lin et al. 2016, Liao et al. 2020).

**H2:** Polish (L1) subtitles will lower the level of cognitive load more than English (L2) subtitles (e.g. Baranowska 2020).

**H3:** The availability of sound and picture (“full version’) will not lead to cognitive overload (e.g. Homer et al. 2008, Lång 2016).

### RQ 3: What is the impact of subtitles and modality on vocabulary acquisition?

**3A:** What is the impact of subtitles and modality on short-term vocabulary acquisition in terms of unassisted meaning recall?

**3B:** What is the impact of subtitles and modality on long-term vocabulary acquisition in terms of unassisted meaning recall?

**3C:** What is the impact of subtitles and modality on vocabulary loss?

**3D:** What is the impact of subtitles and modality on vocabulary acquisition in terms of word recognition?

### **Hypotheses:**

**H1:** English (L2) subtitles will result in greatest short-term vocabulary gains (e.g. Zarei 2009, Zarei and Rashvand 2011, Frumuselu et al. 2015, Shabani and Zanussi 2015), while Polish (L1) subtitles in greatest long-term vocabulary gains since L1 subtitles may entail deeper processing (e.g. Hummel 2010, Dizon and Thanyawatpokin 2021).

**H2:** The availability of sound and picture (“full” version) is predicted to result in greatest vocabulary gains (e.g. Kim and Gilman 2008, Kıvrak and Gökmen 2019, Hsieh 2019).

Additionally, three auxiliary research questions of explorative nature have been added:

**RQ 4: What factors can predict comprehension?**

**RQ 5: What factors can predict vocabulary acquisition?**

**RQ 6: What factors can predict the level of cognitive load?**

### **4.3. Participants**

In total, 211 students participated in the experiment. However, in order to preserve homogeneity within the experimental groups, 15 participants were excluded from the analysis on the basis of one of the exclusion criteria: level of proficiency as measured by the Lexical Test for Advanced Learners of English (LexTale), L1 (other than Polish), age (over 35), and familiarity with the video clip. Eventually, the participants of the study were 196 Polish upper-intermediate (B1+/B2) learners of English. There were 144 women and 52 men, their age ranged from 15 to 30 years. Their level of proficiency in English was determined first by their teachers on the basis of the coursebook they were using and also on the basis of achievement tests, and later, immediately before the experiment, by means of the LexTale test. Their LexTale scores ranged from 60% to 75%, which, in accordance with previous

studies juxtaposing LexTale scores with other proficiency tests (Lemhöfer and Broersma 2012), means that they can be classified as B2 learners of English. After the experiment, the subjects were asked about their familiarity with the video clip they had watched, and those who were familiar with the TV-series were excluded from the analysis.

To increase the generalisability of the findings, a two-stage sampling method was used: cluster sampling followed by convenience sampling. Cluster sampling is a probability sampling scheme in which a population is divided into groups, i.e. clusters. Next, some clusters are selected randomly for the study and each individual, school, etc. within a given cluster is investigated (Alvi 2016). Even though there are some potential problems with the use of cluster sampling (e.g. sampling biases, systematic errors), this method has been chosen due to its feasibility. In the current project, investigating all students from the selected clusters was not possible because of technical (e.g. availability of the computer lab) and organisational problems (e.g. excusing a group of students from their classes, students' consents to participate in the experiment at the cost of missing some classes at school). Hence, in the second stage of cluster sampling, instead of examining all students from each cluster, a convenience sampling method was employed, so that only those students who volunteered participated in the experiment.

Among all schools in Poznań, six educational institutions, or "clusters", (3 high schools, 2 universities, 1 language school) were selected: I Liceum im. Karola Marcinkowskiego, II Liceum Ogólnokształcące im. Generałowej Zamoyskiej i Heleny Modrzejewskiej, III Liceum Ogólnokształcące im. św. Jana Kantego, Wyższa Szkoła Bankowa, Wydział Anglistyki Uniwersytetu im. Adama Mickiewicza, and Szkoła Językowa Uniwersytetu im. Adama Mickiewicza. Subsequently, the researcher approached the headmasters and teachers to invite volunteer students to participate in the experiment. All participants were randomly assigned to different experimental groups, that is, no intact classes were used. Instead, in each group, students were assigned to different experimental conditions, so that, for example, from a group of 15 participants, 5 watched the video without sound and subtitles, 3 without picture but with Polish subtitles, 3 without picture but with English subtitles, and 4 watched the video without subtitles but with sound and picture.

In total, there were 9 experimental groups that differed in terms of the version of the video clip they watched. There were approximately 20 participants in each group:

- 22 students in the FULL group (video with sound and picture, no subtitles)

- 23 students in the FULLENG group (video with sound and picture, English subtitles)
- 23 students in the FULLPL group (video with sound and picture, Polish subtitles)
- 22 students in the AUD group (video without picture but with sound only, no subtitles)
- 21 students in the AUDENG group (video without picture but with sound only, English subtitles)
- 22 students in the AUDPL group (video without picture but with sound only, Polish subtitles)
- 21 students in the VID group (video without sound but with picture only, no subtitles)
- 22 students in the VIDENG group (video without sound but with picture only, English subtitles)
- 22 students in the VIDPL group (video without sound but with picture only, Polish subtitles)

#### **4.4. Study design**

##### **4.4.1. Research plan**

The experiment was conducted in computer labs, one on the premises of the Faculty of English, Adam Mickiewicz University, and one on the premises of St. John Cantius High School (III Liceum Ogólnokształcące im. św. Jana Kantego). The first lab was equipped with 22 desktop computers and headphones, the second one with 15 laptops and headphones. Each session took between 60 to 75 minutes.

First, each participant signed an informed consent form. At the beginning of the study, the participants completed an online test of proficiency (LexTale); the results of the test were automatically sent via e-mail to the researcher, which allowed her to exclude the participants at a higher or lower level of proficiency after the data collection period, but before the analysis. Next, the researcher assigned the participants to different experimental groups and explained how to generate an individual code to ensure anonymity. The code

consisted of the following elements: group symbol + 2 first letters of the name+ 2 first letters of the surname+ first letter of the mother's / father's name+ birthday, e.g. FULLK-ABAB23.

After these preliminary procedures, the participants completed a pre-test on vocabulary from the movie clip they were going to watch. Additionally, they were asked to provide information concerning their age, gender, and L1. Then, each participant was instructed how to run the experiment on their computer, tested the equipment, and eventually started watching the video clip which lasted around 23 minutes. Simultaneously, the participants' reaction time to each sound stimulus occurring throughout the video was measured as a direct measurement of cognitive load.

After the viewing session, each participant completed a post-test on comprehension, which also included a post-test on vocabulary. Additionally, the participants were asked to indicate whether they had watched the clip before and, in general, whether they were familiar with the TV-series. This allowed the researcher to exclude the participants who had some prior knowledge, and which could facilitate answering answer comprehension questions, even if they did not fully understand the language. Finally, the participants completed a questionnaire on the level of cognitive load experienced.

A month later, the researcher approached the participants once again, this time by visiting them in their classrooms, in order to conduct a delayed post-test on vocabulary. The test took approximately 8 minutes.

#### **4.4.2. Materials**

##### **4.4.2.1. LexTale test**

Lexical Test for Advanced Learners of English (LexTale) is a quick online lexical decision task available at <http://lextale.com>, which takes around 3.5 minutes and consists of 60 trials. It has been found to be a valid and objective indicator of vocabulary knowledge and general English proficiency. In their study on Dutch and Korean advanced learners of English, Lemhöfer and Broersma (2012) tested, inter alia, whether LexTale correlates with other indicators of language proficiency. The results demonstrate that LexTale results substan-

tially and significantly correlate with the results of more extensive tests on proficiency, such as the Quick Placement Test (QPT) and the TOEIC test.

Since the test is quick, free, easy to administer, objective and valid, it was used in the current project to confirm the participants' level of proficiency as reported by the teachers. Overall, the results of LexTale confirmed the level of proficiency reported by the teachers, which further corroborates the validity of the test.

#### **4.4.2.2. Pre- test and immediate post-test on vocabulary**

The vocabulary pre-test and immediate post-test used in the study were adapted from the Revised Vocabulary Knowledge Scale (RVKS) test used by Zhao and Macaro (2016: 86). There were 25 items in the pre-test, 10 of which were distractors (words that did not appear in the video clip) that were meant to distract the participants from focusing on the words while watching the video. The immediate post-test consisted of 15 words that appeared in the movie clip; there was no need for distractors as the post-test tested the vocabulary acquisition after the viewing session. The RVKS test consists of a three-point vocabulary knowledge scale, and the test taker is supposed to circle the level of knowledge of a given word true for them (The RVKS test used in the current study is attached in Appendix A). The first level, "I haven't seen this word before", indicates no knowledge of the word and is worth 0 points. The second level, "I have seen this word before, and I think it's related to the category\_\_" allows for tracking the development of the word knowledge; 1 point is assigned for this level, provided that the student names the correct category. This level indicates that a student has seen the word before, and, as we colloquially say, "it rings a bell". The final, third level, is defined as follows: "I know this word. It means.... (answer in Polish or English)", is worth 2 points for the correct answer. Here the participants were asked to provide all the meanings of the word they knew. However, points were awarded only if among the meanings provided was the required meaning. While the pre-test tested general vocabulary knowledge, the post-test measured the ability to infer context-dependent meanings (ad hoc concepts) in that points were awarded for the meaning related to the context (the video clip). What needs to be emphasized, however, is the fact that the immediate post-test measured only short term vocabulary gains, thus not all of the newly acquired words would be transferred to long-term memory and some would be perhaps forgotten.

#### **4.4.2.3. The video clip**

The video clip used in the study was a 23-minute fragment of the first episode of the TV-series “Gilmore Girls” – “Pilot”. There were three main reasons behind the choice of this particular series. The first reason is authenticity. “Gilmore Girls” was a popular American TV-series, thus it is an authentic material, rather than a video created specifically for educational purposes. As mentioned in Chapter 1, when exposed to authentic language materials, learners are afforded the opportunity to experience the target language in a naturalistic setting with language that is not usually taught in the classroom, for example slang expressions. Such movies are, therefore, a valuable source of input. In contrast to videos created specifically for learners at a given level of proficiency, authentic movies fuel motivation towards learning since learners watch them for entertainment, and learning is more incidental than in the case of educational materials tailored for learners at a specific level of proficiency. The second motive behind choosing this series was the fact that it ended its run in 2007. Thus, in contrast to current tv-series and movies, it was likely that the participants (aged 15-30) would not know or remember the first episode of “Gilmore Girls”. It turned out that it was indeed the case—among all participants recruited for the study, only two were excluded on the basis of their familiarity with the video clip. The third reason for choosing “Gilmore Girls” was its genre. It is a comedy- drama series rather than, for example, an action movie, thus most scenes include dialogues. This was important for the current project since one of the objectives was to measure comprehension on the basis of understanding the language. With a dialogue-based video clip, it was possible to design a comprehension questionnaire with questions asking about the details that could not be inferred solely from picture, but only from dialogues.

The video clip was prepared in 9 versions corresponding to 9 experimental groups that differed in terms of picture, sound and subtitles (see section 1.4). Although original subtitles were used, subtitling for the experimental clips required some editing (e.g. cutting, merging clips) and was created in accordance with “The Subtitling Guidelines” produced by the BBC Academy available at <https://bbc.github.io/subtitle-guidelines/#Introduction>.

#### **4.4.2.4. The experiment**

The video clip was embedded in the experiment designed with the use of PsychoPy, which is an application for creating, for example, psycholinguistic experiments with timing of stimuli (e.g. Peirce et al. 2019). Most importantly, it allows for measuring reaction time to different stimuli, which is of paramount importance to the current project, as reaction time was used as an objective measurement of cognitive load.

First, a participant read the instructions which were presented on a computer screen. The instruction informed the participant about the length of the video clip as well as the secondary task in which they were asked to press the space bar whenever they heard a sound stimulus played over the headphones during the movie clip. The next screen was a trial in which a participant heard the sound that would occur in the movie and had to provide the response with the keyboard. The purpose of this trial was to familiarize participants with the procedure, and to expose them to the sound, which would prevent them from reacting to other sounds in the movie. After that, the experiment proper started. The timing of each sound stimulus was randomized for each participant, which means that each participant heard stimuli at different, unequal intervals. In this way, the measurement would be more sensitive as the participants could not anticipate when the next stimulus would occur. There were around 5 sound stimuli per minute, which meant that in total, each participant had to react to around 115 stimuli.

#### **4.4.2.5. Post-test on comprehension**

In previous literature, there exist various taxonomies of comprehension levels, ranging from two to six levels, those that distinguish independent categories, and those that present a hierarchical order in which one level leads to another (see section 3.3.1). Given that Francuz and Szalkowska's taxonomy (2007) was previously used in research on watching audiovisual materials rather than reading comprehension (e.g. Francuz et al. 2010), and that the taxonomy contains only four clearly described categories of comprehension which draw on previous research in the field, Francuz and Szalkowska's taxonomy was selected as the underlying taxonomy of the comprehension test. The post-test on comprehension (Appendices B and C) was adapted from a "Big- 4" questionnaire designed by Ośrodek Psychologicznych Analiz Komunikowania społecznego (2005). The questions tap into 4 levels of

comprehension which are included in the taxonomy of comprehension used by Francuz and Szalkowska (2007, see section 3.3.1 for a full description).

In the comprehension test used in the current study, level 1 is tested in tasks 1 and 3, level 2 in tasks 2 and 4, level 3 in tasks 5, 6, and 7, and level in task 8. Since not all experimental groups watched the video with picture, two versions of the questionnaire were prepared. In the version for the VID and FULL groups, task 3 on scene recognition contained screenshots, in the version for the AUD groups, the task included line recognition – the participant had to decide whether a particular line was spoken in the movie or not. Similarly, in task 4, the FULL and VID groups saw pictures of characters, while the AUD groups saw only their names.

All the questions and instructions on the test were in Polish, because comprehension tests presented in L1 lower anxiety and are more reliable since they measure only listening comprehension, unlike comprehension questions in L2 which test both listening and reading comprehension (Shohamy 1984). In this way, the results of such a test “are not contaminated with other skills” (Buck 2001: 143). Appendix B presents the test for the FULL and VID groups, while Appendix C the test for the AUD groups.

#### **4.4.2.6. Self-report on cognitive load**

The self-reported questionnaire investigating the amount of cognitive load experienced was compiled from questionnaires used in previous research, mostly NASA Task Load Index (Hart and Staveland 1988), the questionnaire used by Kruger et al. (2014), and Baranowska (2020). The questionnaire consists of questions grouped into 5 categories: intrinsic load, mental effort, extraneous load, germane load, and emotions. The participants were asked to provide an answer to each question on a five-point Likert scale. Because extraneous load concerns the load induced by the way of presentation, in the case of the current project the presence or absence of subtitles, picture, or sound, questions tapping into this type of cognitive load were different for different experimental groups. For example, those participants who had access to subtitles were asked whether subtitles were more of a hindrance or help, while the participants watching the clip without subtitles were asked whether Polish or English subtitles would, in their opinion, facilitate comprehension. The self-report is presented in Appendix D.

#### **4.4.2.7. Delayed post-test on vocabulary**

The delayed vocabulary post-test consisted of two parts. The first part was exactly the same as the immediate post-test (RVKS format), thus it measured unassisted recall of word meaning. The second part, on the other hand, tested recognition of the words from the first part of the test. In this second part, the participants saw all the words from the first part accompanied by two translations, and their task was to circle the correct translation. The delayed post-test is presented in Appendix E. While the productive knowledge of words is the ultimate goal for learners, word recognition is the first step in learning the word, thus it is interesting to see whether watching films leads to vocabulary acquisition in terms of recognition. To prevent the participants from cheating, the researcher first collected the first part of the test, and only later did she administer the second part. As the delayed post-test was administered a month after the experiment, it measured long-term vocabulary acquisition, that is how many words the participants indeed learned from the movie.

#### **4.4.3. Data analysis**

In the pre-test, the participants could receive up to 30 points. As for the immediate post-test, scores were calculated separately for the first task which was a vocabulary post-test (max 30pts), while points for tasks 2-8 were summed up to give an overall comprehension score (max 35pts). Additionally, to account for all 4 levels of comprehension, points were calculated separately for each level: for level 1 (task 1 and 3) there were 34 points, for level 2 (task 2 and 4) 18pts, for level 3 (task 5,6,7) 9 pts, and for level 4 (task 8), 4 points. Cognitive load was measured through reaction time to a secondary task, that is why for each participant mean reaction time to all the stimuli was calculated. As for the subjective measurement of cognitive load, the self-report, two scores were calculated: one for cognitive load detrimental to learning, which included points for the four categories—intrinsic load, mental effort, extraneous load, and emotions, and one for “the good load”, i.e. germane cognitive load. The delayed post-test consisted of two parts – for the first part (unassisted recall of meaning), a participant could receive up to 30 pts, for the second part (recognition), up to 15 points. In order to see how many words were acquired, the results of the pre-test were subtracted from the results of the immediate vocabulary post-test (“short-term

gains”), and the results of the delayed post-test (“long-term gains”). Since there were two post-tests on vocabulary, the so-called “vocabulary loss” was also calculated by subtracting the results of the immediate post-test on vocabulary from the delayed one to see how many words were lost on their way to long-term memory.

Before the analysis, all measurements were correlated using Pearson Correlation Coefficient. The rationale behind this procedure was to exclude strongly correlated measurements from the analysis. If two measures had turned out to be very strongly correlated ( $r > 0.8$ ), only one of them would have been chosen for the analysis. Appendix F shows the correlational matrix in the form of a heatmap. The strongest correlations were found between long and short-term vocabulary gains ( $r = 0.77$ ), short-term gains and vocabulary loss ( $r = 0.69$ ), and between the two parts of the delayed post-test, production and recognition ( $r = 0.62$ ). Since none of these correlations qualified as a very strong correlation, all measurements were retained in the final analysis.

Several interesting findings emerged from the correlational matrix. First of all, the two measures of cognitive load were very weakly correlated ( $r = 0.015$ ), which is surprising given that it is frequently argued in literature that subjective and objective measurements of cognitive load are strongly correlated (e.g. Kalyuga et al. 2001a: 10). Furthermore, it can be expected that vocabulary acquisition should be correlated with comprehension since the more words we know, the more we understand. However, in the present study, the correlation between short-term vocabulary gains and comprehension was quite weak ( $r = 0.29$ ), which means that comprehension is not dependent solely on vocabulary knowledge. Instead, understanding the content of a video clip may be determined by some other factors, for example modality, as viewers may infer some information without having access to the language, just pictures (the VID version). Moreover, viewers may guess the meaning of unfamiliar words from context, or skip them, and still be able to understand the dialogue. Thus, the knowledge of all words used in a movie is not essential to its overall comprehension. According to Cognitive Load Theory, germane load is the “good load”, which means that it should be negatively correlated with “bad load”, i.e. the sum of intrinsic and extraneous load (e.g. Sweller et al. 2011). As a result, including both categories of cognitive load would essentially yield the same results—the higher negative cognitive load a task induces, the higher germane load is. In the current study, however, there was only a weak negative correlation between germane load and cognitive load measured by a self-report ( $r = -0.45$ ), thus both measured were employed in the final analysis.

All statistical data analyses were performed using SPSS version 26.0 (IBM Corp 2019). Two statistical procedures were run: two-way ANOVA, and a step-wise regression. In the two-way Analysis of Variance the interaction between two factors (subtitles, modality) was explored. Also, the procedures for main effects and post-hoc tests were carried out. Post-hoc tests determine the mean difference between groups in the first factor at all levels of the second factor and vice versa (Laerd Statistics 2015a). As in the current study there were two factors (subtitles, modality), a two-way ANOVA was employed to answer research questions 1-3. Moreover, a step-wise regression was performed for the purpose of selecting predictor variables that best predict the dependent variable. Step-wise regression fine-tunes the model to choose the predictor that contributes most to predicting the outcome variable in a step-by-step procedure which involves either adding most significant variables to the model, or removing the insignificant predictors (Larson-Hall 2010). In the current study, 6 separate stepwise procedures were run for 6 dependent variables: comprehension, vocabulary acquisition (short-term gains, long-term gains,), and cognitive load (self-reports, RT, germane load). The level of proficiency was a constant variable since all participants were supposed to be at the same level of proficiency. However, just to ensure that the level of proficiency as measured by the LexTale test was not a significant predictor of any of the dependent variables entered into the regressions, the LexTale results were added to each of the regression models. As expected, it turned out that the level of proficiency as measured by the LexTale test was not a significant predictor of any of the dependent variables, thus proficiency was excluded from the regression models.

#### **4.5. Pilot study**

A pilot study was conducted three weeks before the experiment proper. The major aim of the study was to discover any potential problems with the study design, test the equipment, and gather feedback from the participants. Due to a limited number of participants, modality as an independent variable was ignored, and, as a result, there was only one independent variable – subtitles, while the dependent variables were the same as in the main study. Hence, the pilot study investigated the impact of different subtitling conditions on comprehension, vocabulary acquisition, and cognitive load.

The participants of the study were recruited by means of convenience sampling from a pool of potential student populations that could participate in the main study. In total, there were twelve participants, all of them were Polish B2 students of English studying Russian-English Philology at the Faculty of English, Adam Mickiewicz University in Poznań. The students were randomly divided into three experimental groups: there were 4 students in the FULL group, 4 in the FULL ENG group, and 4 in the “FULL PL” group. The procedure and materials used were the same as in the main study.

Although there were no significant differences between the groups because the sample was small, the results of the pilot study indicated a number of trends that could herald the outcomes of the main experiment. However, the main goal of this study was to pilot the experiment and verify research instruments rather than form hypotheses about the expected results of the main experiment. The participants reported no technical problems with the equipment and the experiment in PsychoPy. The instructions and questions found in the written tests (pre-test, immediate post-test on vocabulary, test on comprehension, self-report on cognitive load, delayed post-test on vocabulary) were evaluated as clear and precise. However, there was one modification introduced to the comprehension test as a result of the pilot study. Originally, there was only one version of the test, which means there were two versions of some questions: for the groups that watched the movie with video some tasks contained screenshots, while for the audio groups the same tasks included only words (names or lines from the movie). The participants of the pilot study found it to be confusing as sometimes they did not know which question number 4 they were asked to complete. As a result, two separate versions of the comprehension test for video and no-video groups were prepared (see section 1.4.2.5).

## **4.6. Results**

### **4.6.1. RQ1: The impact of subtitles and modality on comprehension**

A two-way ANOVA was run to examine the effects of subtitles and modality on comprehension. The interaction between subtitles and modality was significant ( $F(2,195) = 9.166$ ,  $p < 0.001$ ), and showed that Polish subtitles facilitated comprehension in all modalities,

while English subtitles were helpful only for the VID group since in this condition there was no spoken language available, so any subtitling mode significantly boosted comprehension. Fig. 2 below illustrates mean comprehension scores broken by subtitles and modality:

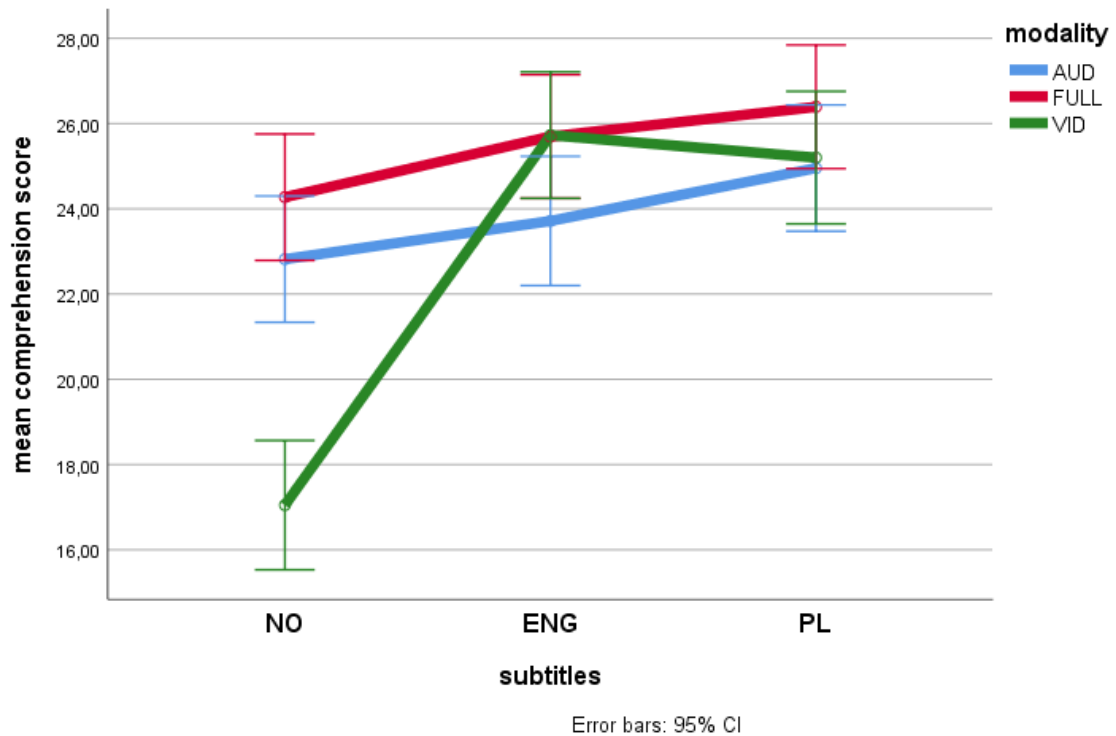


Fig. 2. Mean comprehension scores broken by subtitles and modality.

Main effects analysis demonstrated the following:

- when watching the movie without the picture (AUD version), comprehension was significantly higher with Polish subtitles than without subtitles ( $F(2,195) = 9.166, p = 0.046$ )
- when watching the movie with sound and picture (FULL version), comprehension was significantly higher with Polish subtitles than without subtitles ( $F(2,195) = 9.166, p = 0.045$ )
- when watching the movie without sound (VID version), comprehension was significantly higher with Polish subtitles than without subtitles ( $F(2,195) = 9.166, p < 0.001$ ), and significantly higher with English subtitles than without subtitles ( $F(2,195) = 9.166, p < 0.001$ )
- when watching the movie without subtitles, comprehension was significantly higher in the FULL version than in the VID version ( $F(2,195) = 9.166, p < 0.001$ ), and

significantly higher in the AUD version than in the VID version ( $F(2,195) = 9.166, p < 0.001$ )

The above analysis takes into account a total comprehension score, that is the sum of scores from each task on the comprehension test. As has been mentioned, however, the test measured different levels of comprehension in different tasks. In order to analyze the influence of subtitles and modality on different levels of comprehension, a two-way ANOVA was also run for each level. As for level 1, lexical and visual comprehension, the analysis showed that there was no statistically significant interaction between the effects of subtitles and modality on comprehension at level 1 ( $F(2,195) = 0.509, p = 0.729$ ). The main effect for subtitles was not statistically significant ( $F(2,195) = 0.805, p = 0.449$ ), however, the main effect for modality reached the level of statistical significance ( $F(2,195) = 12.718, p < 0.001$ ). Pairwise comparisons HSD revealed that the AUD group obtained significantly higher scores than the FULL group ( $F(2,195) = 12.718, p < 0.001$ ), and the VID group ( $F(2,195) = 12.718, p < 0.001$ ). Fig. 3 below provides an illustration:

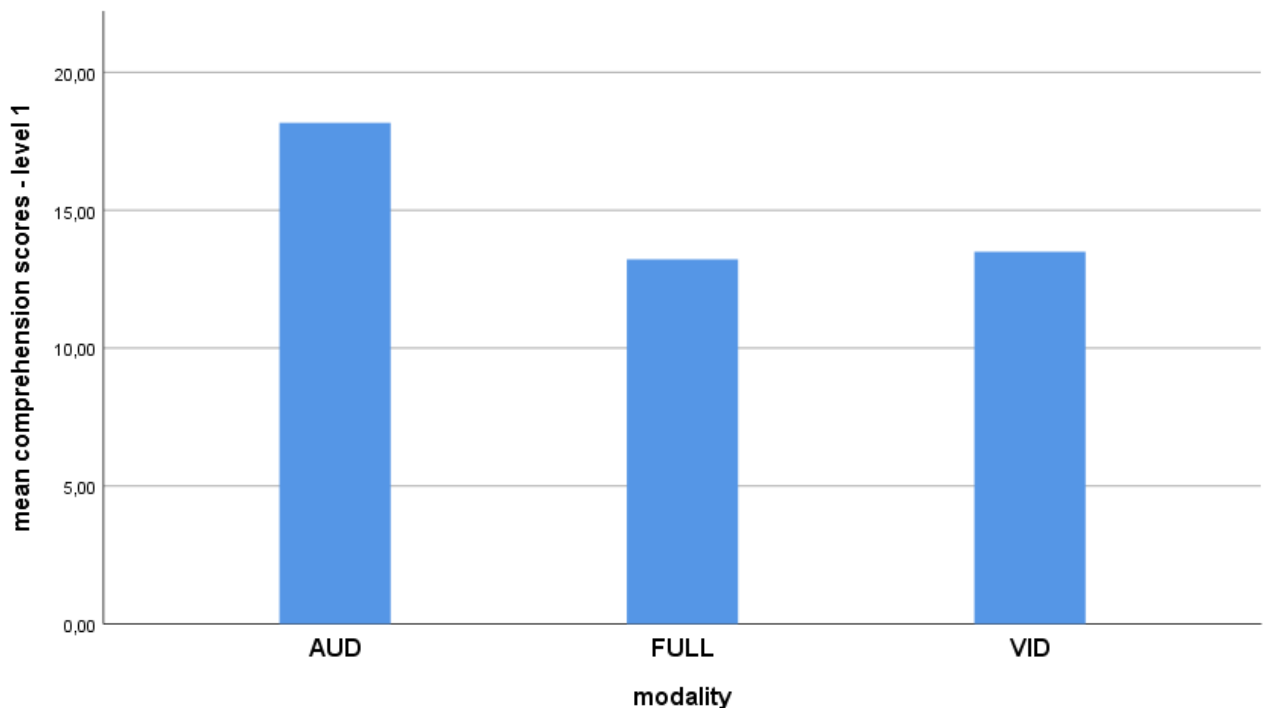


Fig. 3. Mean comprehension scores for level 1 broken by modality.

When it comes to level 2, the understanding of detailed information, a two-way ANOVA demonstrated that there was a statistically significant interaction between the effects of subtitles and modality on comprehension at level 2 ( $F(2,195) = 13.438, p < 0.001$ ).

The VID group obtained the lowest comprehension scores since this group did not have access to the spoken language, thus the participants significantly benefited from both Polish and English subtitles, while the FULL group benefited only from English subtitles. Fig. 4 provides an illustration:

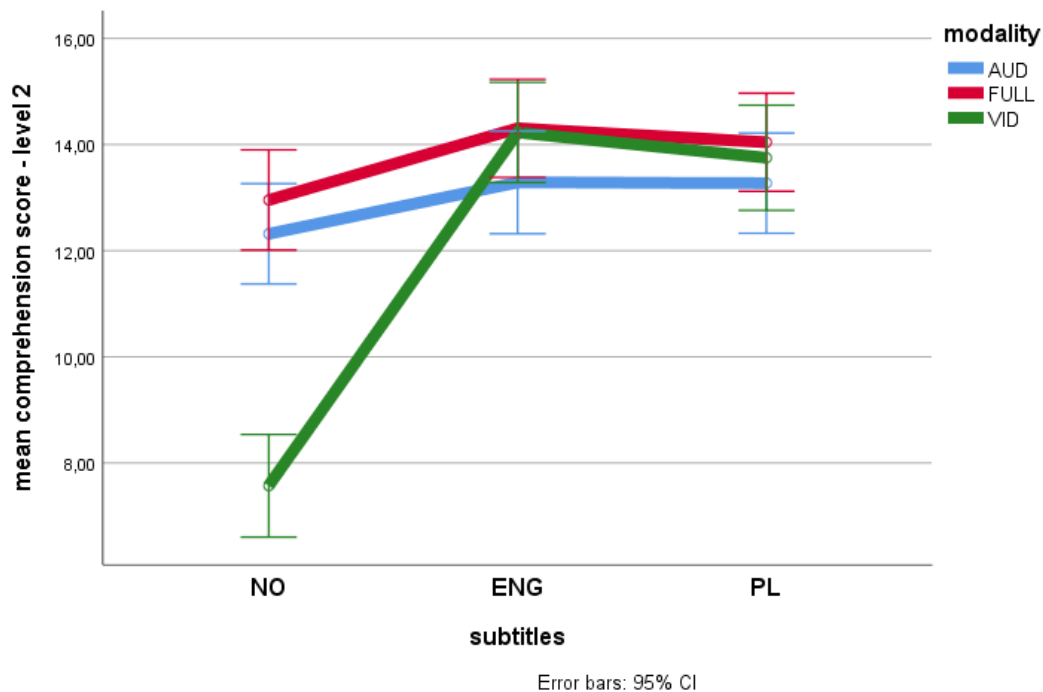


Fig. 4. Mean comprehension scores for level 2 broken by subtitles and modality.

Main effects analysis demonstrated the following:

- when watching the video in the FULL version, there was a statistically significant difference between the no-subtitles and the English-subtitles groups ( $F(2,195) = 13.438, p = 0.045$ )
- when watching the video in the VID version, there was a statistically significant difference between the no-subtitles group and the English-subtitles group ( $F(2,195) = 13.438, p < 0.001$ ), as well as the no-subtitles and the Polish subtitles group ( $F(2,195) = 13.438, p < 0.001$ )
- while watching the video without subtitles, there was a significant difference between the AUD and the VID groups ( $F(2,195) = 13.438, p < 0.001$ ), and the VID and FULL groups ( $F(2,195) = 13.438, p < 0.001$ )

A two-way ANOVA performed for level 3, the understanding of the main idea of the text, revealed that there was a statistically significant interaction between the effects of

subtitles and modality on comprehension at level 3 ( $F(2,195) = 6.138, p < 0.001$ ), and that while watching a movie in the VID version, this level of comprehension is bolstered when subtitles, either Polish or English, are available. Fig. 5 provides an illustration:

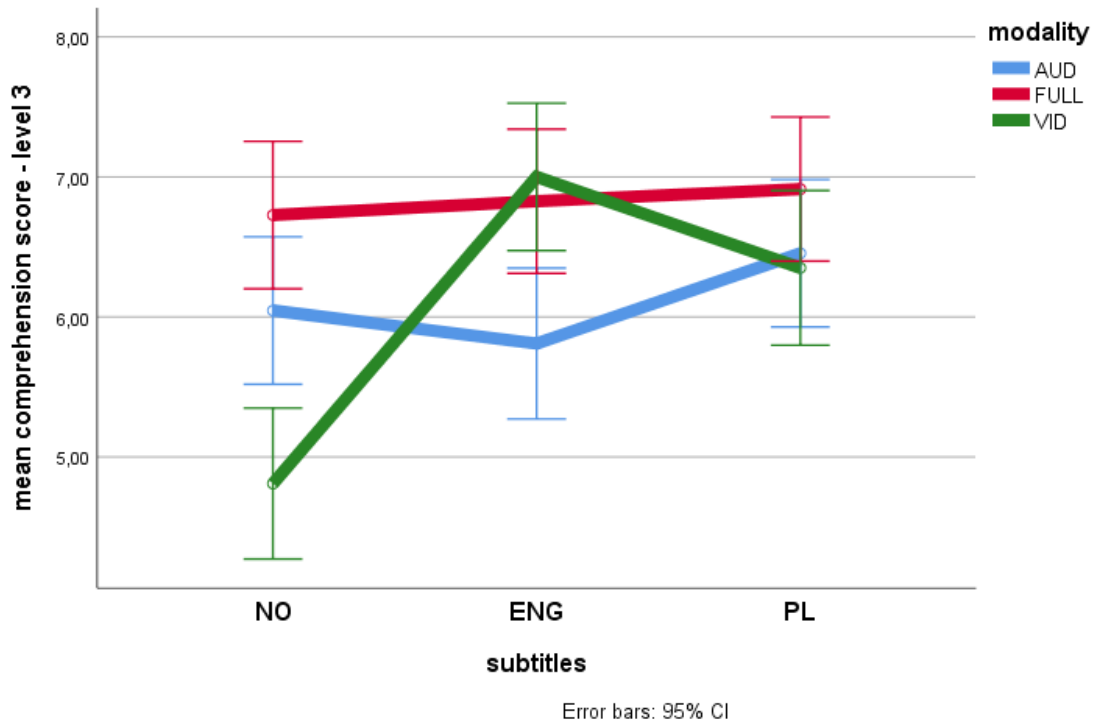


Fig. 5. Mean comprehension scores for level 3 broken by subtitles and modality.

Main effects analysis demonstrated the following :

- when watching the movie in the VID version, there was a significant difference between the no-subtitles and the English subtitles groups ( $F(2,195) = 6.138, p < 0.001$ ), as well as the no-subtitles group and the Polish subtitles group ( $F(2,195) = 6.138, p < 0.001$ )
- when watching the movie without subtitles, there was a statistically significant difference between the AUD and the VID groups ( $p < 0.001$ ) and the FULL and VID groups ( $F(2,195) = 6.138, p < 0.001$ ).
- when watching the movie with English subtitles, there was a significant difference between the AUD and the FULL groups ( $F(2,195) = 6.138, p = 0.008$ ), and the AUD and VID groups ( $F(2,195) = 6.138, p = 0.002$ ).

As for level 4, comprehension going beyond what is explicitly presented in the material, a two-way ANOVA showed that there was no statistically significant interaction be-

tween the effects of subtitles and modality on comprehension at level 4 ( $F(2,195) = 0.429$ ,  $p = 0.788$ ). The main effect for subtitles was statistically significant ( $F(2,195) = 4.873$ ,  $p = 0.009$ ). Pairwise comparisons HSD revealed that the Polish subtitles group significantly outperformed the no-subtitles group ( $F(2,195) = 4.873$ ,  $p = 0.006$ ), and the English subtitles group ( $F(2,195) = 4.873$ ,  $p = 0.009$ ). Fig. 6 below provides an illustration:

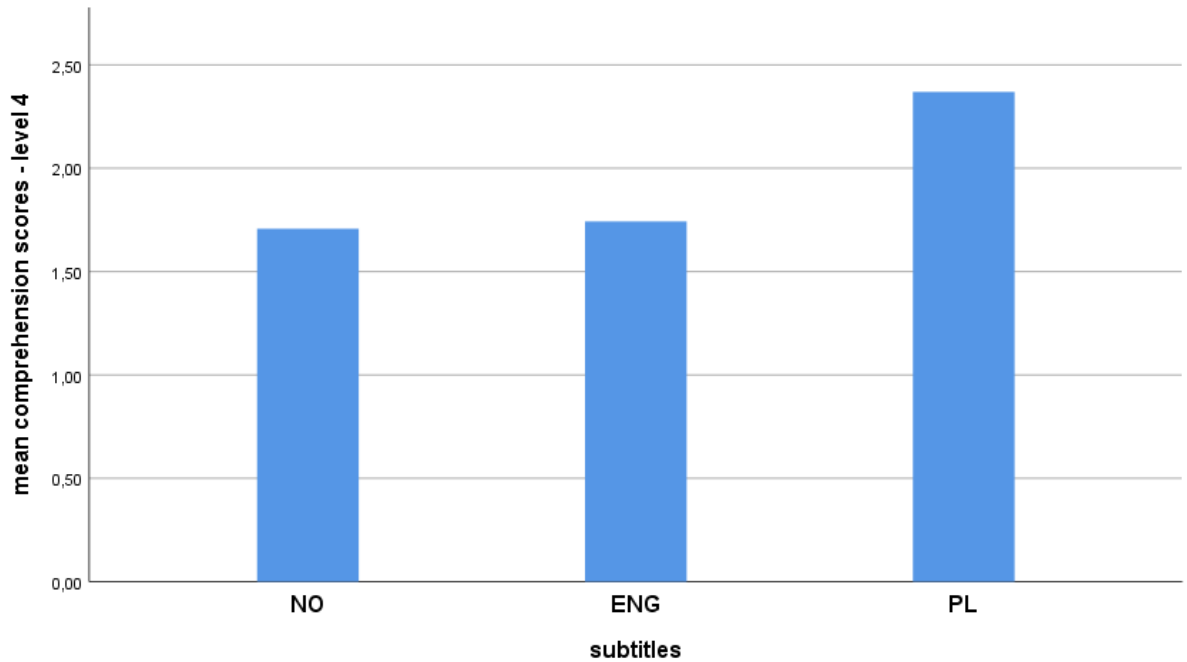


Fig. 6. Mean comprehension scores for level 4 broken by subtitles.

In addition, Pearson correlation coefficient was used to examine how strongly different levels of comprehension were correlated. It turned out that there were no strong correlations between different levels of comprehension, except for level 2 and level 3, which were found to be moderately correlated. Table 3 below shows the correlational matrix.

Table 3. Correlational matrix of different levels of comprehension.

	Level 1	Level 2	Level 3	Level 4
Level 1	-----	0.2	0.09	0.00
Level 2	-----	-----	0.56	0.10
Level 3	-----	-----	-----	0.06
Level 4	-----	-----	-----	-----

## 4.6.2. RQ2: The impact of subtitles and modality on cognitive load

### 4.6.2.1. Cognitive load as measured by Reaction Time (RT)

A two-way ANOVA was conducted to examine the effects of subtitles and modality on cognitive load (RT). There was no statistically significant interaction between the effects of subtitles and modality on cognitive load ( $F(2,195) = 1.251, p = 0.291$ ). The main effect for subtitles was statistically significant ( $F(2,195) = 5.584, p = 0.004$ ). Pairwise comparisons HSD revealed that Polish subtitles lowered cognitive load significantly more than English subtitles ( $F(2,195) = 5.584, p = 0.004$ ), and no subtitles ( $F(2,195) = 5.584, p = 0.049$ ). Fig. 7 provides an illustration:

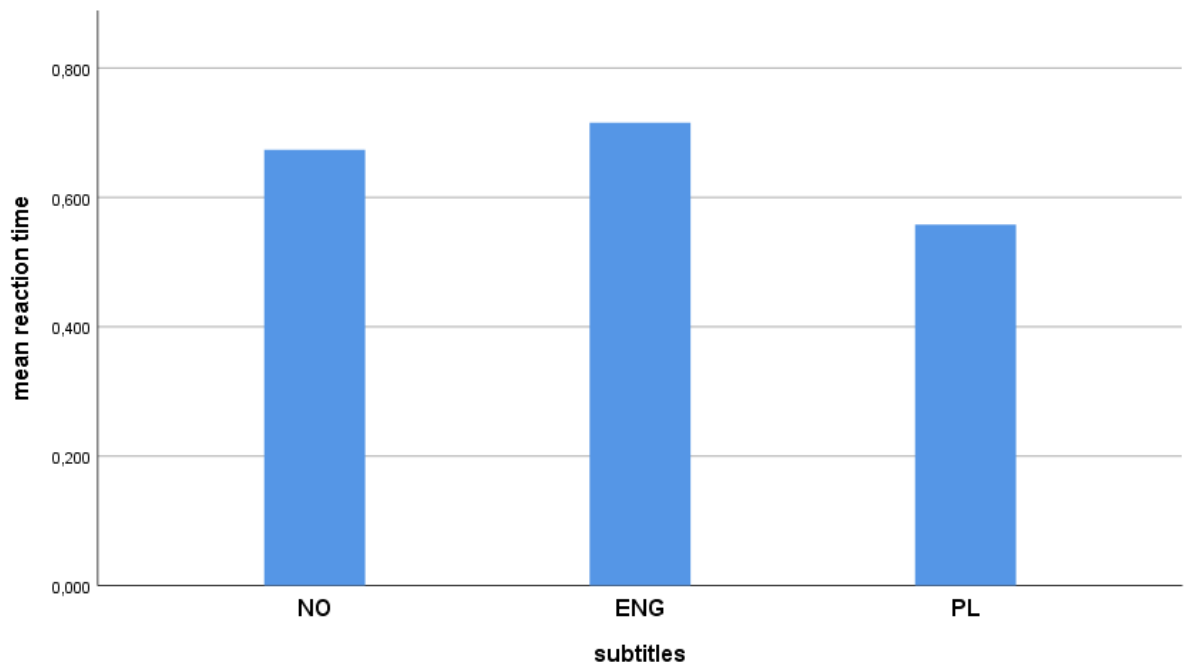


Fig. 7. Mean reaction time broken by subtitles.

### 4.6.2.2. Cognitive load as measured by self-reports

A two-way ANOVA was performed to determine the effect of subtitles and modality on cognitive load measured by self-reports. There was a statistically significant interaction between the effects of subtitles and modality on cognitive load ( $F(2,195) = 3.242$ ,  $p = 0.013$ ). The interaction shows that subtitles, regardless of their type, lower cognitive load but only in the VID modality. Fig. 8 below provides an illustration:

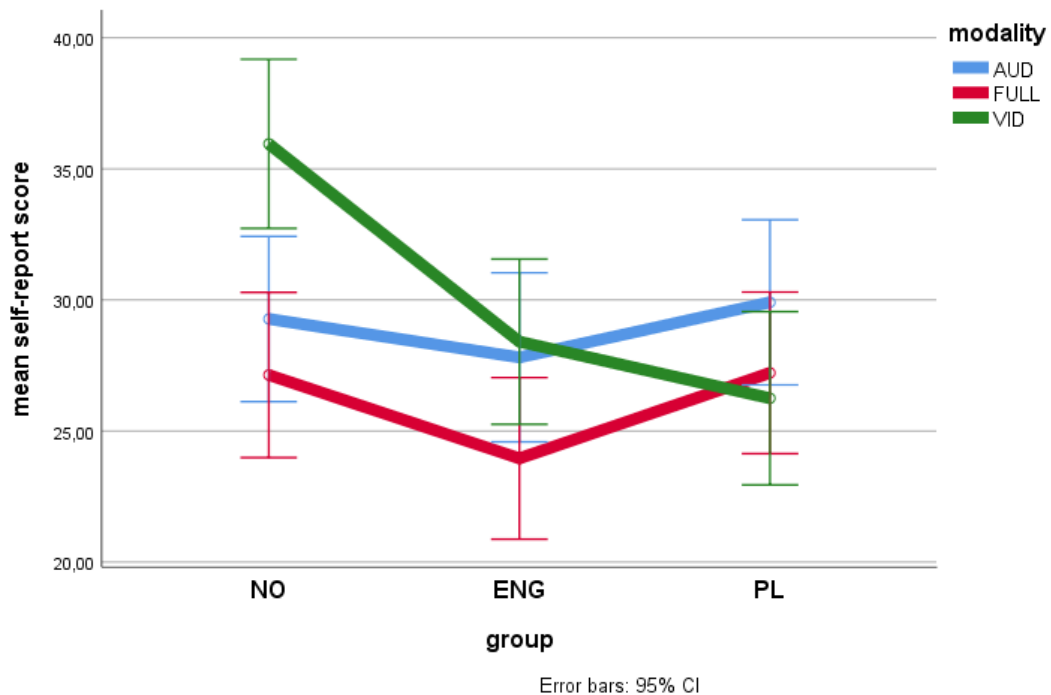


Fig. 8. Mean scores from self-reports broken by subtitles and modality.

Main effects analysis demonstrated the following:

- when watching the video in the VID version, the level of cognitive load was significantly higher without subtitles than with Polish subtitles ( $F(2,195) = 3.242$ ,  $p < 0.001$ ), and significantly higher without subtitles than with English subtitles ( $F(2,195) = 3.242$ ,  $p = 0.001$ )
- when watching the movie without subtitles, the level of cognitive load was significantly higher in the VID version than in the AUD version ( $F(2,195) = 3.242$ ,  $p = 0.004$ ), and significantly higher in the VID version than in the FULL version ( $F(2,195) = 3.242$ ,  $p < 0.001$ )
- when watching the movie with English subtitles, the level of cognitive load was significantly higher in the VID version than in the FULL version ( $F(2,195) = 3.242$ ,  $p = 0.048$ )

#### 4.6.2.3. RQ3: Germane cognitive load

A two-way ANOVA revealed that there was a statistically significant interaction between the effects of subtitles and modality on germane cognitive load ( $F(2,195) = 6.644$ ,  $p < 0.000$ ). The interaction shows that subtitles increase germane cognitive load, but only in the VID modality, while English subtitles result in higher germane load only in the FULL version. Fig. 9 below provides an illustration:

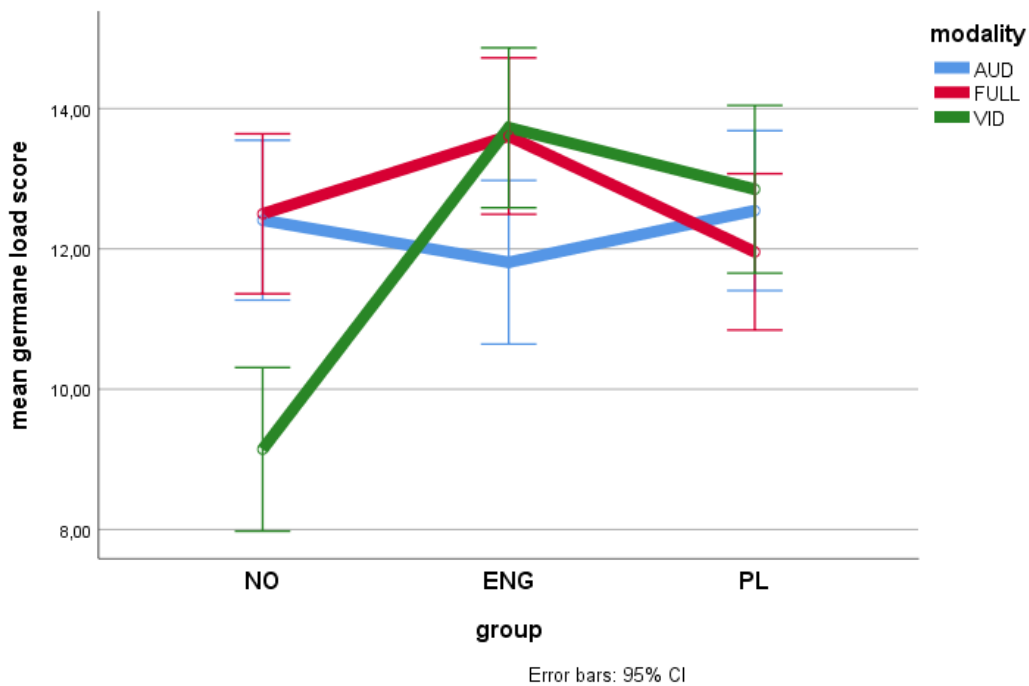


Fig. 9. Mean germane load scores broken by subtitles and modality.

Main effects analysis demonstrated the following:

- when watching the movie in the FULL version, there was a significant difference between the English-subtitles and the Polish-subtitles groups ( $F(2,195) = 6.644$ ,  $p = 0.040$ )
- when watching the movie in the VID version, a significant difference was found between the no-subtitles and the English subtitles groups ( $F(2,195) = 6.644$ ,  $p < 0.001$ ), and the no-subtitles and the Polish subtitles group ( $F(2,195) = 6.644$ ,  $p < 0.001$ )
- when watching the movie without subtitles, there were statistically significant differences between the AUD and the VID groups ( $F(2,195) = 6.644$ ,  $p < 0.001$ ), and the FULL and the VID groups ( $F(2,195) = 6.644$ ,  $p < 0.001$ )

- when watching the movie with English subtitles, a significant difference was found between the AUD and the VID groups ( $F(2,195) = 6.644, p = 0.021$ ), and the AUD and the FULL groups ( $F(2,195) = 6.644, p = 0.029$ )

### 4.6.3. RQ3: The impact of subtitles and modality on vocabulary acquisition

#### 4.6.3.1. Short-term acquisition

To address RQ3, which concerned the influence of subtitles and modality on short-term vocabulary gains, a two-way ANOVA was performed. The analysis revealed that there was no statistically significant interaction between the effects of subtitles and modality on short-term vocabulary gains ( $F(2,195) = 1.346, p = 0.255$ ). The main effect for subtitles was statistically significant ( $F(2,195) = 6.049, p = 0.003$ ). Pairwise comparisons HSD revealed that the English subtitles group had significantly more short-term gains than the no subtitles group ( $F(2,195) = 6.049, p = 0.003$ ). Fig. 10 below provides an illustration:

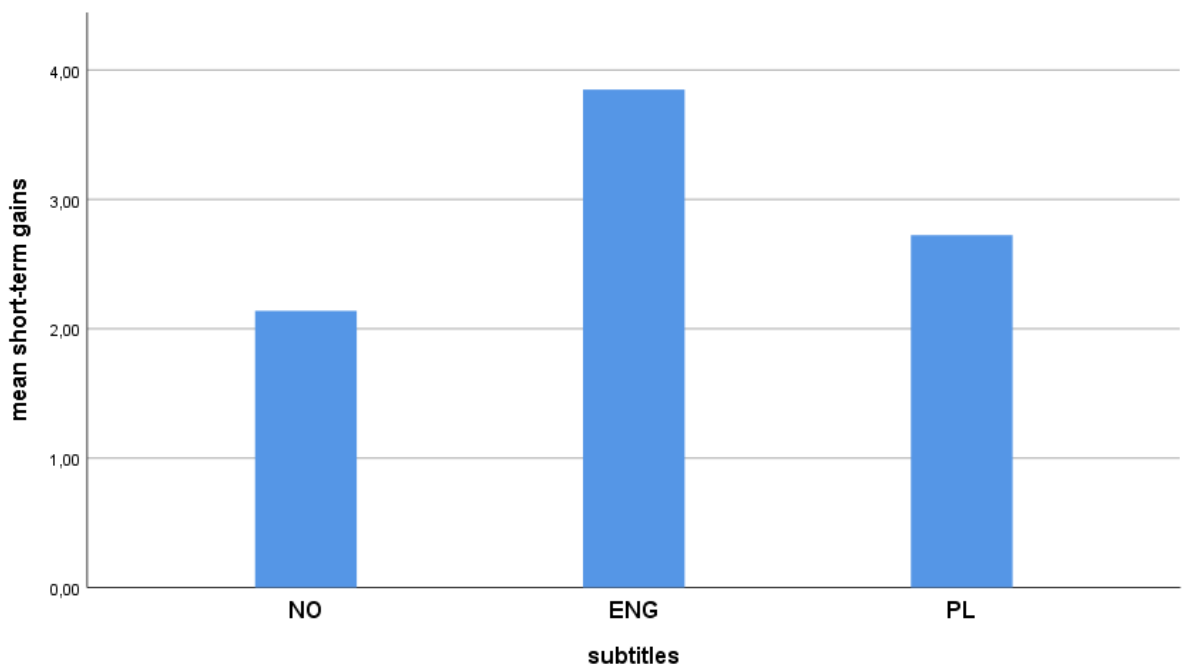


Fig. 10. Mean short-term gains broken by subtitles.

The main effect for modality was also significant ( $F(2,195) = 13.463, p < 0.001$ ). Pairwise comparisons HSD showed that the VID group had significantly smaller gains than the

FULL group ( $F(2,195) = 13.463, p < 0.001$ ), and the AUD group  $F(2,195) = 13.463, (p < 0.001)$ . Fig. 11 below provides an illustration:

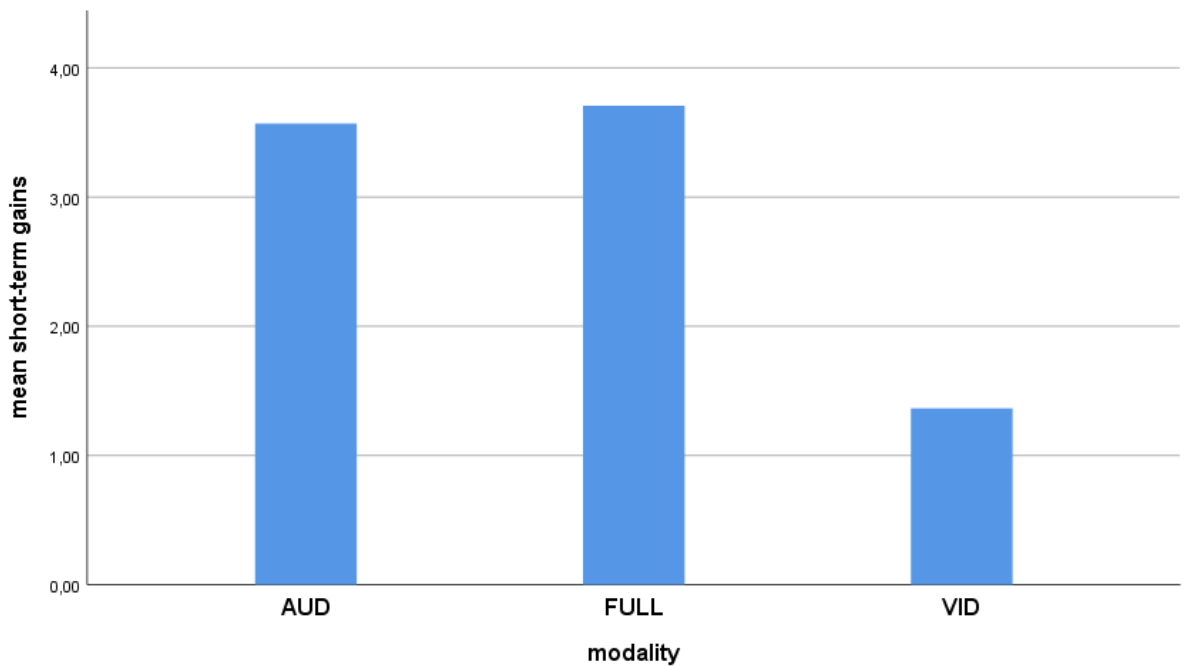


Fig. 11. Mean short-term gains broken by modality.

#### 4.6.3.2. Long-term acquisition

A two-way ANOVA was conducted to examine the effect of subtitles and modality on long-term vocabulary gains. The analysis showed that there was no statistically significant interaction between the effects of subtitles and modality on long-term vocabulary gains ( $F(2,195) = 0.486, p = 0.746$ ). The main effect for subtitles was statistically significant ( $F(2,195) = 18.214, p < 0.001$ ). Pairwise comparisons HSD indicated that the English subtitles group had significantly bigger gains than the Polish subtitles group ( $F(2,195) = 18.214, p = 0.001$ ), and the no-subtitles group ( $F(2,195) = 18.214, p < 0.001$ ). Fig. 12 below provides an illustration:

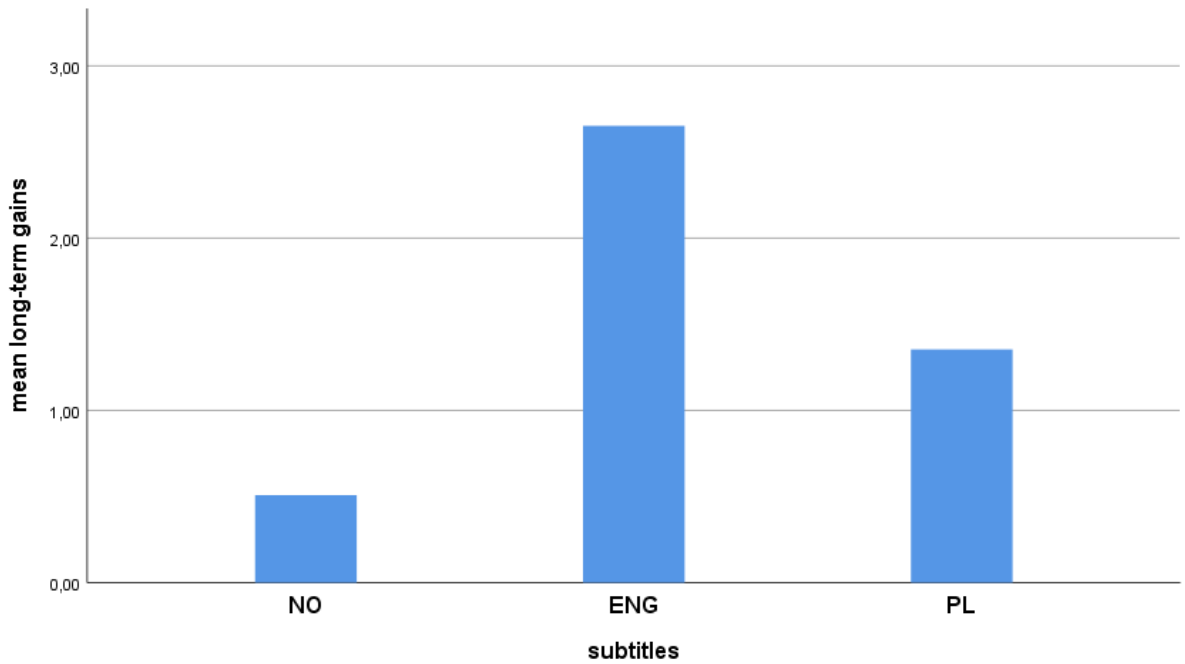


Fig. 12. Mean long-term gains broken by subtitles.

The main effect for modality was also statistically significant ( $F(2,195) = 8.533$ ,  $p < 0.001$ ). Pairwise comparisons HSD indicated that VID group had significantly smaller gains than the FULL group ( $F(2,195) = 8.533$ ,  $p < 0.001$ ), and the AUD group ( $F(2,195) = 8.533$ ,  $p = 0.012$ ). Fig. 13 below provides an illustration:

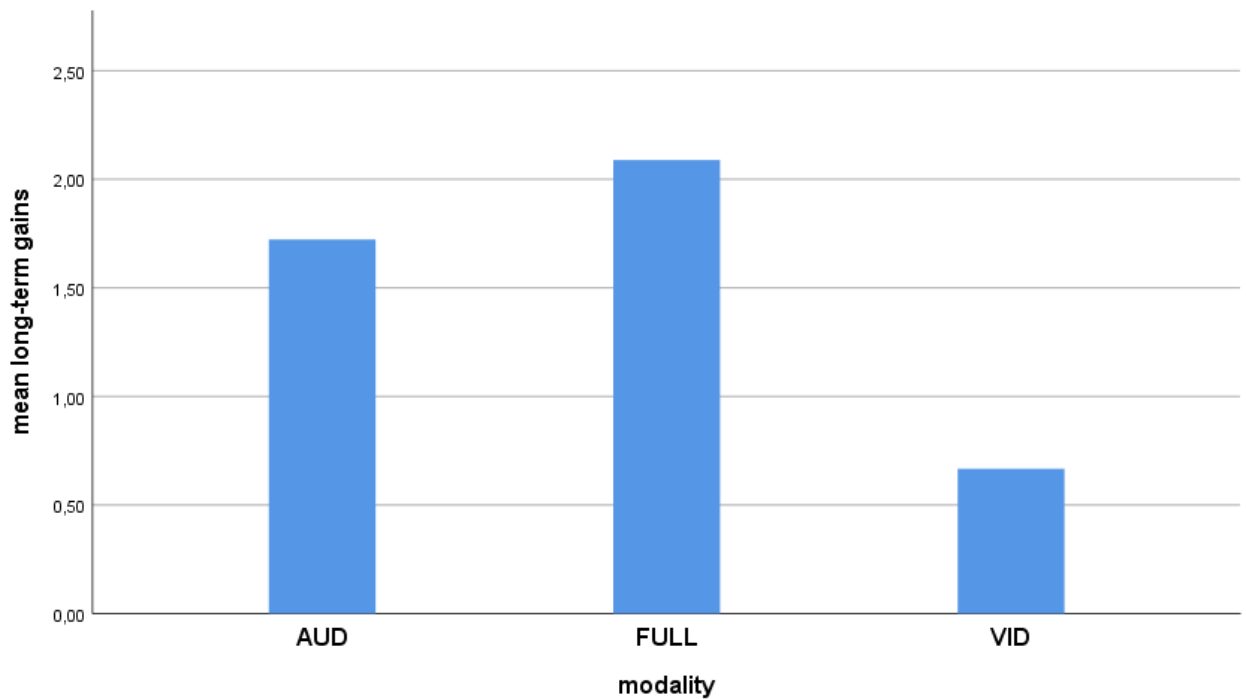


Fig. 13. Mean long-term gains broken by modality.

### 4.6.3.3. Vocabulary loss

A two-way ANOVA was run to determine the impact of subtitles and modality on vocabulary loss. The analysis showed that there was a statistically significant interaction between the effects of subtitles and modality on vocabulary loss ( $F(2,195) = 4.573, p = 0.002$ ). The interaction shows that English subtitles help retain newly acquired words, but only in the AUD modality, while in the FULL and VID version they will have no effect on vocabulary retention. Fig. 14 below provides an illustration:

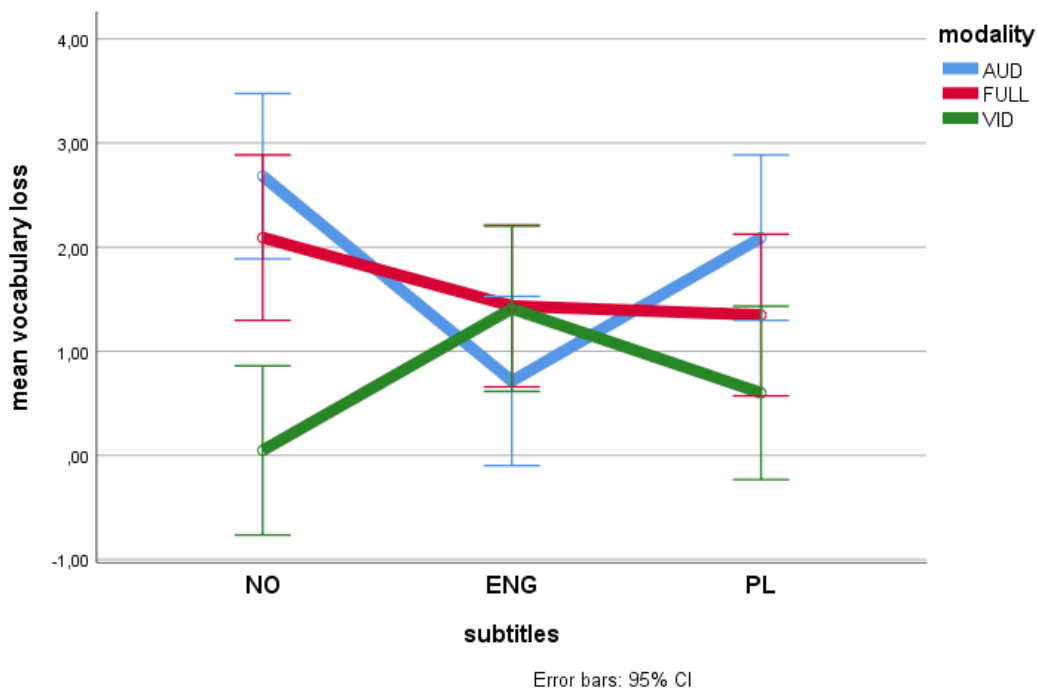


Fig. 14. Mean vocabulary loss broken by subtitles and modality.

Main effects analysis demonstrated the following:

- when watching the video in the AUD version, English subtitles contributed to a statistically lower vocabulary loss than no subtitles ( $F(2,195) = 4.573, p = 0.001$ ), and Polish subtitles ( $F(2,195) = 4.573, p = 0.018$ )
- when watching the video in the VID version, the absence of subtitles contributed to a significantly smaller vocabulary loss than English subtitles ( $F(2,195) = 4.573, p = 0.019$ )
- when watching the movie without subtitles, the VID version contributed to a significantly smaller vocabulary loss than the AUD version ( $F(2,195) = 4.573, p < 0.001$ ), and the FULL version ( $F(2,195) = 4.573, p < 0.001$ )

- when watching the video with Polish subtitles, the VID version contributed to a significantly smaller vocabulary loss than the AUD version ( $F(2,195) = 4.573$ ,  $p = 0.011$ )

#### 4.6.3.4. Vocabulary recognition

A two-way ANOVA was run to determine the effect of subtitles and modality on vocabulary recognition. The analysis showed that there was no significant interaction between subtitles and modality on vocabulary recognition ( $F(2,195) = 0.574$ ,  $p = 0.682$ ). The main effect for modality was statistically significant ( $F(2,195) = 3.126$ ,  $p = 0.046$ ). Pairwise comparisons HSD revealed that the VID group significantly outperformed the FULL group ( $F(2,195) = 3.126$ ,  $p = 0.014$ ). Fig. 15 below provides an illustration:

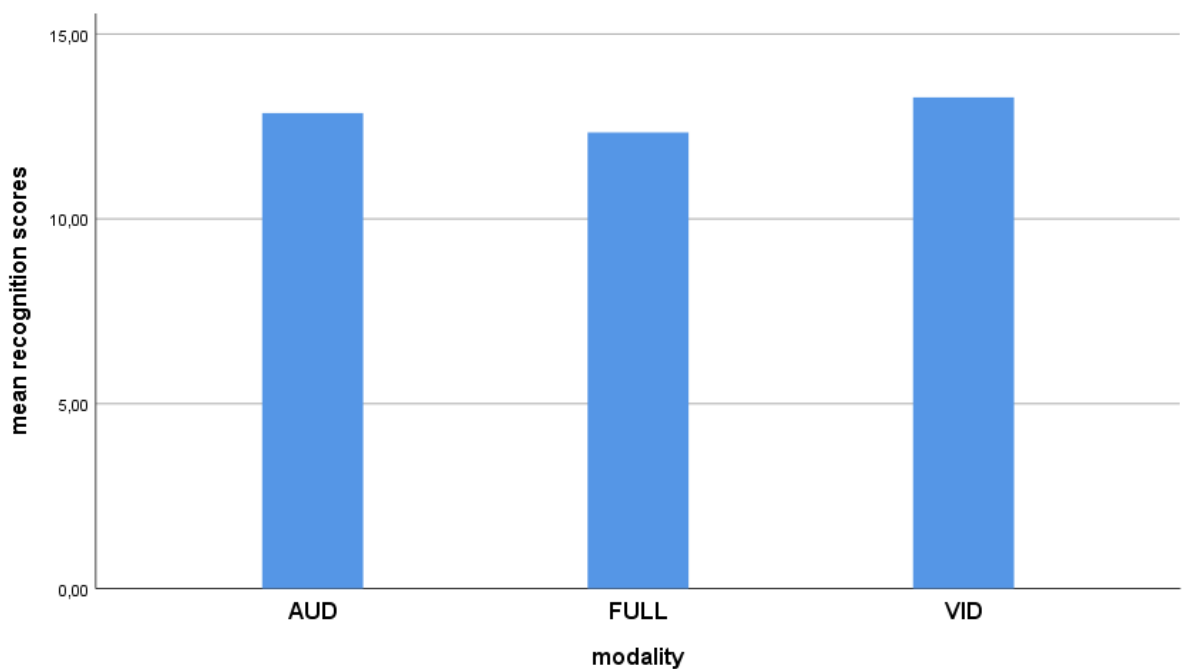


Fig. 15. Mean recognition scores broken by modality.

#### 4.6.4. RQ4: Factors predicting comprehension

A stepwise regression was employed to determine which factors contribute most to predicting the results of the comprehension test. The initial set of explanatory variables involved

the results of the self-report, RT, germane cognitive load, and short-term vocabulary gains, while comprehension was treated as a dependent variable in the regression model. The analysis revealed that the self-report, germane cognitive load, and short-term gains were significant predictors of comprehension; they accounted for approximately 25% of the variability of comprehension ( $R^2 = 0.255$ ). The inspection of the  $\beta$  weights and structure coefficients suggest that the level of cognitive load as measured by a self-report contributed most to the variability explained with the largest absolute value for both the  $\beta$  value and the structure coefficient ( $\beta = -0.336$ ,  $r_s = -0.44$ ,  $r_s^2 = 33\%$ ). As the  $\beta$  value is negative, comprehension is predicted by cognitive load adversely, that is, the higher the level of cognitive load as measured by self-report, the lower the comprehension score. The next significant predictor was short-term gains ( $\beta = 0.20$ ,  $r_s = 0.53$ ,  $r_s^2 = 28\%$  and  $\beta = 0.188$ ,  $r_s = 0.296$ ,  $r_s^2 = 20\%$ ), followed by germane cognitive load ( $\beta = 0.148$ ,  $r_s = 0.354$ ,  $r_s^2 = 15\%$ ).

#### **4.6.5. RQ5: Factors predicting vocabulary acquisition**

A stepwise regression was run to determine which factors account for vocabulary acquisition. When it comes to short-term gains as a dependent variable, the initial set of explanatory variables involved comprehension score, RT, self-report, and germane cognitive load. The analysis showed that only comprehension and germane load are significant predictors of short-term vocabulary gains, and they account for 12% of the variability of short-term gains ( $R^2 = 0.123$ ). The inspection of the  $\beta$  weights and structure coefficients suggests that comprehension contributed most to the variability explained with the largest absolute value for both the  $\beta$  value and the structure coefficient ( $\beta = 0.225$ ,  $r_s = 0.296$ ,  $r_s^2 = 22\%$ ), followed by germane cognitive load ( $\beta = 0.20$ ,  $r_s = 0.28$ ,  $r_s^2 = 20\%$ ). From this it can be inferred that the higher the comprehension score, the higher short term gains are. Similarly, short-term gains are positively predicted by the level of germane cognitive load.

When it comes to long-term vocabulary gains as a dependent variable, RT, self-report, germane load, and comprehension were initially entered into a stepwise regression as potential explanatory variables. No significant predictors of long-term vocabulary acquisition were found.

#### 4.6.6. RQ6: Factors predicting cognitive load

A stepwise regression was run to determine which factors account for cognitive load as measured by RT and a self-report. With regard to RT as a dependent variable, no significant predictors were found. However, when it comes to cognitive load measured by a self-report, the initial set of explanatory variables involved RT, germane cognitive load, short-term vocabulary gains, and comprehension. The best model found by the stepwise procedure included two significant predictors of cognitive load: comprehension and germane cognitive load, which account for c. 30% of the variability of cognitive load ( $R^2 = 0.298$ ). The inspection of the  $\beta$  weights and structure coefficients suggests that germane cognitive load contributed most to the variability explained with the largest absolute value for both the  $\beta$  value and the structure coefficient ( $\beta = -0.345$ ,  $r_s = -0.458$ ,  $r_s^2 = 36\%$ ), followed by comprehension ( $\beta = -0.318$ ,  $r_s = -0.440$ ,  $r_s^2 = 33\%$ ). Both germane load and comprehension predict cognitive load adversely.

Comprehension, short-term gains, self-report, and RT were also entered as potential explanatory variables of germane cognitive load. The stepwise procedure revealed that there were three significant predictors: comprehension, short-term gains, and a self-report, and that the predictors explain the dependent variable (germane load) in 26% ( $R^2 = 0.263$ ). The inspection of the  $\beta$  weights and structure coefficients suggest that a self-report contributed most to the variability explained with the largest absolute value for both the  $\beta$  value and the structure coefficient ( $\beta = -0.361$ ,  $r_s = -0.458$ ,  $r_s^2 = 35\%$ ), followed by short-term gains ( $\beta = 0.165$ ,  $r_s = 0.280$ ,  $r_s^2 = 18\%$ ) and comprehension ( $\beta = 0.146$ ,  $r_s = 0.354$ ,  $r_s^2 = 15\%$ ). While a self-report predicts germane load negatively, short-term gains and comprehension are positively correlated with the dependent variable.

## **Chapter 5: Discussion**

### **5.1. The impact of subtitles and modality on comprehension**

#### **5.1.1. Comprehension as a total score**

The results of the study corroborated the first hypothesis (H1 in RQ 1) since, in all modalities, the Polish subtitles group outperformed the no-subtitles group on the comprehension test. This is hardly surprising given that in previous research (e.g. Markham et al. 2001, Napikul et al. 2018, Baranowska 2020) L1 subtitles contributed most to comprehension; after all, learners, as native speakers, understand the subtitle language while with L2, even when they are quite proficient, they may come across words that they are not familiar with, which may sometimes substantially impair comprehension.

The presence of L1 subtitles did not distract the viewers from attending to the content of the video, and at the same time did not lead to cognitive overload. This is consistent with previous research in the field on the impact of subtitles on attention (e.g. Perego et al. 2010, Kruger et al. 2013), and Mayer's Cognitive Theory of Multimedia Learning (2009), which postulates that presenting information via visual and auditory channels simultaneously reinforces rather than hinders comprehension and learning. It has been argued that subtitles may result in the redundancy effect (Sweller et al. 2011) since a viewer can see the same words that are spoken. In the case of interlingual subtitling it is also possible to talk about the redundancy effect since viewers are exposed to translation equivalents of the spoken words, and this translation may be redundant as it conveys the same meaning as the audio input. In the present study, a reversed redundancy was found since subtitles were not

found to impede comprehension, which is in line with previous research in the field (e.g. Lin et al. 2016, Lång 2016). One possible explanation of this finding is that subtitles may be redundant only for advanced learners of English. In Lavaur and Bairstow's study (2011) for example, subtitles turned out to be useful only for beginners, while for advanced learners they were redundant as in the no-subtitles condition they obtained higher scores on the comprehension test than advanced learners in subtitled groups.

As for the differences between interlingual and intralingual subtitles, it was hypothesized that Polish subtitles would lead to greatest comprehension, and indeed it turned out that Polish subtitles resulted in significantly higher scores than the absence of subtitles. However, when no sound was available, in the VID condition, both English and Polish subtitles bolstered comprehension, but this can be due the fact that in this modality any subtitled condition delivered some language, which was always better than no language at all. Given that in the VID condition both L1 and L2 subtitles were more helpful for comprehension than no subtitles, and that the differences between Polish and English subtitles were not significant in all modalities, it may be tentatively concluded that subtitles, either L1 or L2, have a positive impact on comprehension, which was also found by Vulchanova et al. (2015). Most probably, this finding can be accounted for in terms of the participants' level of proficiency – while it comes as no surprise that L1 subtitles lead to greater comprehension, L2 subtitles could be challenging for less proficient learners as they may not compensate for the difficulty of the language used in a movie (e.g. Guillory 1998). For those learners who have just started learning a foreign language and for those who are already very advanced, intralingual subtitles may not aid comprehension as they are unnecessary. For beginners who do not know many words in the target language, seeing them written on screen may be of little use as they do not know these words anyway, so the problem does not lie in understanding the spoken text, but in vocabulary knowledge in general. For advanced learners, on the other hand, L2 subtitles are redundant because such learners have developed listening comprehension skills, and understanding spoken words is not a problem. As in the present study the participants were upper-intermediate learners of English, it is hardly surprising that L2 subtitles were found to aid comprehension even if not significantly more than the absence of subtitles in the AUD and FULL versions. The participants were neither too advanced to find subtitles redundant, nor were they beginners for whom subtitles would be useless since they already possessed substantial knowledge of foreign language vocabulary, thus they found L2 subtitles to be of help rather than hindrance.

When it comes to the impact of modality on comprehension, the second hypothesis (H2 in RQ 1) was confirmed in that the participants who watched the video in the FULL or AUD version outperformed the students from the VID condition, however, only when no-subtitles were available. In the Polish and English subtitles groups, the differences between the three modality groups did not reach the level of statistical significance. The findings somewhat challenge the Dual Coding Theory in that, contrary to the DCT assumptions, the audiovisual format of the video clip did not lead to greater comprehension than the audio only format since there were no significant differences between the FULL and the AUD condition. Thus, while the video and audio format bolsters comprehension, the audio-only format is not inferior, which leads to the conclusion that on-screen visuals and non-verbal communication are not as crucial to comprehension as the spoken language. These findings are similar to those of Baltova (1994) or Londe (2009), who also did not confirm the superiority of dual modality input over single modality presentation.

Although the VID groups received significantly lower comprehension scores than the FULL and AUD groups when no subtitles were available, they still managed to earn some points, which means that non-verbal communication does play a role in communication. The participants from the VID group in the no-subtitles condition were completely deprived of the language, but they received on average 17.05 points on the test, while the FULL group received 24.27 points. Sueyoshi and Hardison (2005) explored the role of gestures and facial expression in comprehension of a videotaped lecture. The participants of the study were low intermediate and advanced ESL learners. They were divided into three experimental groups: one watched the lecture with audio, video and gestures with facial cues (AV-gesture-face), one with audio, video and facial cues (AV-face), and one only with audio (A-only). The results show that the presence of the visual channel, be it with gestures or without them, facilitated listening comprehension as evidenced by a multiple-choice test administered after the viewing session. There was, however, a difference in the effectiveness of particular conditions between the two levels of proficiency: while the advanced learners benefited most from the AV-face condition, in the case of the low-intermediate learners it was the AV-gesture-face that turned out to be most beneficial for comprehension. Overall, the results indicate that the presence of the visual channel positively affects comprehension of a FL learning material. The results of the current study corroborate the findings from Sueyoshi and Hardison's study (2005) in that they also testify to the importance of using non-verbal cues for comprehension. Even if video only is not enough to

understand the content of a movie, it can allow viewers to infer the meanings of some unfamiliar words, and, as the results demonstrate, understand the gist of the movie content.

The significant differences between the three modalities were found only in the no-subtitles condition. When subtitles were added (either Polish or English), it did not matter whether the participants heard the dialogues or saw the on-screen visuals. Thus, subtitles compensated for the absence of video or audio, which means that modality in which students view FL movies does not determine the level of comprehension as much as the availability of subtitles.

### **5.1.2. Comprehension measured at separate levels**

Interesting findings emerged also from the analysis of each level of comprehension. First of all, no significant interactions between subtitles and modality and comprehension were found at level 1 and level 4, that is the level of most shallow and deepest comprehension. However, at level 2 and level 3, the interaction was significant and it revealed that, similarly to the findings from the total comprehension score, in the VID condition subtitles, either L1 or L2, resulted in better comprehension than the absence of subtitles. Hence, the findings dispel the fear that subtitles cause viewers to skip on-screen visuals (Szarkowska et al. 2011), since level 2 and level 3 test also scene recognition and, since the participants scored high on these levels, the subtitles did not interfere with attending to the scenes. Interestingly, at level 2, English subtitles led to significantly better comprehension than the absence of subtitles, which stands in contrast to the findings from the previous section which took into account the total score from the comprehension test. Although there were no significant differences between L1 and L2 subtitles at level 2, it is the L2 subtitles that led to significantly better comprehension than no subtitles. Thus, it can be inferred that L2 subtitles are most effective when it comes to the understanding of detailed information. As mentioned above, at the level of deepest comprehension, level 4, there was no significant interaction between subtitles and modality, but the main effect for subtitles was significant and it showed that L1 subtitles increased comprehension significantly more than L2 subtitles and no subtitles. Hence, the beneficial impact of interlingual subtitles on comprehension was once again corroborated.

As for modality, at level 1, the main effect for modality was significant and it demonstrated that the AUD group significantly outperformed the FULL and the VID groups. This is in line with previous studies on multimodality (e.g. Pusey and Lenz 2014) which challenge the assumption of the Dual Coding Theory in that single modality input turns out to be more effective than dual modality input. At level 2 and 3, the interaction between subtitles and modality was significant and it showed that the FULL and the AUD groups outperformed the VID group when no subtitles were available. There were no significant differences between the FULL and the AUD condition, which again challenges the Dual Coding Theory and previous research in the field (e.g. Beagles-Roos and Gat 1983, Safarali and Hamidi 2012). Nevertheless, audiovisual materials turned out to be most beneficial for learners since when no subtitles were available, at level 2 and level 3 of comprehension, the FULL group obtained the highest scores. At level 3, the interaction between subtitles and modality was significant and it indicated that the VID group obtained the highest score when English subtitles were available. There were no significant differences between the VID and the FULL group, but both groups scored significantly higher than the AUD group, which further corroborates the ineffectiveness of dual modality input –in the VID ENG group the participants received the input only via the visual channel and still significantly outperformed the AUD ENG group which received input via the visual (subtitles) and the verbal channel (audio).

Finally, Pearson Correlation Coefficient demonstrated that the four levels of comprehension were not strongly correlated, which points to the necessity of investigating each level separately. Also, the weak correlation indicates that if a test on comprehension is to be valid, it should contain higher-level comprehension questions since the understanding of words and explicit information (level 1) does not mean that a student has completely understood the content of the video. Even though terminology may differ, in previous literature researchers discussed different “levels” of comprehension. However, since each “level” includes different competences, the levels used in the current study do not represent an underlying taxonomic relation where one “level” of comprehension is needed to move to the next. Instead, these are different dimensions of comprehension which are not strongly correlated with each other, and which denote different aspects of understanding. This is in line with Klausmeier’s (1976) view of “taxonomy” in which taxonomy is just a classification system consisting of independent categories, rather than with Bloom’s (1956) understand-

ing of taxonomy which assumes a hierarchy of levels that increase in complexity and in which the mastery of lower-order skills is required for the mastery of higher-order skills.

## **5.2. The impact of subtitles and modality on cognitive load**

Subtitles were hypothesized to decrease, while the absence of subtitles to increase the level of cognitive load (H1 in RQ 2), and the results of the study corroborated these predictions. The subjective measurement of CL, a self-report, showed that when no sound was available (the VID version), subtitles, either Polish or English, led to significantly lower cognitive load than the absence of subtitles. The analysis of germane load also shows that subtitles were beneficial in terms of increasing cognitive resources available for processing the learning material – while in the FULL version, English subtitles turned out to be more effective than Polish subtitles, in the VID version both English and Polish subtitles increased germane cognitive load significantly more than the absence of subtitles.

Further, the results corroborate the second hypothesis (H2 in RQ 2) in that they indicate that L1 subtitles lower cognitive load the most, and thus are most beneficial for learners. This is evidenced by the objective measurement of cognitive load, reaction time, since the main effect for subtitles was significant and it revealed that Polish subtitles lowered cognitive load significantly more than English subtitles and the absence of subtitles.

As for modality, the results of self-reports demonstrated that when no subtitles were available, video only resulted in higher cognitive load than audio only and audiovisual material. When English subtitles were available, the participants reported having experienced a significantly higher load in the VID version than in the FULL version. The amount of germane load reported is similarly correlated with modalities – video resulted in significantly lower germane load than the FULL and AUD modalities. This can be attributed to the fact that the VID group did not have access to language in any form (neither written nor spoken), and this is why they had to put a lot of mental effort to comprehend anything from non-verbal communication and on-screen visuals. However, when English subtitles were added, the AUD group reported the lowest germane load. Hence, one general finding is that video alone has the tendency to overload students' cognitive system. However, subtitles, especially L2 subtitles, may overcome this negative effect and make videos with subtitles more effective than audio with subtitles in terms of the cognitive load experienced.

Of particular interest is the fact that there were no significant differences between the AUD and FULL groups, and that germane load was highest in the FULL group. This means that adding on-screen visuals neither significantly increased cognitive load nor decreased germane load, which corroborates the third hypothesis (H3 in RQ 2). However, when English subtitles were added, the audio with subtitles group (no video) reported significantly lower germane load than the video with subtitles group (no sound), which appears to challenge the Dual Coding Theory since dual modality input turned out to decrease positive load more than single modality input.

What needs to be acknowledged is the fact that neither modality alone nor the interaction of modality and subtitles had a differential impact on RT. While the participants reported a different level of cognitive load experienced via self-reports, the objective measurement did not indicate any significant differences between the modalities. Thus, modality does not play a crucial role in lowering cognitive load while watching FL videos, but viewers may nonetheless “feel the difference” so that they think it is easier to watch a video with sound and picture rather than with video alone. This is why the results of self-reports should by no means be neglected since learners should be exposed to materials that are in their opinion less overwhelming, which can in turn increase motivation.

Overall, subtitles can be credited with lowering cognitive load and increasing the amount of cognitive resources available for processing information (germane load), which was also found in previous research in the field (e.g. Kruger et al. 2013, Kruger and Steyn 2013). Hence, in order to reduce extraneous cognitive load induced by a FL movie, teachers can resort to subtitles. Moreover, the results point to the effectiveness of using L1 subtitles for lowering cognitive load since the participants who had access to Polish subtitles experienced significantly lower cognitive load than the no-subtitles and English-subtitles groups. This is in line with the findings of my previous study (Baranowska 2020), in which the Polish subtitles group experienced significantly lower cognitive load than the no-subtitles group while watching a video with picture and sound. When it comes to modality, when no subtitles are available, there is no significant difference between audiovisual and audio-only materials. Therefore, all the concerns about overloading students’ cognitive capacity with the use of audiovisual materials seem to be unsubstantiated, especially given that the FULL group reported the highest germane load, thus they felt that this condition was most beneficial and “student-friendly”. In addition, when subtitles were available, dual modality input proved to lower cognitive load more than single modality input since the FULL ENG

group reported a significantly lower load than the VID ENG group which received input only via the visual channel (no soundtrack).

### **5.3. The impact of subtitles and modality on vocabulary acquisition**

It was hypothesized that English subtitles would contribute to biggest short-term gains and vocabulary acquisition in terms of recognition, while Polish subtitles would lead to greatest gains in terms of long-term acquisition. The analysis showed that the interaction between subtitles and modality was not significant in terms of short and long-term gains, but the main effects for subtitles was and it revealed that L2 subtitles led to greatest acquisition when it comes to short as well as long term memory, which partially confirms the first hypothesis (H1 in RQ 3). Moreover, English subtitles led to a smaller vocabulary loss than Polish subtitles and the absence of subtitles when the clip was available in the AUD version. While the superiority of L2 subtitles in vocabulary learning is consistent with previous research in the field (e.g. Mitterer and McQueen 2009, Zarei 2009, Frumuselu et al. 2015, Baranowska 2020), it should be noted that L1 subtitles resulted in bigger gains than no-subtitles, even though the difference did not reach the level of statistical significance. Moreover, in terms of short-term gains, the difference between English and Polish subtitles was not significant. This finding corroborates the beneficial impact of subtitles on vocabulary acquisition since subtitles did not distract the viewers, but rather facilitated spoken language recognition. L2 subtitles helped the viewers notice and identify words they were heard in the speech stream, and which would have been most probably lost (Vanderplank 1988) given that the film used as an experimental video was authentic rather than specifically tailored for students, so the participants could find it challenging to keep up with the pace to identify the spoken words. The administration of the delayed post-test ensured the validity of the results since only by measuring long-term gains can we say how effective a given treatment was (Hulstijn 2003). As the results demonstrate, the learners benefited from L2 subtitles in terms of short and long-term gains, which means that the first hypothesis was partially confirmed. Contrary to what was hypothesized, however, L2 subtitles helped in retention of the newly acquired words more than L1 subtitles, and this is why intralingual subtitling should be a preferred subtitling mode if the objective is incidental vocabulary learning.

When it comes to recognition, no subtitling condition significantly contributed to higher scores on the recognition test, thus, mere exposure to FL movies regardless of the subtitling mode improves the ability to recognize new words. A similar finding emerged from Scheffler and Baranowska's study (In press) on learning pronunciation through TV series – while there was a differential effect of subtitles on production, no significant differences were found between different subtitling conditions (Polish, English, no subtitles) on recognition of the newly acquired words. Even though the study concerned the acquisition of the correct pronunciation of unfamiliar words, not their meaning, it nevertheless shows that learners benefit from mere exposure to videos regardless of the subtitling condition. This is probably due to the fact that recognition is just the first stage of acquiring a new word, so it does not entail a lot of effort and attention as opposed to productive vocabulary knowledge. There is, therefore, no need for extra help in the form of subtitles to gain receptive knowledge of new words either in terms of their pronunciation or meaning.

As for modality, the second hypothesis (H2 in RQ 3) was refuted as there were no significant differences between the FULL and the AUD groups in their impact on short-term and long-term vocabulary acquisition as well as vocabulary loss. It can be, therefore, inferred that the presence of the visuals (picture) does not facilitate vocabulary learning. The results of a two-way ANOVA for vocabulary loss show that single modality input leads to better retention of the newly acquired words than dual modality input since the VID PL group (no sound, Polish subtitles) had a smaller vocabulary loss than the AUD PL group (no picture, Polish subtitles). However, these results are misleading since the VID PL group did not basically learn any new words as having seen the on-screen visuals and reading subtitles in their L1, they were not exposed to English at all. Therefore, they did not lose any words because they did not learn any.

To conclude, subtitles, especially FL subtitles, assist in incidental foreign language learning in that they lead to short and long-term acquisition of new words more than the absence of subtitles. However, even watching a movie without subtitles brings some benefits as viewers are able to at least recognize the form of new words, which is the first step in vocabulary acquisition. While exposure to audiovisual materials may seem to be distracting for learners since they have to pay attention to on screen visuals and audio simultaneously, it turns out that cutting out the visuals does not significantly exacerbate incidental learning of new words, thus following what is happening on screen does not prevent viewers from paying attention to the spoken language.

#### 5.4. Predictor variables

To help learners benefit more from FL movies it is worth analyzing factors that may predict comprehension, cognitive load, or vocabulary acquisition. The analysis revealed that around 25% of comprehension can be predicted by the level of reported cognitive load, germane load, and short-term gains. Thus, in order to facilitate comprehension, teachers should aim to lower cognitive load as it is negatively correlated with comprehension, and probably pre-teach some unfamiliar vocabulary items so that the vocabulary gains are more substantial, which will lead to greater comprehension. This finding is hardly surprising given that when cognitive load is lower, more cognitive resources are available for dealing with processing information, in this case understanding the content of a movie. Moreover, comprehension is impaired if vocabulary knowledge is impoverished, thus the more words learners know, to more likely they are to understand the dialogues.

When it comes to vocabulary acquisition, short-term gains are predicted by comprehension and germane cognitive load, but in only around 12%. Thus, in order to incidentally learn some new words from a FL movie, learners need to understand its content, and the better they do, the more likely they are to acquire new words. It looks like comprehension and vocabulary acquisition are dependent on each other – the more learners understand, the more words they learn and vice versa, the more words they learn, the more they understand from a movie. A possible explanation is that when exposed to a video containing unfamiliar words, learners need to use strategies to infer the meaning of some words, thus in an attempt to comprehend the movie, they learn the meanings of new words. The more words they successfully manage to infer the meanings of, the more they understand. As for long-term vocabulary acquisition, no significant predictors were found. Thus, neither cognitive load nor comprehension played a significant role in the retention of newly acquired words. Long-term vocabulary acquisition must be, therefore, dependent on other external factors, possibly, on conscious practice of the newly acquired words after the immediate and before the delayed post (Hulstijn 2003: 364).

As for intrinsic and extraneous cognitive load, the analysis revealed that it can be predicted in around 30% by comprehension and germane cognitive load. As mentioned above, cognitive load is a significant predictor of comprehension, which means that the more challenging a given material is, the lower we will understand from it. At the same time, comprehension was found to be a significant predictor of cognitive load, which

means that the more we understand, the lower the experienced cognitive load is. When it comes to germane load, in line with literature (e.g. Sweller et al. 2011), it is negatively correlated with cognitive load. Hence, the more challenging a task is, the fewer resources are left for cognitive processing that takes place while attending to a learning material. The analysis shows that comprehension, short-term vocabulary gains, and cognitive load can predict the amount of germane load in around 26%. Therefore, greater comprehension and vocabulary acquisition increase “the good load”, which means that these tasks entail some effort, but this is the effort essential to learning which does not overburden the working memory capacity.

### **5.5. General discussion and practical implications**

The above findings spawn numerous practical implications for foreign language educators. First of all, if the major objective is comprehension, teachers should not refrain from using videos with subtitles (either L1 or L2) at the upper-intermediate level of proficiency for fear of overloading students’ working memory. As the results of the present study show, subtitles aid comprehension that goes beyond just shallow processing of information explicitly stated in the text, but involves deeper levels of processing. When subtitles were added, the differences between different modalities disappeared, which means that subtitles are more useful to students in terms of comprehension than audio or video presentations.

Although no significant differences were found between Polish and English subtitles, it can be inferred that L1 subtitles bolster comprehension the most since Polish subtitles improved comprehension significantly more than the absence of subtitles, while English subtitles, though contributed to greater comprehension than the absence of subtitles, did not differ significantly from the no-subtitles condition. L1 subtitles may result in deeper processing since they create an “elaborate set of memory traces” (Hummel 2010: 64), which may lead to better comprehension. This is why, when the main objective is comprehension, audiovisual materials should be supplied with subtitles, preferably L1 subtitles.

Audiovisual materials, such as foreign-language movies, are understood by learners more than the same material presented in the video-only format, or the audio-only format. Interestingly, no significant differences were found between the FULL and the AUD format, which challenges the Dual Coding Theory by showing that picture is not crucial for

comprehension. However, it should be noted that those participants who were exposed to the video only, with no sound or subtitles, still managed to understand the content of the video to some extent.

Further, teachers should consider different levels of comprehension of a given learning material. In the case of FL videos, it may not be enough to test students' comprehension by means of a simple set of questions asking about information that was explicitly stated in the video. Since different levels of comprehension are not correlated, the fact that a student understood detailed information does not mean that they can successfully integrate information from various parts of a movie, or to draw proper conclusions. This lends support to creating more detailed comprehension tests tapping into different levels of comprehension. Tests aiming at the first level of comprehension are severely impoverished, though they can be useful if the objective is just literal comprehension of the learning material. However, tests aiming at deeper levels of comprehension allow students to delve into the content of the learning material since addressing these deeper levels is like "diving down into its depths" (King 2007: 267). By using such higher level questions, teachers make sure that their students fully understood the assigned material, and with time, it may lead to developing comprehension skills, as was the case in Taylor et al.'s study (2002), in which the use of higher level questions by teachers turned out to be positively correlated with students' reading ability.

Overall, in line with previous research in the field, subtitles were found to be beneficial for FL learners in terms of comprehension, especially at deeper levels (level 2 and 3). At the same time, they did not result in cognitive overload and increased germane load essential for better processing of the presented information. Even though no significant differences were found between L1 and L2 subtitles, interlingual subtitles enhanced comprehension the most and allowed for the deepest processing of the information from the movie (level 4) without much mental effort. Intralingual subtitles, on the other hand, assisted learners with incidental vocabulary learning in terms of short and long-term retention, which confirms the hypothesis about the impact of subtitles on vocabulary acquisition.

When it comes to modality, one of the most interesting findings is that overall, there were no significant differences between the impact of the FULL and the AUD versions of the movie on comprehension, cognitive load, and vocabulary acquisition. Thus, on screen visuals neither result in cognitive overload nor facilitate comprehension or learning more than the audio track only. This challenges the dual channel assumption of the Dual Coding

Theory which says that information delivered by two different channels, visual and verbal, is more effective than single modality input. At the same time, processing dual modality input did not come at the expense of comprehension or learning, so exposure to audiovisual materials does not overload our cognitive system. Hence, in the present study, both dual and single modality input turned out to be almost equally effective.

As the correlations between cognitive load and vocabulary acquisition, as well as cognitive load and comprehension were weak, it can be inferred that a low level of cognitive load does not necessarily go hand in hand with better comprehension or vocabulary acquisition. A certain amount of mental effort is therefore required to understand something from a FL movie, but, since no positive correlation was found as well, putting too much effort may lead to cognitive overload, which in turn impedes learning and comprehension.

In general, the use of subtitles is highly recommended in the EFL context for upper-intermediate learners of English. If subtitles are not available, it should be borne in mind that traditional mp3 listening materials are not inferior to audiovisual materials, thus while presenting information via different channels is indeed effective, it is not significantly better than presenting information via the verbal channel only. What is more, teachers should strive to lower extraneous cognitive load and increase germane load as it facilitates comprehension and learning, however, a low level of cognitive load does not guarantee learning outcomes. If cognitive load is very low, the learning material may be simply too easy for learners, and they may not benefit from it either.

## **5.6. Limitations of the study and implications for further research**

One of the limitations of the current study is the fact that it focused on incidental vocabulary learning. Incidental learning is a by-product of engaging in other activities, for example, watching a movie for entertainment, thus it does not involve conscious effort. Since the learning objective is “hidden” from students, they learn the target language in a more relaxed atmosphere, watching a movie for pleasure, not in order to learn something, which undeniably fuels motivation towards learning in general. As nowadays students frequently watch FL movies and video clips in their free time, investigating how much they can benefit from this activity is an important goal of current research. However, videos are also used in classrooms where teachers make use of videos for explicit language practice (e.g. Herre-

ro and Vanderschelden 2019). Hence, it would be interesting to compare comprehension, vocabulary acquisition, and cognitive load in the case of exposure to FL movies in formal and informal contexts.

Moreover, in the present research, the participants watched the video only once. For more substantial learning outcomes, numerous encounters with new words are required (Saragi et al. 1978, Huckin and Coady 1999, Waring and Nation 2004). While investigating the effects of short term exposure to FL videos on comprehension and learning is important as it shows how much learners can benefit from accidental, one-off exposure to FL movies, further research should also examine the effects of long-term exposure to FL video materials and take into account other components of proficiency, not only vocabulary, but also grammar or pronunciation to see how overall language proficiency evolves through the use of FL movies for learning a foreign language.

The results of the study are relevant only for B1+/B2 Polish learners of English. It would be interesting to compare the impact of subtitles and modality on vocabulary learning, cognitive load, and comprehension with learners at lower and higher levels of proficiency and from different L1 backgrounds. As has been argued, subtitles may be redundant for comprehension for very advanced learners (Lavour and Bairstow 2011) as well as beginners (Guillory 1998), but further research is needed to verify this claim. Moreover, to generalize the research findings on the effectiveness of L1 and L2 subtitles, further research should examine learners with different L1s learning foreign languages other than English.

## Conclusion

Since foreign language learners these days frequently engage in watching FL movies for entertainment, there has been an upsurge of experimental studies that aim to determine which viewing conditions, with or without subtitles, with L1 or L2 subtitles, or which modality conditions (dual modality or single modality input) are most beneficial for learners.

The results of the current study corroborate the positive impact of viewing FL videos on language learning. In line with previous research in the field, foreign language subtitles were found to assist in vocabulary learning the most, while native language subtitles were most effective for helping with comprehension. Most importantly, subtitles, neither L1 nor L2, did not overload working memory capacity, which clearly indicates that rather than being an unnecessary distractor, they reinforce learning and comprehension without straining our cognitive system. Moreover, the results of the study point that audiovisual materials do not lead to cognitive overload, thus viewers can effectively process information presented via different channels.

Investigating the role of exposure to FL movies in the process of FL learning is a wide-ranging subject given how many factors come into play: proficiency, learners' native language and their age, to enumerate but a few. While the study described in the current thesis aimed to address some gaps in the existing body of literature, further research is still needed to shed light on other aspects of the effects of exposure to FL movies. For example, future studies could examine the impact of incidental vs. intentional learning, the impact of long-term, systematic exposure vs. one-off exposure, or the impact of exposure to FL videos on various language skills in the case of learners at different proficiency levels. Moreover, future research should take into account potential confounding variables, such as experience with watching subtitled movies, the use of the target language at home, literacy, or

individual differences like language learning aptitude and motivation. These are, of course, some tentative suggestions only, as researching the use of FL movies in education offers almost endless possibilities. While we already have some insight into the effects of viewing FL audiovisual materials on language learning, there are still areas that have not been investigated thoroughly, which necessitates further research that will allow viewers to optimize their viewing experience, that is to maximize learning opportunities and enjoyment, but at the same time minimize mental effort.

## **Abstract**

This dissertation investigates the effects of viewing video materials in English as a foreign language with different types of subtitling (native language, foreign language, and no subtitles) and in different modalities (audio, video, audio and video) on foreign language vocabulary development, comprehension and cognitive load.

The first chapter is a review of the literature related to the use of video in language teaching. The first part of the chapter provides an overview of several international projects aiming at investigating practices regarding the use of media, especially audiovisual materials by learners of English as a foreign language from different countries. The next section describes the benefits and potential problems of using foreign language films for language learning. The section includes a review of experimental research on the effects of exposure to video materials on the development of different linguistic competences, as well as a review of research focusing on learners' own perceptions of the effectiveness of using media, including video materials, for language learning. The second part of the chapter deals with the use of subtitling in foreign language films and its impact on language development. This section contains a literature-based description of the benefits and potential problems of using different types of subtitling while watching foreign language films. The next section describes empirical research on the impact of subtitling on language development. The last section focuses on the differences between subtitling in the native and foreign language, and their differential effects on comprehension and vocabulary acquisition.

The second chapter focuses on the concept of cognitive load. The chapter begins with a description of Cognitive Load Theory (Chandler and Sweller 1991) together with the principles of human memory performance. Next, different types of cognitive load known from the literature are described, as well as practical implications of the theory of cognitive

load, especially ways to reduce the level of cognitive load for better learning outcomes. As cognitive effort is an abstract concept, the next section is devoted to describing different ways of operationalising it. This section contains a description of all available measurements of cognitive load, including those used in the study conducted for this dissertation, i.e. the questionnaire and the primary and secondary task techniques, along with examples of studies in which each measurement was used. The last part of the chapter provides an overview of empirical research on the effects of watching foreign language subtitled films on cognitive load.

The third chapter deals with modality. The first part of the chapter describes two theories supporting the use of multimodality in foreign language learning: the concept of dual coding (Paivio 1971) and the Cognitive Theory of Multimedia Learning (Mayer 2009). The description of both theories is complemented by a description of empirical studies testing their assumptions. The second part of the chapter is devoted to the concept of comprehension and a review of experimental research focusing on the influence of modality on comprehension. It includes studies both confirming and questioning the beneficial effect of combining different modalities (audio, video, subtitles) on the comprehension of audiovisual materials. The last part of the chapter contains a description of the most important concepts and processes related to vocabulary acquisition, followed by a review of experimental research on the influence of different modalities on vocabulary acquisition in a foreign language.

The fourth chapter is a chapter describing the methodology and results of the experimental study conducted for the purposes of this dissertation. The chapter begins with a section describing the gaps in current knowledge which the study aims to fill. This includes, for example, investigating the impact of watching subtitled films on comprehension, which is examined at several levels according to the taxonomy used in psychological research (Francuz and Szalkowska 2007, Francuz et al. 2010), examining the relationship between comprehension, vocabulary acquisition and cognitive load, or identifying predictors of comprehension, vocabulary acquisition and cognitive load. The following research questions were formulated:

- What is the impact of subtitles and modality on comprehension?
- What is the impact of subtitles and modality on cognitive load?
- What is the impact of subtitles and modality on vocabulary acquisition in terms of unassisted meaning recall?

- What factors can predict comprehension?
- What factors can predict vocabulary acquisition?
- What factors can predict the level of cognitive load?

The following sections describe the participants, the research methodology and the materials used. A total of 196 Polish learners of English at B1+/B2 level were recruited for the study. They were randomly assigned to nine experimental groups formed on the basis of two three-level independent variables: subtitling (Polish, English, none) and modality (audio, video, audio and video). At the beginning of the study, each participant completed a consent form to participate in the study and an English language proficiency test (LexTale). Next, participants completed a pre-test on vocabulary and then watched a video clip in a given version in PsychoPy while reacting to sound stimuli during the film. Immediately after the viewing session, the participants completed a questionnaire on the experienced cognitive load, comprehension tests, and vocabulary acquisition. Finally, one month after taking part in the experiment, the participants were asked to complete a vocabulary test to investigate long-term memory for newly acquired vocabulary. The next section of the chapter describes a pilot study conducted before the main study in order to detect any potential problems with the materials and procedure. The next section of the chapter presents the results.

The analysis of the data showed, among other things, that native language subtitling significantly facilitates comprehension in all modalities, whereas English subtitling significantly helps only when video is available without sound. The differences between Polish and English subtitles, on the other hand, were not significant, which leads to the conclusion that subtitling, regardless of whether it is in the mother tongue or a foreign language, has a positive impact on comprehension. As far as modality is concerned, the analysis revealed no significant differences between the audiovisual group and the audio group, meaning that the presence of an image neither distracts viewers from understanding the content nor significantly facilitates comprehension. Furthermore, significant differences between the audiovisual and visual, and audio and visual groups, were only found when subtitles were unavailable. When subtitles, either Polish or English, were added to each modality, the differences between the modalities were levelled out, demonstrating the importance of the presence of subtitles for comprehension. As far as cognitive load is concerned, an objective measure, reaction time, showed that native language subtitling decreased cognitive load significantly more than foreign language subtitling or no subtitling. In addition, the objec-

tive measure of cognitive load showed no significant difference between the audiovisual and visual groups, indicating that the use of visuals does not place an additional burden on viewers. In terms of vocabulary acquisition, English subtitles lead to significantly more gains in terms of both short-term and long-term memory. It was also found that exposure to a film in a foreign language, whether with or without subtitles, leads to vocabulary acquisition in terms of recognition of its form, which is the first step towards vocabulary acquisition. As far as modality is concerned, the analysis showed no significant differences between the audio and audiovisual groups, indicating that the presence of image does not facilitate but also does not hinder vocabulary acquisition

The fifth chapter is devoted to a general discussion of the results obtained in the light of the research questions and previous studies of a similar nature. In addition, the chapter includes practical implications for students and teachers arising from the study. The chapter concludes with a section describing the limitations of the study and suggestions for further research that might complement the findings of the study described.

## Streszczenie

Niniejsza rozprawa doktorska dotyczy wpływu oglądania materiałów wideo w języku angielskim jako języku obcym z różnymi rodzajami napisów (napisy w języku ojczystym, w języku obcym oraz bez napisów) oraz w różnych modalnościach (audio, wideo, audio i wideo) na rozwój słownictwa w języku obcym, zrozumienie treści oraz wysiłek poznawczy.

Rozdział pierwszy poświęcony jest przeglądowi literatury związanej z wykorzystaniem materiałów wideo w nauczaniu języków obcych. W pierwszej części rozdziału znajduje się przegląd kilku międzynarodowych projektów mających na celu zbadanie praktyk dotyczących wykorzystania mediów, zwłaszcza materiałów audiowizualnych przez uczących się języka angielskiego jako obcego pochodzących z różnych krajów. Kolejna sekcja opisuje korzyści oraz potencjalne problemy wynikające z wykorzystania filmów obcojęzycznych do nauki języków obcych. Sekcja ta zawiera również przegląd badań eksperymentalnych dotyczących wpływu ekspozycji na materiały wideo na rozwój różnych kompetencji językowych, jak również przegląd badań skupiających się na postrzeganiu przez samych uczniów efektywności wykorzystywania mediów, w tym materiałów wideo, do nauki języka. Druga część rozdziału traktuje o wykorzystaniu napisów do oglądania filmów obcojęzycznych i ich wpływie na rozwój języka. Znajduje się tutaj wynikający z literatury opis korzyści i potencjalnych problemów z wykorzystaniem różnego rodzaju napisów w trakcie oglądania filmów w języku obcym. Kolejna sekcja zawiera opis badań empirycznych poświęconych wpływowi napisów na rozwój języka obcego. Ostatnia sekcja skupia się na różnicach pomiędzy napisami w języku ojczystym oraz w języku obcym i ich zróżnicowanym wpływie na zrozumienie i przyswajanie słownictwa.

Rozdział drugi skupia się na pojęciu wysiłku poznawczego. Na początku rozdziału znajduje się opis teorii wysiłku poznawczego (Chandler and Sweller 1991) wraz z zasadami działania ludzkiej pamięci. Następnie opisane zostały znane z literatury różne typy wysiłku poznawczego oraz praktycznie implikacje wynikające z teorii wysiłku poznawczego, m.in. sposoby na obniżenie poziomu wysiłku poznawczego dla lepszych efektów w przyswajaniu wiedzy. Jako że wysiłek poznawczy jest pojęciem abstrakcyjnym, kolejna sekcja poświęcona jest sposobom na operacjonalizację tego konceptu. Sekcja ta zawiera opis wszystkich dostępnych pomiarów wysiłku poznawczego, włącznie z pomiarami wykorzystanymi w badaniu przeprowadzonym w ramach niniejszego projektu, tj. kwestionariusza oraz techniki pierwszego i drugiego zadania, wraz z przykładami badań w których wykorzystano każdą z metod pomiaru. Ostatnia część rozdziału zawiera przegląd badań empirycznych poświęconych wpływowi oglądania filmów obcojęzycznych z napisami na wysiłek poznawczy.

Rozdział trzeci traktuje o modalności. W pierwszej części rozdziału opisane zostały dwie teorie wspierające wykorzystanie multimodalności w nauce języków obcych: koncepcję podwójnego kodowania (Paivio 1971) oraz Kognitywną Teorię uczenia się poprzez multimedia (Mayer 2009). Opis obu teorii uzupełniony jest o opis badań empirycznych testujących ich założenia. Druga część rozdziału poświęcona jest pojęciu rozumienia oraz przeglądowi badań eksperymentalnych skupiających się na wpływie modalności na zrozumienie. Znajdują się tu badania zarówno potwierdzające jak i podważające korzystny wpływ połączenia różnych modalności (audio, wideo, napisy) na zrozumienie materiału audiowizualnego. W ostatniej części rozdziału znajduje się opis najważniejszych pojęć i procesów związanych z przyswajaniem słownictwa, po którym następuje przegląd badań eksperymentalnych nad wpływem różnych modalności na przyswajanie słownictwa w języku obcym.

Rozdział czwarty to rozdział opisujący metodologię oraz wyniki przeprowadzonego badania eksperymentalnego. Rozdział rozpoczyna sekcja opisująca luki w dotychczasowej wiedzy, które przeprowadzone badanie miało na celu uzupełnić. Jest to na przykład zbadanie wpływu oglądania filmów z napisami na zrozumienie treści, które odbywa się na kilku poziomach zgodnie z taksonomią użytą w badaniach psychologicznych (Francuz i Szalkowska 2007, Francuz et al. 2010), zbadanie zależności między zrozumieniem, przyswajaniem słownictwa a wysiłkiem poznawczym, czy określenie predyktorów zrozumienia tre-

ści, akwizycji słownictwa i wysiłku poznawczego. Postawiono następujące główne pytania badawcze:

- Jaki jest wpływ napisów i modalności na zrozumienie treści?
- Jaki jest wpływ napisów i modalności na wysiłek poznawczy?
- Jaki jest wpływ napisów i modalności na przyswajanie słownictwa?
- Jakie czynniki determinują zrozumienie?
- Jakie czynniki determinują przyswajanie słownictwa?
- Jakie czynniki determinują poziom wysiłku poznawczego?

W kolejnych sekcjach opisano uczestników, metodologię badania oraz wykorzystane materiały. Do badania zrekrutowano 196 Polaków uczniów języka angielskiego na poziomie B1+/B2. Zostali oni losowo przydzieleni do dziewięciu grup eksperymentalnych utworzonych na podstawie dwóch trypoziomowych zmiennych niezależnych: napisów (polskie, angielskie, brak) i modalności (audio, wideo, audio i wideo). Na początku badania każdy uczestnik wypełnił zgodę na wzięcie w nim udziału, a następnie wypełnił test określający poziom znajomości języka angielskiego (LexTale). Następnie uczestnicy wypełnili wstępny test na słownictwo, po czym obejrzeli klip filmowy w określonej wersji w programie PsychoPy, reagując jednocześnie na bodźce dźwiękowe pojawiające się w trakcie filmu. Po obejrzeniu materiału wideo, uczestnicy wypełnili kwestionariusz dotyczący doświadczonego wysiłku poznawczego, testy na zrozumienie, oraz przyswajanie słownictwa. Miesiąc później, uczestnicy zostali poproszeni o wypełnienie testu na słownictwo w celu zbadania ile nowo przyswojonych słówek pozostało w pamięci długotrwałej. Kolejna sekcja rozdziału opisuje badanie pilotażowe przeprowadzone przed badaniem głównym w celu wykrycia potencjalnych problemów z materiałami i procedurą. Kolejna część rozdziału przedstawia uzyskane wyniki z podziałem na pytania badawcze.

Analiza danych pokazała między innymi, że napisy w języku ojczystym znacząco ułatwiają zrozumienie we wszystkich modalnościach, natomiast napisy w języku angielskim znacząco pomagają jedynie w przypadku, gdy dostępny jest tylko obraz bez dźwięku. Różnice między napisami polskimi a angielskimi nie były natomiast istotne, co pozwala stwierdzić, że napisy bez względu na to czy są w języku ojczystym czy obcym, mają pozytywny wpływ na zrozumienie. Co do modalności, analiza nie wykazała istotnych różnic między grupą audiowizualną a grupą audio, co oznacza że obecność obrazu ani nie dekoncentruje oglądających odrywając ich od zrozumienia treści, ani też znacząco nie ułatwia zrozumienia. Ponadto, istotne różnice między grupą audiowizualną i wizualną, oraz audio i

wizualną, zostały znalezione tylko w przypadku gdy napisy były niedostępne. Kiedy do każdej modalności dodane były napisy, czy to polskie czy angielskie, różnice między modalnościami zostały zniwelowane, co pokazuje jak duże znaczenie ma obecność napisów na potrzeby rozumienia. Jeśli chodzi o wysiłek poznawczy, obiektywny pomiar, tzn. czas reakcji, pokazał, że napisy w języku ojczystym obniżają poziom wysiłku poznawczego istotnie bardziej niż napisy w języku obcym czy brak napisów. Ponadto, obiektywny pomiar wysiłku poznawczego nie pokazał istotnych różnic między grupą audiowizualną a wizualną, co wskazuje na to, że wykorzystanie obrazu nie obciąża dodatkowo oglądających. Jeśli chodzi o akwizycję słownictwa, napisy angielskie przyczyniły się do istotnie większego przyrostu słów zarówno w pamięci krótko jak i długotrwałej. Okazało się również, że ekspozycja na film w języku obcym, bez względu na to czy z napisami czy bez, prowadzi do przyswajania słownictwa jeśli chodzi o rozpoznanie ich formy, co jest już pierwszym krokiem do akwizycji słownictwa. Co do modalności, analiza nie pokazała istotnych różnic między grupą audio a grupą audiowizualną, co wskazuje na to, że obecność obrazu nie ułatwia, ale też nie utrudnia akwizycji słownictwa

Rozdział piąty poświęcony jest ogólnej dyskusji poświęconej omówieniu uzyskanych wyników w świetle pytań badawczych oraz dotychczasowych badań o podobnej tematyce. Ponadto, rozdział zawiera również praktyczne implikacje dla uczniów i nauczycieli wynikające z przeprowadzonego badania. Rozdział kończy sekcja zawierająca opis ograniczeń opisywanego badania, oraz sugestie dotyczące dalszych badań, które mogłyby uzupełnić wyniki opisanego badania.

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## Appendix A: Vocabulary pre-test

### TEST POCZĄTKOWY NA SŁOWNICTWO

KOD \_\_\_\_\_

**Zadanie 1** Poniżej znajduje się 15 słów które pojawiły się w materiale filmowym. Do każdego słowa przypisane są trzy poziomy jego znajomości. Dla każdego słówka zaznacz odpowiedni poziom znajomości. Jeśli wybierzesz/aś poziom 2, nie zapomnij wpisać kategorii, np. 'food', 'emotion', itd. Jeśli wybierzesz/aś poziom 3, nie zapomnij podać tłumaczenia na język polski lub angielskiego synonimu.

- **pursuit**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **adamant**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **soak**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **graduate**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **tip jar**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **stitches**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **inn**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **cliché**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **trunk**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **get knocked up**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **tuition**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **enrolment fee**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **flamboyant**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **blinds**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **faucet**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **hem**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **reenact**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **invoice**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **drop out**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **reconcile**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **lapel**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **drop in**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **scavenge**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **get ahold of somebody**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **treat (rzeczownik)**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

## Appendix B: Comprehension post-test (FULL and VID groups)

### KWESTIONARIUSZ BADAJĄCY ZROZUMIENIE MATERIAŁU FILMOWEGO

Kod: \_\_\_\_\_ -

**Zadanie 1** Poniżej znajduje się 15 słów które pojawiły się w materiale filmowym. Do każdego słowa przypisane są trzy poziomy jego znajomości. Dla każdego słówka zaznacz odpowiedni poziom znajomości. Jeśli wybrałeś/aś poziom 2, nie zapomnij wpisać kategorii, np. 'food', 'emotion', itd. Jeśli wybrałeś/aś poziom 3, nie zapomnij podać tłumaczenia na język polski lub angielskiego synonimu.

- **soak**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **tip jar**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **stitches**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **inn**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **cliché**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **get knocked up**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **tuition**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **enrolment fee**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **hem**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_ (e.g. food, art action, emotion)
- 3) I know this word. It means \_\_\_\_\_

- **reenact**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **invoice**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **drop out**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **drop in**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **get ahold of somebody**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **treat (rzeczownik)**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

**Zadanie 2** Wybierz właściwą odpowiedź spośród 4 podanych. Pod każdym pytaniem znajduje się również procentowa skala pewności udzielonej odpowiedzi. Zaznacz obwódką na ile procent jesteś pewien/pewna udzielonej odpowiedzi.

1. Na początku klipu nauczycielka dała uczniom dwa zadania do wyboru. Były to:
  - A. Dokończenie czytania książki „Huckleberry Finn” lub odrobienie zadania domowego
  - B. Przeczytanie kolejnego rozdziału książki „Huckleberry Finn” lub napisanie eseju
  - C. Dokończenie czytania książki „Huckleberry Finn” lub napisanie eseju
  - D. Rozpoczęcie czytania książki „Huckleberry Finn” lub poprawa eseju

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

2. Co w przyszłości planują zrobić Lorelai i Sookie?
  - A. Otworzyć własną knajpę
  - B. Sprzedawać autorski sos Sookie
  - C. Napisać książkę kucharską
  - D. Otworzyć własny sklep

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

3. Gdzie Rory i Lane spotkały się z mamą Lane?
- A. W sklepie
  - B. W kuchni
  - C. W salonie
  - D. Na tarasie

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

4. Dlaczego mama Lane nienawidzi mamy Rory?
- A. Bo mama Rory jest niezamężna
  - B. Bo mama Rory nie utrzymuje kontaktu ze swoimi rodzicami
  - C. Bo rodzina Rory jest bogatsza
  - D. Bo się pokłóciły

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

5. Jak Lorelai zmusiła recepcjonistę do odebrania telefonu?
- A. Zagroziła mu nożem
  - B. Zagroziła mu zwolnieniem z pracy
  - C. Zagroziła mu zmniejszeniem pensji
  - D. Zagroziła mu degradacją stanowiska

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

6. Co było w liście który otrzymała mama Rory?
- A. Zaproszenie do udziału w teledysku Britney Spears
  - B. Informacja o wygranej
  - C. Informacja o przyjęciu do prywatnej szkoły
  - D. Informacja o przyznaniu stypendium

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

7. W jaki sposób Lorelai zdobyła pieniądze na czesne dla Rory?
- A. Poprosiła o pomoc swoich zamożnych rodziców
  - B. Sprzedała samochód Sookie
  - C. Napadła na bank
  - D. Wzięła kredyt

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

8. Lorelai zdobyła pieniądze na czesne. Musi jednak spełnić pewne warunki. Są to:
- A. Zrezygnowanie z kursu biznesowego na który uczęszcza i częste odwiedzanie rodziców
  - B. Wspólny obiad z rodzicami i córką raz w miesiącu oraz telefon do rodziców raz na tydzień
  - C. Wspólny obiad z rodzicami i córką w każdy piątek i telefon do rodziców raz na tydzień
  - D. Wspólny obiad wnuczki z dziadkami w każdy piątek oraz telefon do rodziców raz na tydzień z bieżącymi informacjami o postępach wnuczki w nauce

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

9. Dlaczego Lorelai dała córce swoje imię?
- A. Był to przejaw feminizmu
  - B. Chciała pokazać że córka jest wyłącznie jej
  - C. Zrobiła na złość rodzicom
  - D. Chciała żeby córka była dokładnie taka jak ona

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

10. W czym Rory pomogła Deanowi?
- A. W poznaniu kolegów z nowej szkoły
  - B. W znalezieniu pracy
  - C. W znalezieniu mieszkania
  - D. W odrobieniu pracy domowej

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

11. Jaką książkę czytała ostatnio Rory?
- A. Moby Dick
  - B. Wuthering Heights
  - C. Madame Bovary
  - D. Pride and Prejudice

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

12. W trakcie wspólnego posiłku Lorelai informuje Rory o ich planach na kolejny dzień. Dokąd miały pójść?
- A. Na kolację do znajomych
  - B. W odwiedziny do dalszego wujostwa
  - C. W odwiedziny do siostry Lorelai
  - D. Na kolację do rodziców Lorelai (dziadków Rory)

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

13. Początkowo Rory bardzo chciała iść do Chilton, ale potem zmieniła zdanie. Jakie powody podała?
- A. Miłość do chłopaka ze starej szkoły
  - B. Problem z dojazdem i tęsknota za domem
  - C. Czas i pieniądze
  - D. Strach przed wymaganiami szkoły

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

14. Jaką pracę znalazła dla Dean'a pani Patty?
- A. Sprzedawca
  - B. Magazynier
  - C. Barista
  - D. Mechanik

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

15. Co przydarzyło się Lorelai gdy miała 16 lat?

- A. Uciekła z domu
- B. Zachorowała
- C. Chciała popełnić samobójstwo
- D. Zaszła w ciążę

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

**Zadanie 3** Poniżej znajduje się kilka zdjęć z różnych odcinków serialu „Kochane kłopoty”. Zaznacz zdjęcia które pochodzą z obejrzanego fragmentu wstawiając X w kratkę obok. Dodatkowo, zaznacz na ile procent jesteś pewien/pewna swojej odpowiedzi.



JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %



JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %



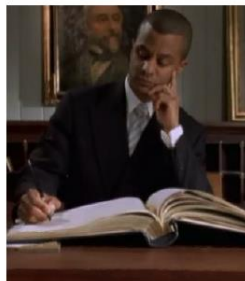
JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %



JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

**Zadanie 4** Poniżej znajdują się trzy wypowiedzi wycięte z obejrzanego fragmentu. Zaznacz X zdjęcie osoby która wypowiedziała podaną kwestię.

- 1) People are particularly stupid today. I can't talk to any more of them. / Ludzie są dziś wyjątkowo głupi. Nie mogę dłużej z nimi rozmawiać.



- 2) I don't ask for favours. You know that./ Wicie że nie proszę o zapomogę.



- 3) No more people checking you out to see what you're wearing. / Ludzie nie patrzą na to co nosisz.



**Zadanie 5** Na podstawie obejrzanego fragment serialu, można wywnioskować pewne rzeczy. Oceń każdy podany wniosek – jeśli uważasz że jest prawdziwy zakreśl PRAWDA, jeśli uważasz że jest fałszywy zakreśl FAŁSZ.

1. Mama Lane nienawidzi Lorelai bo ta nie jest mężatką. W związku z tym, mama Lane nie jest zadowolona z przyjaźni jej córki z córką Lorelai.

PRAWDA FAŁSZ

2. Harfistka zatrudniona w hotelu jest nieuprzejma i chciwa gdyż domaga się napiwków i opryskliwie zwraca się do słuchaczy.

PRAWDA FAŁSZ

3. Dean chciał poznać Rory, gdyż wiedział, że dziewczyna pomoże mu znaleźć pracę.

PRAWDA FAŁSZ

4. Lorelai wysłała córkę do prywatnej szkoły żeby ta nie powtórzyła błędów matki zachodząc w ciążę w wieku 16 lat.

PRAWDA FAŁSZ

5. Rodzice Lorelai traktują córkę chłodno, gdyż mają do niej żal za to, jak ułożyła sobie życie.

PRAWDA FAŁSZ

**Zadanie 6** Poniżej znajdują się trzy pary wydarzeń jakie miały miejsce w obejrzanym fragmencie. W każdej parze zakreśl zdarzenie **wcześniejsze**.

1. A. Lorelai prosi rodziców o pomoc finansową  
B. Rory poznaje Dean'a
2. A. Rory i Lane rozmawiają z mamą Lane w jej sklepie  
B. Lorelai próbuje nowego sosu przygotowanego przez Sookie
3. A. Lorelai i Rory jedzą kolację  
B. Lorelai skraca spódnicę Rory

**Zadanie 7** O czym był obejrzany fragment filmu? Wybierz najlepsze twoim zdaniem podsumowanie wstawiając X w odpowiedniej kratce.

Lorelai boryka się z problemami finansowymi, dlatego też gdy jej córka Rory zostaje przyjęta do prywatnej szkoły, jest zmuszona prosić o pomoc swoją przyjaciółkę, a gdy to nie pomaga, musi prosić swoich rodziców, którzy co prawda pomogą, ale pod pewnymi warunkami

Za sprawą matki, Rory dostała się do prywatnej szkoły. Nie chce się jednak przenieść, gdyż zakochała się w chłopaku, który właśnie został przyjęty do jej obecnej szkoły. W związku z tym, Rory próbuje wszelkimi sposobami aby pozostać w szkole.

Lorelai otrzymuje wiadomość, że jej córka Rory dostała się do prywatnej szkoły. Aby móc opłacić jej czesne, prosi o pomoc swoich rodziców. Gdy wszystko jest załatwione, Rory informuje matkę, że nie chce zmieniać szkoły. Okazuje się, że to przez chłopaka, dlatego też matka stara się zrobić wszystko aby przekonać córkę, że nauka jest ważniejsza.

Lorelai robi wszystko aby uchronić córkę przed popełnieniem jej własnych błędów z młodości. Gdy otrzymuje wiadomość, że Rory dostała się do prywatnej szkoły, mimo problemów finansowych, znajduje sposób na zdobycie pieniędzy, tak aby córka mogła się przenieść. Wszystko za sprawą tego że Rory zakochała się w chłopaku ze szkoły, a matka która sama zaszła w ciążę w wieku 16 lat chce uchronić córkę przed tym losem.

**Zadanie 8** Poniżej znajdują się mini dialogi z życia codziennego. Wyobraź sobie że jesteś postacią z obejrzanego filmu (osoba B). Czy Twoja reakcja na wypowiedź osoby A jest prawidłowa? Zakreśl TAK, lub NIE. Zaznacz także na ile procent jesteś pewien/pewna swojej odpowiedzi.

1. A. Moja córka nie chce iść do prywatnej szkoły, bo nie chce zostawiać starych znajomych.  
B. Nauka jest najważniejsza, koledzy i koleżanki poczekają, prywatna szkoła nie.

TAK NIE

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

2. A. Moja córka nie chce iść do prywatnej szkoły bo nie chce zostawiać starych znajomych.  
B. Nikogo nie można do niczego zmuszać. Możesz przedstawić córce szereg powodów, dla których powinna zmienić szkołę, ale nie powinnaś jej do niczego zmuszać.

TAK NIE

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

3. A. Nie chcę aby rodzice poznali prawdziwy powód mojej decyzji.  
B. Podaj inne, przekonujące powody. Jeśli dowiedzą się jaki jest prawdziwy powód, na pewno się nie zgodzą.

TAK NIE

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

4. A. Nie chcę aby rodzice poznali prawdziwy powód mojej decyzji.  
B. Od razu powiedz prawdę. Prędzej czy później i tak się dowiedzą i wtedy będzie większa afery i na pewno się nie zgodzą. Jeśli powiesz od razu o co chodzi, jest szansa że zrozumieją

TAK NIE

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

## Appendix C: Comprehension post-test (AUD groups)

### KWESTIONARIUSZ BADAJĄCY ZROZUMIENIE MATERIAŁU FILMOWEGO

Kod: \_\_\_\_\_ -

**Zadanie 1** Poniżej znajduje się 15 słów które pojawiły się w materiale filmowym. Do każdego słowa przypisane są trzy poziomy jego znajomości. Dla każdego słówka zaznacz odpowiedni poziom znajomości. Jeśli wybrałeś/aś poziom 2, nie zapomnij wpisać kategorii, np. 'food', 'emotion', itd. Jeśli wybrałeś/aś poziom 3, nie zapomnij podać tłumaczenia na język polski lub angielskiego synonimu.

- **soak**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **tip jar**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **stitches**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **inn**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **cliché**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **get knocked up**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **tuition**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **enrolment fee**

- 1) I haven't seen this word before
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- **hem**

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- 3) I know this word. It means \_\_\_\_\_

- **reenact**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **invoice**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **drop out**

- 1) I haven't seen this word before
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- 3) I know this word. It means \_\_\_\_\_

- **get ahold of somebody**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **treat (rzeczownik)**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
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**Zadanie 2** Wybierz właściwą odpowiedź spośród 4 podanych. Pod każdym pytaniem znajduje się również procentowa skala pewności udzielonej odpowiedzi. Zaznacz obwódką na ile procent jesteś pewien/pewna udzielonej odpowiedzi.

1. Na początku klipu nauczycielka dała uczniom dwa zadania do wyboru. Były to:
  - A. Dokończenie czytania książki „Huckleberry Finn” lub odrobienie zadania domowego
  - B. Przeczytanie kolejnego rozdziału książki „Huckleberry Finn” lub napisanie eseju
  - C. Dokończenie czytania książki „Huckleberry Finn” lub napisanie eseju
  - D. Rozpoczęcie czytanie książki „Huckleberry Finn” lub poprawa eseju

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100%

2. Co w przyszłości planują zrobić Lorelai i Sookie?
  - A. Otworzyć własną knajpę
  - B. Sprzedawać autorski sos Sookie
  - C. Napisać książkę kucharską
  - D. Otworzyć własny sklep

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

3. Gdzie Rory i Lane spotkały się z mamą Lane?

- A. W sklepie
- B. W kuchni
- C. W salonie
- D. Na tarasie

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

4. Dlaczego mama Lane nienawidzi mamy Rory?

- A. Bo mama Rory jest niezamężna
- B. Bo mama Rory nie utrzymuje kontaktu ze swoimi rodzicami
- C. Bo rodzina Rory jest bogatsza
- D. Bo się pokłócili

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

5. Jak Lorelai zmusiła recepcjonistę do odebrania telefonu?

- A. Zagroziła mu nożem
- B. Zagroziła mu zwolnieniem z pracy
- C. Zagroziła mu zmniejszeniem pensji
- D. Zagroziła mu degradacją stanowiska

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

6. Co było w liście który otrzymała mama Rory?

- A. Zaproszenie do udziału w teledysku Britney Spears
- B. Informacja o wygranej
- C. Informacja o przyjęciu do prywatnej szkoły
- D. Informacja o przyznaniu stypendium

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

7. W jaki sposób Lorelai zdobyła pieniądze na czesne dla Rory?

- A. Poprosiła o pomoc swoich zamożnych rodziców
- B. Sprzedała samochód Sookie
- C. Napadła na bank
- D. Wzięła kredyt

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

8. Lorelai zdobyła pieniądze na czesne. Musi jednak spełnić pewne warunki. Są to:

- A. Zrezygnowanie z kursu biznesowego na który uczęszcza i częste odwiedzanie rodziców
- B. Wspólny obiad z rodzicami i córką raz w miesiącu oraz telefon do rodziców raz na tydzień
- C. Wspólny obiad z rodzicami i córką w każdy piątek i telefon do rodziców raz na tydzień
- D. Wspólny obiad wnuczki z dziadkami w każdy piątek oraz telefon do rodziców raz na tydzień z bieżącymi informacjami o postępach wnuczki w nauce

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9. Dlaczego Lorelai dała córce swoje imię?
- A. Był to przejaw feminizmu
  - B. Chciała pokazać że córka jest wyłącznie jej
  - C. Zrobiła na złość rodzicom
  - D. Chciała żeby córka była dokładnie taka jak ona

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10. W czym Rory pomogła Deanowi?
- A. W poznaniu kolegów z nowej szkoły
  - B. W znalezieniu pracy
  - C. W znalezieniu mieszkania
  - D. W odrobieniu pracy domowej

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11. Jaką książkę czytała ostatnio Rory?
- A. Moby Dick
  - B. Wuthering Heights
  - C. Madame Bovary
  - D. Pride and Prejudice

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12. W trakcie wspólnego posiłku Lorelai informuje Rory o ich planach na kolejny dzień. Dokąd miały pójść?
- A. Na kolację do znajomych
  - B. W odwiedziny do dalszego wujostwa
  - C. W odwiedziny do siostry Lorelai
  - D. Na kolację do rodziców Lorelai (dziadków Rory)

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13. Początkowo Rory bardzo chciała iść do Chilton, ale potem zmieniła zdanie. Jakie powody podała?
- A. Miłość do chłopaka ze starej szkoły
  - B. Problem z dojazdem i tęsknota za domem
  - C. Czas i pieniądze
  - D. Strach przed wymaganiami szkoły

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14. Jaką pracę znalazła dla Dean'a pani Patty?
- A. Sprzedawca
  - B. Magazynier
  - C. Barista
  - D. Mechanik

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15. Co przydarzyło się Lorelai gdy miała 16 lat?

- A. Uciekła z domu
- B. Zachorowała
- C. Chciała popełnić samobójstwo
- D. Zaszła w ciążę

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**Zadanie 3** Poniżej znajduje się kilka zdań z różnych odcinków serialu „Kochane kłopoty”. Zaznacz te które pochodzą z obejrzanego fragmentu. Dodatkowo, zaznacz na ile procent jesteś pewien/pewna swojej odpowiedzi.

1) Czy nie przyjęlibyście częściowej opłaty na początek / I guess what I'm wondering is if you couldn't take, say, part of it now

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2) Sprawdziłam z zegarkiem/ I timed it.

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3) Miałam ogromny brzuch i spuchnięte kostki/ I had a huge, fat stomach, and big, fat ankles

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4) Podam ci adres/ Let me give you our address

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

**Zadanie 4** Poniżej znajdują się trzy wypowiedzi wycięte z obejrzanego fragmentu. Zaznacz X osobę, która wypowiedziała podaną kwestię.

1) People are particularly stupid today. I can't talk to any more of them. / Ludzie są dziś wyjątkowo głupi. Nie mogę dłużej z nimi rozmawiać.

Sookie

Michel

Lorelai

2) I don't ask for favours. You know that./ Wiecie że nie proszę o zapomogę.

Lorelai

Lane

Rory

3) No more people checking you out to see what you're wearing. / Ludzie nie patrzą na to co nosisz.

Lane

Rory

Lorelai

**Zadanie 5** Na podstawie obejrzanego fragment serialu, można wywnioskować pewne rzeczy. Oceń każdy podany wniosek – jeśli uważasz że jest prawdziwy zakreśl PRAWDA, jeśli uważasz że jest fałszywy zakreśl FAŁSZ.

1. Mama Lane nienawidzi Lorelai bo ta nie jest mężatką. W związku z tym, mama Lane nie jest zadowolona z przjaźni jej córki z córką Lorelai.

PRAWDA FAŁSZ

2. Harfistka zatrudniona w hotelu jest nieuprzejma i chciwa gdyż domaga się napiwków i opryskliwie zwraca się do słuchaczy.

PRAWDA FAŁSZ

3. Dean chciał poznać Rory, gdyż wiedział, że dziewczyna pomoże mu znaleźć pracę.

PRAWDA FAŁSZ

4. Lorelai wysłała córkę do prywatnej szkoły żeby ta nie powtórzyła błędów matki zachodząc w ciążę w wieku 16 lat.

PRAWDA FAŁSZ

5. Rodzice Lorelai traktują córkę chłodno, gdyż mają do niej żal za to, jak ułożyła sobie życie.

PRAWDA FAŁSZ

**Zadanie 6** Poniżej znajdują się trzy pary wydarzeń jakie miały miejsce w obejrzanym fragmencie. W każdej parze zakreśl zdarzenie wcześniejsze.

1. A. Lorelai prosi rodziców o pomoc finansową  
B. Rory poznaje Dean'a
2. A. Rory i Lane rozmawiają z mamą Lane w jej sklepie  
B. Lorelai próbuje nowego sosu przygotowanego przez Sookie
3. A. Lorelai i Rory jedzą kolację  
B. Lorelai skraca spódnicę Rory

**Zadanie 7** O czym był obejrzany fragment filmu? Wybierz najlepsze twoim zdaniem podsumowanie wstawiając X w odpowiedniej kratce.

Lorelai boryka się z problemami finansowymi, dlatego też gdy jej córka Rory zostaje przyjęta do prywatnej szkoły, jest zmuszona prosić o pomoc swoją przyjaciółkę, a gdy to nie pomaga, musi prosić swoich rodziców, którzy co prawda pomogą, ale pod pewnymi warunkami

Za sprawą matki, Rory dostała się do prywatnej szkoły. Nie chce się jednak przenosić, gdyż zakochała się w chłopaku, który właśnie został przyjęty do jej obecnej szkoły. W związku z tym, Rory próbuje wszelkich sposobów aby pozostać w szkole.

Lorelai otrzymuje wiadomość, że jej córka Rory dostała się do prywatnej szkoły. Aby móc opłacić jej czesne, prosi o pomoc swoich rodziców. Gdy wszystko jest załatwione, Rory informuje matkę, że nie chce zmieniać szkoły. Okazuje się, że to przez chłopaka, dlatego też matka stara się zrobić wszystko aby przekonać córkę, że nauka jest ważniejsza.

Lorelai robi wszystko aby uchronić córkę przed popełnieniem jej własnych błędów z młodości. Gdy otrzymuje wiadomość, że Rory dostała się do prywatnej szkoły, mimo problemów finansowych, znajduje sposób na zdobycie pieniędzy, tak aby córka mogła się przenieść. Wszystko za sprawą tego że Rory zakochała się w chłopaku ze szkoły, a matka która sama zaszła w ciążę w wieku 16 lat chce uchronić córkę przed tym losem.

**Zadanie 8** Poniżej znajdują się mini dialogi z życia codziennego. Wyobraź sobie że jesteś postacią z obejrzanego filmu (osoba B). Czy Twoja reakcja na wypowiedź osoby A jest prawidłowa? Zakreśl TAK, lub NIE. Zaznacz także na ile procent jesteś pewien/pewna swojej odpowiedzi.

1. A. Moja córka nie chce iść do prywatnej szkoły, bo nie chce zostawiać starych znajomych.  
B. Nauka jest najważniejsza, koledzy i koleżanki poczekają, prywatna szkoła nie.

TAK NIE

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2. A. Moja córka nie chce iść do prywatnej szkoły bo nie chce zostawiać starych znajomych.  
B. Nikogo nie można do niczego zmuszać. Możesz przedstawić córce szereg powodów, dla których powinna zmienić szkołę, ale nie powinnaś jej do niczego zmuszać.

TAK NIE

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

3. A. Nie chcę aby rodzice poznali prawdziwy powód mojej decyzji.  
B. Podaj inne, przekonujące powody. Jeśli dowiedzą się jaki jest prawdziwy powód, na pewno się nie zgodzą.

TAK NIE

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

4. A. Nie chcę aby rodzice poznali prawdziwy powód mojej decyzji.  
B. Od razu powiedz prawdę. Prędeż czy później i tak się dowiedzą i wtedy będzie większa afera i na pewno się nie zgodzą. Jeśli powiesz od razu o co chodzi, jest szansa że zrozumieją

TAK NIE

JESTEM PEWIEN/-A SWOJEJ ODPOWIEDZI NA 10 20 30 40 50 60 70 80 90 100 %

## Appendix D: Self-report on cognitive load

### Ankieta dotycząca wysiłku poznawczego

KOD \_\_\_\_\_

**Proszę zakreślić odpowiednią wartością w skali 1-5.**

Intrinsic CL	1. Jakie trudności sprawiało użyte w filmie słownictwo?	Bardzo małe	1	2	3	4	5	Bardzo duże
	2. Jakie trudności sprawiało tempo mowy?	Bardzo małe	1	2	3	4	5	Bardzo duże
	3. Jak trudności sprawiał użyty w filmie akcent?	Bardzo małe	1	2	3	4	5	Bardzo duże
	4. Jak trudny do zrozumienia był obejrany film?	Bardzo łatwy	1	2	3	4	5	Bardzo trudny
Mental effort	5. Ile wysiłku włożyłeś/aś w zrozumienie materiału filmowego?	Bardzo mało	1	2	3	4	5	Bardzo dużo
	6. Jak bardzo musiałeś/aś się skupić w trakcie oglądania filmu?	Bardzo mało	1	2	3	4	5	Bardzo dużo
Extrane ous CL	7. <b>[dla grup z napisami]</b> W jakim stopniu napisy pomogły ci w zrozumieniu materiału filmowego?	Bardzo mało	1	2	3	4	5	Bardzo dużo
	8. <b>[dla grup z napisami]</b> Jak bardzo napisy utrudniały ci oglądanie filmu?	Bardzo mało	1	2	3	4	5	Bardzo dużo
	9. <b>[dla grup bez napisów]</b> Jak bardzo napisy w języku polskim ułatwiłyby zrozumienie filmu?	Bardzo mało	1	2	3	4	5	Bardzo dużo
	10. <b>[dla grup bez napisów]</b> Jak bardzo napisy w języku angielskim ułatwiłyby zrozumienie filmu?	Bardzo mało	1	2	3	4	5	Bardzo dużo
	11. <b>[dla grup AUD]</b> Jak bardzo brak obrazu wideo utrudniał ci zrozumienie filmu?	Bardzo mało	1	2	3	4	5	Bardzo dużo
	12. <b>[dla grup VID]</b> Jak bardzo brak dźwięku utrudniał ci zrozumienie filmu?	Bardzo mało	1	2	3	4	5	Bardzo dużo

Germane  
CL  
(performance)

**13.** Jak szybko udało ci się odpowiedzieć na pytania dotyczące zrozumienia klipu?

Bardzo wolno    1            2            3            4            5            Bardzo szybko

**14.** Jak dużo udało ci się zrozumieć?

Prawie nic    1            2            3            4            5            Prawie wszystko

**15.** Jak szybko udało ci się odpowiedzieć na pytania dotyczące słownictwa?

Bardzo wolno    1            2            3            4            5            Bardzo szybko

**16.** Jak dużo nowych słówek udało ci się przyswoić z klipu filmowego?

Bardzo mało    1            2            3            4            5            Bardzo dużo

Emotions

**17.** Jak bardzo zestresowany, sfrustrowany byłeś/aś a trakcie oglądania filmu?

Bardzo mało    1            2            3            4            5            Bardzo dużo

**18.** Jak bardzo pewny/a siebie czułeś/aś się w trakcie rozwiązywania testów po obejrzeniu klipu?

Bardzo pewny/a siebie    1            2            3            4            5            Bardzo niepewny/a siebie

**19.** Jak bardzo zmotywowany/a byłeś/aś do obejrzenia filmu?

Bardzo zmotywowany/a    1            2            3            4            5            Brak motywacji

## Appendix E: Delayed vocabulary post-test

Kod \_\_\_\_\_

### TEST KOŃCOWY NA SŁOWNICTWO

**Zadanie 1** Poniżej znajduje się 15 słów które pojawiły się w materiale filmowym. Do każdego słowa przypisane są trzy poziomy jego znajomości. Dla każdego słówka zaznacz odpowiedni poziom znajomości. Jeśli wybrałeś/aś poziom 2, nie zapomnij wpisać kategorii, np. 'food', 'emotion', itd. Jeśli wybrałeś/aś poziom 3, nie zapomnij podać tłumaczenia na język polski lub angielskiego synonimu.

- **soak**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **tip jar**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **stitches**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **inn**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **cliché**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **get knocked up**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **tuition**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **enrolment fee**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **hem**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category \_\_\_\_\_
- 3) I know this word. It means \_\_\_\_\_

- **reenact**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **invoice**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **drop out**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **drop in**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **get ahold of somebody**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

- **treat (rzeczownik)**

- 1) I haven't seen this word before
- 2) I have seen this word before, and I think it's related to the category\_\_\_\_\_
- 3) I know this word. It means\_\_\_\_\_

**Zadanie 2** Wybierz właściwe tłumaczenie podanych słów, zakreślając właściwe tłumaczenie

<b>Soak</b>	moczyć	padać
<b>Tip jar</b>	stoik na napiwki	stoik na dżem
<b>Stitches</b>	szczudła	szwy
<b>Inn</b>	knajpa	bar
<b>Cliché</b>	klisza	banat
<b>Get knocked up</b>	zajść w ciążę	zostać znokautowanym
<b>Tuition</b>	wpisowe	czesne
<b>Enrolment fee</b>	wpisowe	czesne
<b>Hem</b>	szynka	skrócić
<b>Reenact</b>	reanimować	odegrać ponownie
<b>Invoice</b>	faktura	głośnik
<b>Drop out</b>	upuścić	rzucić szkołę
<b>Drop in</b>	wpaść do kogoś	zaprosić kogoś
<b>Get ahold of somebody</b>	skontaktować się z	zakochać się w
<b>Treat</b>	przyjemność	utrapienie

## Appendix F: Correlational matrix of all measurements in the form of a heatmap

	comprehension	CL selfreport	CL RT	short term gains	long term gains	vocab loss	recognition	posttest2	germane CL
comprehension	1,00	-0,44	-0,09	0,30	0,20	0,23	0,05	0,10	0,35
CL_selfreport		1,00	0,02	-0,20	-0,08	-0,21	-0,11	-0,18	-0,46
CL_RT			1,00	-0,07	-0,03	-0,08	0,03	-0,08	0,04
short_term_gains				1,00	0,77	0,69	0,16	0,38	0,28
long_term_gains					1,00	0,08	0,20	0,35	0,17
vocab_loss						1,00	0,02	0,19	0,24
recognition							1,00	0,63	0,08
posttest2								1,00	0,24
germane_CL									1,00

